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## Managing Development of Fringe Areas in Dhaka City: "Land Readjustment" as a Technique for Sustainable Future Development Ensuring Environmental and Social Justice

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# Managing Development of Fringe Areas in Dhaka City: "Land Readjustment" as a Technique for Sustainable Future Development Ensuring Environmental and Social Justice

## Peer Review

This work has undergone a double-blind review by a minimum of two faculty members from institutions of higher learning from around the world. The faculty reviewers have expertise in disciplines closely related to those represented by this work. If possible, the work was also reviewed by undergraduates in collaboration with the faculty reviewers.

## Abstract

Dhaka, the capital city of Bangladesh, is one of the fastest growing megacities in the world. With the rapid growth of population and high urbanization rate, Dhaka is bound to expand the borders to accommodate the growing need of space. But this expansion is already taking its toll in the form of environmental degradation and social injustice hampering the geographical sustainability in the process. This study proposes a controlled and well-planned development in the eastern fringe of Dhaka City (comprising of *Badda*, *Satarkul* and *Vatara*) to meet up the challenge of future accommodation requirements. The area being geographically vulnerable with lots of agricultural lands, water bodies and retention ponds, the prime concern is to ensure the geographic sustainability of the area and use all the natural features as a vital tool in the process of development. As a planning technique, Land Readjustment Scheme is applied in this regard. This report contains all the measures and proposals regarding the natural features of the study area as well as the whole process of the development scheme including a financial proposal to recover the cost of the development to make this plan financially viable. Finally, the outcome of the study shows that it can be well implemented as all the objectives are fulfilled to the fullest.

## Keywords

Contribution Ratio; Fringe areas; GIS Maps; Land Readjustment or Land Pooling; Observation Survey; Replotting; Rural-urban migration

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*Editor's Note:* Dr. Ishrat Islam, Professor, Dr. Mohammad Shakil Akther, Professor, and Farzana Khatun, Lecturer, Department of Urban & Regional Planning, Bangladesh University of Engineering & Technology, served as faculty mentors for this work.

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## INTRODUCTION

Dhaka, Bangladesh, is one of the most densely populated cities of the world. Approximately 14.5 million people live here in just 1,325 square kilometers with a density of 10,943 persons per square kilometer and an annual growth rate of 4.34% (BBS, 2011). The Population of Dhaka is increasing at an alarming rate and one of the main reasons of such increment is rural-urban migration. Home-wrecked people from natural catastrophes and rural people from the surrounding areas migrate to Dhaka city in search of better living conditions. Providing housing and other facilities for this huge population along with preserving the environment and social equity, has now become a greater challenge for maintaining sustainability in the development of Dhaka city. Sustainability requires reconciliation of three things: economic demands, environmental and social equity (Abukhater, 2011). The effect of present urbanization and development process of Dhaka on sustainability is twofold. First, natural environment is affected severely in the form of illegal and haphazard development over flood flow areas, agricultural lands and critical natural resource areas. Second, this unplanned development results in uprooting the local poor people who have been living in those areas for a long time denying them their social right and justice. Ensuring environmental preservation and social equity usually come after financial profitability, in most of the private housing and land development projects of Dhaka city, if considered at all. Between 1960 and 2010, water bodies have decreased by 33% and low lands have decreased by 53% (Islam et al, 2010). A study shows that, only around 30% of relocated local people can regain their land ownership in such development projects (Mahmood, 2013).

In this paradigm of urban planning, Land Readjustment technique can be a useful tool to determine geographic sustainability in a city such as Dhaka. “Land readjustment or Land pooling” is a technique for managing the urban development of urban-fringe lands, whereby land parcels are assembled for their unified planning, servicing and subdivision as a single estate, with the sale of some of the new building plots to recover the costs and the redistribution of the other plots back to the landowners (Yomralioglu, 1993). There are many examples worldwide where this technique was successfully implemented for high density housing projects. One such project was the Gaepo project in Seoul, South Korea (Lee, 2002). This project was undertaken for accommodating the increasing population in Seoul, without hampering the valuable agricultural land in the area. This project was also important because it improved the connectivity of the project site with the neighboring built-up areas.

