

Environmental Friendly Low Cost Housing and Sustainable Development in Bangladesh

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Abstract– Natural disasters- flood, cyclonic tidal/storm surge, land slide, river bank erosion, drought and earthquakes are the main hindrance to the sustainable development of Bangladesh. In recent years, these have caused extra burden for the marginal people of the country jeopardizing country’s economic growth as a whole. Although it is a small country, its culture, disaster types, availability of building materials are diverse and the housing practices in different regions vary widely too. A large number of rural houses are damaged due to disaster on a regular basis and cause economic losses and sufferings to the people. Repetitive constructions of such houses also impart deterioration of the environment as much of the construction materials are obtained locally from surrounding nature and thus sustainable development is also hampered significantly. To develop the design, at first the local practices and availability of local materials were studied. Besides, it was considered essential to understand and accommodate the need and culture of the community. At the same time it is important to consider environmental issues. Three-stage community level meetings attended by people, leaders and local masons were held to gather their views, demand and experience. Properties of the local construction materials were ascertained from laboratory tests. Respecting local affordability and considering the service and environmental loads, designs were finalized based on FEM analyses. Model houses were constructed at the selected locations to demonstrate them to the local community with an aim that new design or at least some features would be replicated. Different treatment schemes for increasing the durability of materials were employed to study their effectiveness.

Keywords— Building culture, community participation, disaster resilient, local material, rural housing, sustainable development;

I. INTRODUCTION

Housing is a basic need for civilized living. In a developing country like Bangladesh- housing inadequacies and backlog have been increasing mainly due to the galloping increase in population; fast pace of urbanization and other social and economic factors, which include breaking up of the joint family system, and steep rise in the price of land, building materials and labor.

Since 75% of the households are still living in simple huts or houses made of mud, the consequences of these scourges are all the more disastrous. Many house destructions are noted every year in rural areas due to low quality housing, poor materials and wrong building practices.

Habitable shelter is one of the basic needs of human being. The housing pattern of a community largely depends on its socio-economic conditions, availability of raw materials and

environmental factors. The low-income profile of a population is naturally forced to choose a low cost option to raise their dwellings. However, these houses need to be structurally stable and durable to provide a cost-effective return. A minimum level of provision for safe water supply, sanitation, fuel and lighting facilities are also associated with these dwellings.

Such a shelter together with all these basic amenities within an affordable range of low-income communities can significantly contribute to promote their standard of living. With this background, the paper reviews the prevailing socio-economic condition, housing pattern, water supply and sanitation situation of Bangladesh, a densely populated country with very low per capita income. Based on this review, the paper suggests a number of low cost options of housing integrated with potable water supply and sanitation facilities for the low-income communities of both rural and urban slum areas.

Some essential parameters such as durability, structural stability, affordability and competence of local construction & maintenance have been considered prior to suggesting these low cost options. The paper, however, does not entail the cyclone prone southern coastal area, where the design criteria and considerations will be different. Nevertheless, it covers about 80% of the total geographical area and population of Bangladesh.

The UNCHS (2006) refers to slums as the ‘shelter dimension of urban poverty’ as the number of slum-dwellers increased from 715 million in 1991 to 998 million in 2005, adding another 50 million in 2005-7.

UNCHS (2007) projects a total 1.4 billion slum-dwellers in 2020. Slum population in India has more than doubled in the past two decades; in 2001, 54.1% of Mumbaians lived there (NIHFW, 2006). *Dharavi*, Asia’s second largest slum in central Mumbai houses 800,000 people (Davis, 2006). 25% of Sao Paulo population lives in slums.

Kolkata has more slums dwellers at a higher density. Based on water and sanitation access, 99% of Afghans and 94% of Central Africans live in slums; even a third of the Argentines experience the same.

China, India, Nigeria and Pakistan have 175 mil, 158 mil, 42 mil and 36 mil slum-dwellers (UNFPA, 2007). A sixth of Commonwealth citizens (327 mil.) live in slums (Comhabitat,

2006). In 11 African, 2 Asian and 1 Pacific country urbanizing rapidly, over two third urbanites live in slums.

Given their social, economic and political situation, most of the poor could manage only ill-built and ill-served houses (Tipple 1994; World Bank 1993), which however have shown sustainability, and will remain a dominant form of dwelling for some time. This paper infers an outline of sustainable housing out of the concepts of sustainable development, compare the low-income group's (LIG) housing in the developing world, particularly in Bangladesh, and evaluate the slum improvement programs therein. It particularly highlights the advantages of incremental self-built and in situ upgrading, and their role in sustainable housing.