To avoid scattered settlement in the fringe areas and at the same time to preserve the natural resources along with upholding the social right of the local people in those areas, this study aims at accommodating future population through a Land Readjustment Scheme at *Badda-Satarkul* area (Figure 2), located at the eastern fringe area of Dhaka city (Figure 1). There is an ample amount of agricultural lands, vacant spaces and water retention ponds in this area. These days many housing projects are undertaken in this area by the private developers which involve illegal occupation of agricultural land as well as wetlands.

This study envisions several perspectives which are-- Vision 1: A self-sufficient sustainable city, where all the natural resources are fully utilized and preserved and Vision 2: An effective implementation of Land Readjustment

Scheme at *Badda-Satarkul* to accommodate all the present and probable future population. Fulfilling these visions will ensure to find the right balance among the three E's of sustainability (environment, economy and equity) (Abukhater, 2011). Keeping in mind the above mentioned visions, some objectives have been selected for the study which is: 1) to preserve the existing agricultural lands, water retention ponds and water bodies and 2) to allocate serviced land or floor space to the land owners through land readjustment scheme.

## METHODOLOGY

### Study Area Selection

This project is intended to implement land readjustment scheme in *Badda, Satarkul* and *Bhatara* Unions of the DMDP (Dhaka Metropolitan Development Plan) Area. The area is appropriate for land readjustment for the following reasons:

*Badda, Satarkul* and *Bhatara* unions are located in the fringe areas which are less developed and mostly vacant. These types of areas are more preferred for land readjustment scheme as provision of serviced land and community facilities causes a lesser amount of demolition of existing structures.

Around 38 percent land of this area is covered with agricultural land and water retention ponds. This area has been selected because preservation and proper utilization of agricultural land will contribute to the economy by increasing agricultural production and at the same time, preservation of water retention ponds will control flood water and enhance the visual attractiveness of the city.

Most of the land owners of this area possess less than 2 kathas (see glossary) of vacant land. Land readjustment project is proposed for this area to accommodate all

land owners by providing them the equivalent amount of serviced land or floor space after their contribution.

The number of existing community facilities is not sufficient for the projected future population. Land readjustment is required in this area for construction of additional community facilities. This will enable the area to operate as a self-sustainable city.

### Data Collection

This study is based on both primary and secondary sources. An observation survey was conducted at the study area to gather an overall knowledge about the existing land use pattern.

The study area map was collected from the capital improvement authority of Dhaka city named as: *Rajdhani Unnayan Kartipakkha* (RAJUK). All the data were extracted from the GIS database and information such as- land use pattern, ownership pattern; existing community facilities and service facilities were collected. Analyzing these data, the operating policies and design principles regarding the study area were determined.

A systematic procedure was followed then to apply the Land Readjustment technique in the study area. At first, the operating principles were set up to determine the contribution ratio, replotting procedure and amount of monetary compensation. Then a detail design scheme was developed for the whole study area. Finally, the costs of the project along with the implementation phase were designed to see the feasibility of the project from financial perspectives.

## STUDY AREA PROFILE



Figure 1: Google Map of Dhaka Metropolitan Development Plan (DMDP) area.

*Badda, Satarkul and Bhatara* Unions of DMDP area have been selected for carrying out the study. The study area covers a total area of 3466.46 acres. Total population of the area is 97,585.

### Land use, ownership pattern and existing facilities of the study area

The existing land use pattern of the study area is shown in Figure 3:

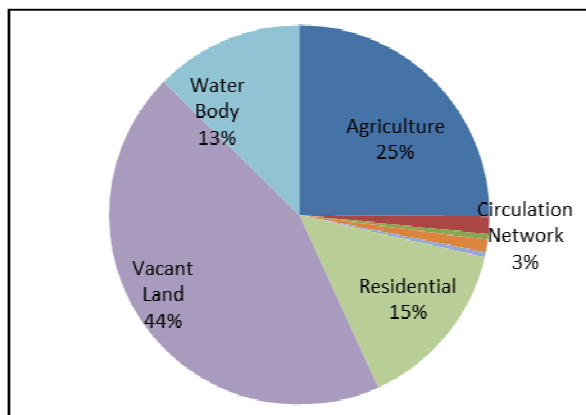


Figure 3: Land use pattern of the study area

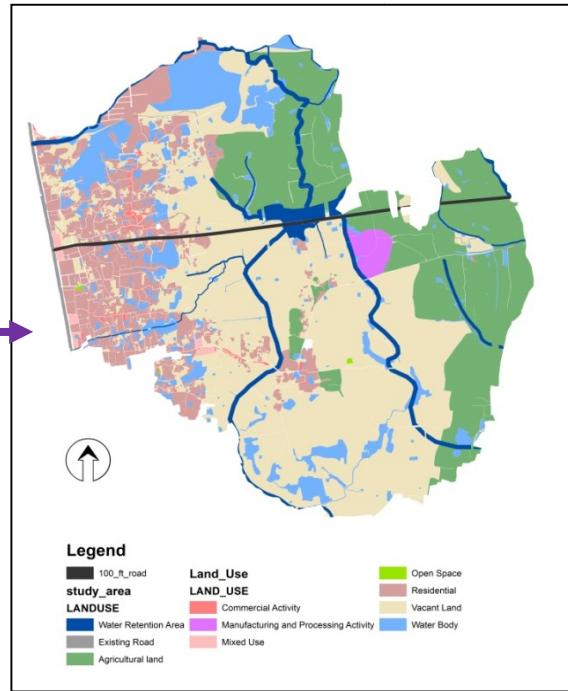


Figure 2: Existing Map of Badda, Satarkul, Bhatara

The Figure 3 shows that around 38 percent land of the study area is covered with agricultural land and water retention ponds. Preservation and proper utilization of these two natural resources is one of the most important visions regarding this area.

The numbers of land owners occupying different amounts of lands are shown in Figure 4:

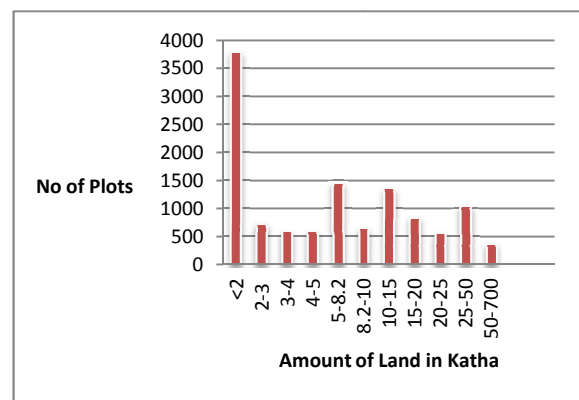


Figure 4: Frequency Distribution of Plots

The existing facilities of the study area are shown in table 1:

Facility Name	Number
College	0
Mosque/temple	39
High school	12
Primary school	14
Hospital	3

Table 1: Existing Facilities and services in the study area

## LAND READJUSTMENT IN THE STUDY AREA

The whole process of land readjustment in the study area can be divided into three parts: 1) operating principles and assumptions 2) detail design of the site and 3) financial aspects and implementation strategy. Based on these the following description depicts the systematic process of applying the land readjustment scheme in the study area:

### 1) Operating Principles and Assumptions

#### *Determination of Contribution Ratio*

Contribution ratio is that percentage of the landowner's land-holdings which they sacrifice to provide space for service facilities such as- roads, parks and other utilities (Puasakul, n.d.). In the project contribution ratio was determined as 39 % (Table-2) .The ratio was derived through trial and error method .This turned out to be the minimum ratio to provide all the facilities as well as to recover all the costs incurred. For any contribution ratio below 39%, the project will not be profitable. Again, any contribution ratio above 39% will result a higher profit. Since profit

maximization was not the primary concern of the project, contribution ratio was determined 39%.

While determining the contribution ratio, following things were taken into consideration:

- Each landowner will share the cost of the project by contributing part of his land area.
- Contribution ratio must be kept minimal otherwise the owners will be discouraged to participate in the project.
- The amount of land each owner has to contribute will depend upon the total cost to be shared by all the landowners, monetary value of the land after the project and the land required for providing facilities.

#### *Replotting Procedure*

The following things were taken into consideration while redistributing serviced plots:

- Only the original land owners will receive the serviced plots in accordance with their contribution to the project. In the remaining plots, apartments will be constructed.
- Land owners will be allowed to choose their plot with the following priority:
  1. Land owner with existing house
  2. Land owner of corner plot of the same block
  3. Land owners of consolidated parcels located at 2 or more than 2 different locations.
- The sizes of the plot will be 5 *katha*, 7.5 *katha*, 10 *Katha* and 20 *Katha* after the implementation of the scheme (as per the common plot sizes in Bangladesh).
- If the receivable amount of land by an owner is less than 5 *Katha* after contribution, the landowner will get equivalent amount of floor spaces.



### ***Determination of Equivalent Amount of Floor Space and Monetary Compensation***

The equivalent amount of floor space and amount of monetary compensation was determined through the following process:

- At first total amount of floor space that can be built in the remaining lands was determined by using this equation: Floor space (S1 sq. ft.) = remaining amount of land (*katha*) after contribution \* 720 \* maximum ground coverage (60%) \* building height (6 stories)
- Then the cost of building this floor space was determined. In the present scenario the building cost of per square feet floor space is 2,000 BDT. As this project is targeted for year 2030, the building cost is assumed as 4,000 BDT per square feet due to inflation.
- Therefore, Total building cost = Total floor space \* 4,000 BDT
- Equivalent floor space which should be sold to recover this cost was determined next. At present per square feet selling price of apartments in nearby areas (Gulshan) is 14,000 BDT (Sheltech). But in this project profit maximization is not the primary goal. So selling price of per be square feet apartment space was assumed 10,000 BDT which will be affordable among the people of various income groups ensuring social justices. So, Equivalent floor space for cost recovery (S2 sq. ft.) = Total Cost/10000
- By deducting this floor space from the floor space which can be built, the amount of floor space required to be returned was found.
- Equivalent floor space required to be returned (S sq. ft.) = S1 – S2
- The remaining fractions of receivable amount of floor spaces will be compensated in terms of equivalent amount of money (shown in the table 2).

### **2) Detail Design of the Site: Principles and Policies**

#### ***Design of Plots: Redistribution of plots***

A portion of total area was subdivided into plots which will be returned to the affected owners. The sizes of the plot will be 5 *katha*, 7.5 *katha*, 10 *Katha* and 20 *katha*. The organization of these different sizes of plots is shown in our proposed map. For this purpose the whole area was subdivided into 50 blocks of 50 *acres*.

Any owner, who will get more than 20 *Katha* land (Table-2) after contribution, will be returned a combination of those sized plots. 19% of the total area will be developed as apartment blocks for returning floor spaces to the owners and for selling the remaining portion for cost recovery. In this project, sizes of apartment will be 500 sq ft, 750 sq ft, 1000 sq ft, 1200 sq ft, 1500 sq ft, 2000 sq ft and 2500 sq ft. Floor space will be distributed in accordance to these apartment sizes (Table 2).

1. Class (Amount of land in <i>katha</i> ) [1 <i>katha</i> = 66.92 square meter] [1 square feet=.093 square meter]	2. Number of Owners	3. Mean Amount of Land ( in <i>katha</i> ) [Arithmetic average for each class, taken from the original data set]	4. Remaining land after 39% contribution (in <i>katha</i> ) [column 3 * 0.61]	5.Amount of Land to be returned to Individual Owners (in <i>katha</i> )	6. Equivalent Amount of floor space required to be returned (Square feet) [as described in the method]	7.Amount of floor space that will be returned (square feet)	8.Monetary compensati on (BDT) for remaining fractions of floor space [(Column 6 – Column 7) * 10,000BD T]
<2	3793	0.53	0.33	0	505.88	500.00	58800.32
2-3	729	2.51	1.53	0	2381.47	2250.00	1314745.49
3-4	590	3.43	2.09	0	3252.30	3250.00	23021.74
4-5	599	4.51	2.75	0	4283.01	4250.00	330085.97
5-8.2	1457	6.53	3.98	0	6194.83	6000.00	1948281.60
8.2-10	645	9.05	5.52	5	809.48	750.00	594816.00
10-15	1353	12.33	7.52	7.5	30.26	0.00	302584.41
15-20	835	17.21	10.50	10	771.33	750.00	213336.76
20-25	558	22.30	13.60	12.5	1715.08	1700.00	150846.77
25-50	1043	34.50	21.05	20	1625.47	1500.00	1254723.31
50-100	337	67.41	41.12	40	1742.15	1700.00	421484.23
100-200	28	109.19	66.61	65	2501.56	2500.00	15614.17
200-700	3	205.86	125.58	125	896.78	750.00	1467801.60

Table 2: Amount of serviced land, floor space and monetary compensation to be returned to the land owners

**Principles for Existing Structure and Facilities**

While keeping, enhancing or demolishing the existing structures the following things were taken into consideration.