Sustainable Housing

Hundreds of cities aspire to be sustainable (Holden 2006) by reconciling between being part of a competitive global network and meeting the citizens' requirements. The political act based on human decisions and ways of life (Robinson 2004) has "revolutionary implications" for urban planning and management, "but sounds so wholesome that everybody endorses it" (Greider, 1997). Cities are relentless consumers and polluters draining the world for their sustenance and energy (Rogers, 1998). The idea of "the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987) emerged to bridge the gap between ecological concerns about the consequences of human actions and socio-economic concerns about development issues (Robinson, 2004). The Brundtland report presents the term as a language truce about a set of ideas like democracy, freedom, or justice (Mebratu 1998; Pezzoli 1997; Guha & Martinez-Alier 1997); academics focused more on the role of institutions, governance, and social capital in the process (Lehtonen, 2004). Sustainability, a social change process for meeting human needs, advancing social equity, expanding effective organization, and building capacity, mandates greater attention to environmental conservation and protection than with development (Roseland, 2000).

Sustainability efforts addressed public health and individual and population-based issues (Prescott-Allen, 2001), social and economic equity (Sachs, 1999), participation (BIP, 2000), environmental quality, economic vitality, urban sprawl, and supportive planning activities and policies (Budd et al., 2008).

These assumed that a sustainable city would preserve a quality environment, use efficient energy resources, have equitable access to utilities, health services and economy, creativity to optimize human potential, resource efficiency, minimal ecological impact, ease of contact, mobility, integrated and compact communities and diversity, actively pursue social equity, and create an engaged citizenry (Kates et al., 2005; Parris & Kates, 2003; Rogers, 1998). Ability to maintain a high quality of life shows a city's sustainability. Besides economic and physical objectives it needs to meet social, environmental, political and cultural ones, and address connection to environmental degradation and people's coping

ability. Hence sustainable urban development promotes economic growth, maintains social inclusion, and minimizes environmental impact. The European Commission (2001) created a directed approach: "economic growth [that] supports social progress and respects the environment, social policy [that] underpins economic performance, and environmental policy [that] is cost-effective.

"To remain meaningful, sustainable human settlements must stay within the absorptive capacity of local and global waste, the achievement of the sustainable use of renewable and replenish-able resources, the minimization in the use of non-renewable resources, and meet basic human needs (Hardoy et. al 1992).

II. OBJECTIVE OF THE STUDY

1. To justify the efficacy of low cost housing and sustainable development in Bangladesh
2. To identify the measures that can be taken to enhance the efficiency low cost housing
3. To find out issues and challenges for environmental friendly low cost housing in Bangladesh
4. To ensure that how to make a sustainable housing policy.
5. To reduce homeless people.
6. To promote the preservation, rehabilitation, and investment in our regional housing stock and neighborhoods.
7. To promote the creation and maintenance of an adequate supply of sound and affordable housing integrated throughout the region.
8. To promote programs, education, and training that support and encourage appropriate rental housing oversight.
9. Increase resource efficiency, improve public health, and reduce environmental impacts by using green residential building strategies.
10. To provide adequate supply of housing for low-and moderate income households.

III. METHODOLOGY

The methods and materials used in the study were:

1. Survey work
2. Designing work
3. Costing work
4. Draft man work

Sample population: 200 respondents

Variables:

Profession

- Engineer : Real Estate/ Civil Engineer/Architects
- Manager : Real Estate/ Financiers/ City
- Inhabitant : Home owner/Flat owner/ Rentals
- Environnementaliste : Science/Arts/Technologiste

Categories

Wealth category:

- Very rich- N0
- Rich -Monthly income: Tk. 2-3 lacs
- Medium high: Tk. 1-2 lacs
- Medium low: Tk. 0.3-1 lacs
- Poor: <0.15-0.30 lacs
- Very poor: No

Probable sites

- Nikunjo
- Badda
- Gulshan Thana
- Dhanmodi
- Basundhara adjacent sites
- Kodomtoli

IV. RESULTS AND DISCUSSION

The obtained from the present research are sequentially mentioned here in the form of table and figures. The results are presented and interpreted under the heading and sub-headings of:

1. Typical Housing Requirement House
2. Type Suitability
3. Reducing Costs
4. Size of the Flat
5. Design Choice

1. Typical Housing Requirement

Typical housing requirement for the majority mid level urban and sub-urban people was found to be very important due to less wealth of the people, shortage of land and degraded and hydromorphic nature of the soils. The results show that 73% of the respondent prioritized Low cost small houses for sustainable accommodation followed by real estate managers being 68%. Their second choice was low cost mid size house which was dominantly supported by the environmentalists. The mean percent results indicated it by the 25% and 23% respondents.