- Existing roads that are wider than 50 feet will be kept as they are.
- Existing community serving facilities such as- schools, colleges, mosques, temples, hospitals etc will be kept at the present location as much as possible.

**Principles for Agricultural Land Preservation**

- Only agriculture related land use will be permitted.
- Farmers’ markets will be created and local infrastructure for small-scale food preservation and storage facilities will be installed.

**Water body Preservation and Enhancement**

- Decorative perimeter fencing and appropriate landscaping with different

types and sizes of plants will be provided surrounding the water bodies.

- Community parks will be provided surrounding the water bodies (Figure 5).

**Principles for Preservation and Enhancement of Water Retention Pond**

A 10 feet wide trail will be installed alongside the retention ponds. 6 feet of this trail will be designated as bikeways and rest 4 feet as walking trail. All these will be done without hampering the existing level of flood protection.

**3) Financial Aspects and Implementation Strategy**

**Cost of the Project**

Cost of the in different sectors are discussed in the following-

**i) Land Development Cost:**

This cost includes construction of roads, footpath, bridges and provision of service facilities, cutting and filling etc. Necessary standards for estimating this cost

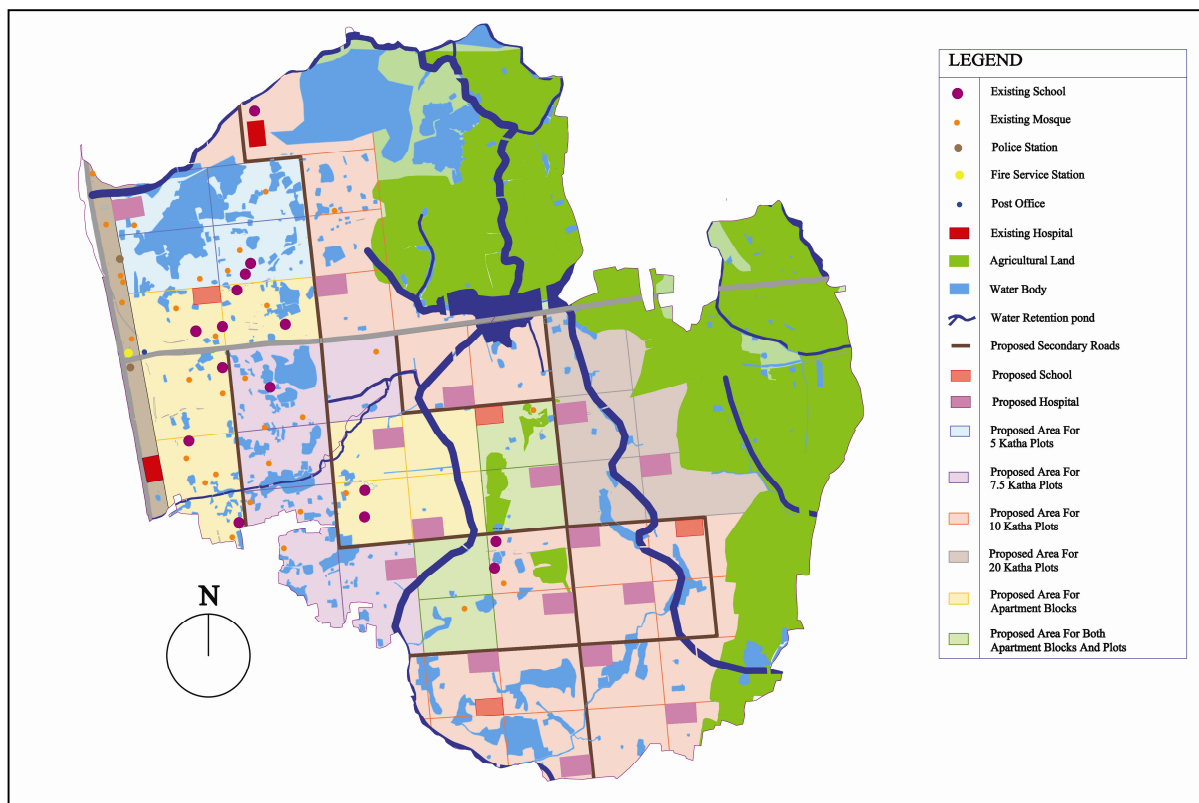


Figure 5: Proposed Map of Badda, Satarkul, Bhatara

is taken from the “Detailed Estimate of Purbachal New Town Project” and per *Katha* development cost is estimated 202,638 BDT. Total cost in this sector is estimated **2,632.93 crore BDT (338,641,328 USD)**.

**ii) Apartment Construction Cost:**

The remaining land, after returning serviced plots to the owner and providing land for community facilities, will be developed as apartment blocks. Total cost in this sector is estimated **16,220.11 crore BDT (2,086,188,286 USD)**.

**iii) Monetary Compensation:**

The amount of monetary compensation is derived in Table 2. [Total monetary compensation =  $\Sigma$  (monetary compensation of each person in each class\*number of owner in each class.)] The total amount of monetary compensation is **BDT 674.23 crore (86,718,310 USD)**.

**iv) Construction of Walking and Cycling Trail:**

From the cost of road construction of “Purbachal New Town Project”, the cost of construction of this road is derived 1533BDT/ square meter. Total cost in this sector is 30.63 crore BDT (3,940,312.98 USD).

**v) Initial Development of Water Bodies and Agricultural Land:**

For landscaping surrounding the water bodies and retention pond, providing small-scale food preservation and storage facilities and development of agricultural land and initial budget of **100 crore BDT (12,861,737 USD)** is estimated.

**Total Cost**

The total development cost of the project can be borrowed from Asian Development Bank for 10 years with 5.5% interest rate (Kabir, 2007). This will need additional **10,811.85 crore BDT (1,390,592,485 USD)**. The total project cost is shown in the Table 3:

Cost Sectors	Cost (Crore BDT)
Total Development cost	19,657.92
Total Interest of 10 years with 5.5% interest Rate [Total Interest= Total Development cost*interest rate(5.5%)*year(10)]	10,811.85
Total project cost	30,469.77 (BDT 304,697,776,104.97)

Table 3: Total Project Cost

**Revenue of the Project**

The revenue of the project will be collected from selling floor spaces and selling serviced plots for community facilities.

**i) Selling Floor Space :**

After returning the apartment to the owners, government will collect revenue for cost recovery by selling rest of the apartments. These apartments will be sold at 10000 BDT/square feet. Total revenue in this sector is **19,540 crore BDT (2,513,187,756 USD)**.

**ii) Selling Serviced Plots for Community Facilities**

Revenue will be collected by selling serviced plots for community facilities. The plots which are designated for hospital, small clinic, college and market/shop will only be sold. The plots designated for hospital, college and small clinic will be sold at reduced rates. Plots which are designated as market place will be sold at market rate. Total area required for different community facilities was determined from the Private House Land Development Rule of Bangladesh, 2004. Total expected revenue in this sector is **10,999.5 crore BDT (1,414,726,688 USD)**.

<b>Total revenue of the project</b>	305,395,348,000.00 BDT
<b>Total project cost</b>	304,697,776,104.97 BDT
<b>Total profit of the project</b>	697,571,895.04 BDT <b>69.75 crore BDT</b>

Table 4: Total revenue earned from the project

### **Implementation Phasing**

The phases of this project are shown in the following chart:

Phase	Time Period	Project Description
<b>Phase 01</b>	2013-2022	Construction of apartments, internal roads and preservation of natural resources.
<b>Phase 02</b>	2020-2026	Construction of apartments on the lands near Pragati Sarani and selling apartments for cost recovery
<b>Phase 03</b>	2025-2030	Redistribution of serviced plots and distribution of apartments among the owners

Table 5: Implementation Phasing

This project will be implemented under the supervision of the government but public participation will be ensured in acquisition of land and redistribution of serviced plots.

### **CONCLUSION**

As most of the projects in Dhaka city are initiated by the private developers, they are completely based on profit maximization. As a result balancing the social equity and preservation of natural environment is completely ignored. Moreover, because of such housing projects, people of low income are becoming landless. This study proposes a plan to continue with the development of an area,

with solutions to these problems. Land readjustment scheme of *Badda*, *Satarkul* and *Bhatara* is a project which is totally based on the three pillars of geographical sustainability.

First, it proposes a plan which is financially viable. As the scheme shows, all the estimated costs of the project are recovered through the revenues earned by selling plots for community facilities. This process leaves enough room of flexibility.

Second, this plan is designed in way; so that the environment is least disturbed and all the natural features of the study area were preserved. Additionally in some cases proposals were provided regarding their enhancement.

Third, the plan was focused to ensure social equity by securitizing serviced plots or apartment space for all the land owners specially the owners having small parcel of lands. During redistribution, maximum possible developed plots were returned to the original owners.

In conclusion it can be said that the study fulfills all of its objectives. With proper governance, the project can be well implemented and thereby ensure a geographically sustainable development in the eastern fringe of Dhaka city.

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**BDT:** Bangladesh Taka. 1USD =77.75BDT  
(Source: Bangladesh Bank, accessed on 17/02/2014)

## GLOSSARY

**Acre:** 1 acre = 43,560 sq. ft. Or 1 acre = 4046.86 sq. meter

**DMDP:** Dhaka Metropolitan Development Plan

**Katha:** Local unit of land measurement. 1 katha= 66.92 square meter

## Appendix A

### Calculation for 38% contribution ratio

1. Class (Amount of land in <i>katha</i> ) [1 <i>katha</i> = 66.92 square meter] [1 square feet=.093 square meter]	2. Number of Owners	3. Mean Amount of Land ( in <i>katha</i> ) [Arithmeti c average for each class, taken from the original data set]	4. Remaining land after 38% contribution (in <i>katha</i> ) [column 3 * 0.62]	5.Amount of Land to be returned to Individual Owners (in <i>katha</i> )	6. Equivalent Amount of floor space required to be returned (Square feet) [as described in the method]	7.Amount of floor space that will be returned (square feet)	8.Monetary compensatio n (BDT) for remaining fractions of floor space [(Column 6 – Column 7) * 10,000BDT]
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4-5	599	4.51	2.80	0	4283.01	4250.00	1032218.53
5-8.2	1457	6.53	4.05	0	6194.83	6000.00	2963827.20
8.2-10	645	9.05	5.61	5	809.48	750.00	2002272.00
10-15	1353	12.33	7.64	7.5	30.26	0.00	2219675.96
15-20	835	17.21	10.67	10	771.33	750.00	2889293.10
20-25	558	22.30	13.83	12.5	1715.08	1700.00	3618893.44
25-50	1043	34.50	21.39	20	1625.47	1500.00	6620210.58
50-100	337	67.41	41.79	40	1742.15	1700.00	10905115.12
100-200	28	109.19	67.70	65	2501.56	2500.00	16997509.49
200-700	3	205.86	127.64	125	896.78	750.00	33483667.20

### Cost calculation

#### **Total development cost**

Cost sector	Amount (BDT)
Apartment Construction Cost	162,201,139,200.00
Construction of Walking and Cycling Trail	306,359,334.00
Land Development cost	26,329,363,254.00
Monetary Compensation	26,928,261,530.00
Initial development of water bodies and agricultural land	1,000,000,000.00
Total Development cost	216,765,123,318.00 (2,787,975,862 USD)

#### **Total cost**

<b>Total Development cost</b>	216,765,123,318 BDT (2,787,975,862 USD)
<b>with 5.5% interest rate for 10 years total interest</b>	119,220,817,825 BDT (1,533,386,724 USD)
<b>Total project cost</b>	335,985,941,143 BDT (4,321,362,587 USD)

**Total Revenue**

Source of Revenue	Amount of Revenue
Selling Apartments	195,400,348,000.00 BDT (2,513,187,756 USD)
Selling serviced plots of community facilities	109,995,000,000.00 BDT (1,414,726,688 USD)
	305,395,348,000.00 BDT <b>30539.5 crore taka</b> (3,927,914,444 USD)

**Total Loss**

<b>Total cost of the project</b>	335,985,941,143 BDT (4,321,362,587 USD)
<b>Total revenue of the project</b>	305,395,348,000 BDT (3,927,914,444 USD)
<b>Total loss of the project</b>	30590593143 BDT (393,448,143.3 USD)