Table 1: Percent response on the typical housing requirement

SI	Variables	Engin eers	Mana gers	Habit ants	Enviro nment	Mean
1	High cost strong housing	55	32	23	38	37.0
2	Mid cost but large house	52	41	42	37	43.0
3	Low cost mid size house	47	49	51	69	54.0
4	Low cost small house	35	68	73	54	57.5
5	Low cost dorm	34	52	34	53	43.3
6	Mean	44.6	48.4	44.6	50.2	47.0

Notes: Typical person (covering > 30% of the urban and sub-urban population of Bangladesh?)

Costs and houses

High cost strong housing (Tk. > 20,000 per square feet, >3000 square ft)

Mid cost but large house (Tk. > 15,000 per square feet, 1800-2000 square ft)

Low cost mid size house (Tk. 7- 10,000 per square feet, 1300-1800 square ft)

Low cost small house (Tk. 5- 7,000 per square feet, 800-1300 square ft)

Low cost dorm house (Tk. > 5,000 per square feet, <800 square ft)

Fig. 1: Cost and housing response as per professional groups

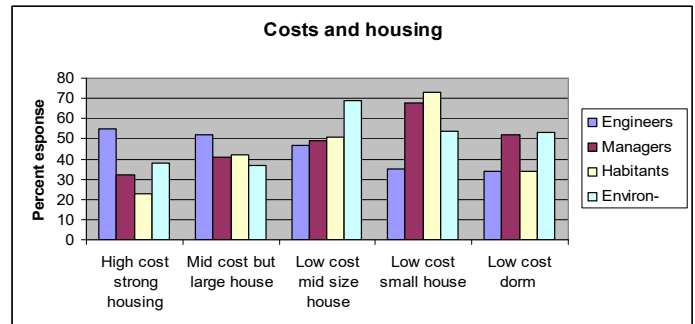


Fig. 2: Cost and housing size priority

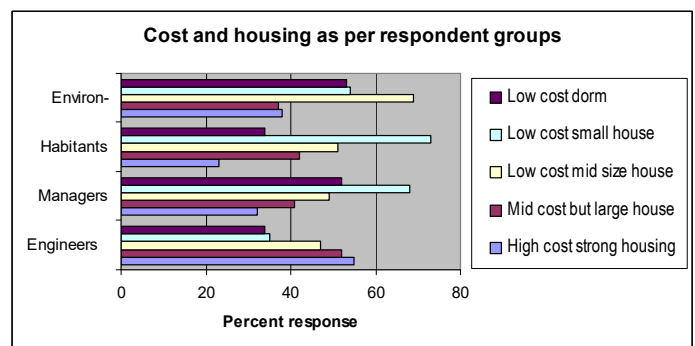
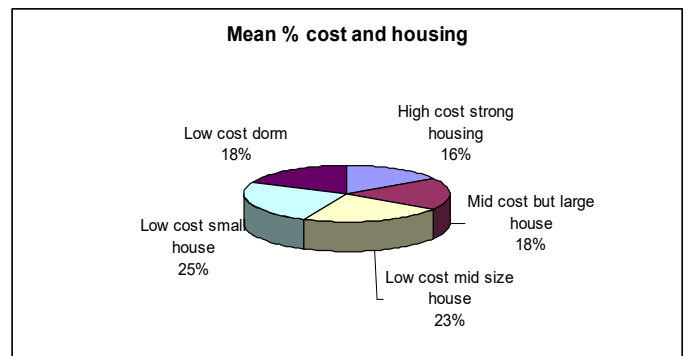


Fig. 3: Mean priority given by respondent cost and house size combinations



2. House Type Suitability

The mean and other results given in the table here show that 77 to 84 % respondent of the medium group scored for up to 6 storey low cost materials (non-lift), while 33-34% liked it. The mean results showed a consistent greater choice for low cost types from rich to poor habitants.

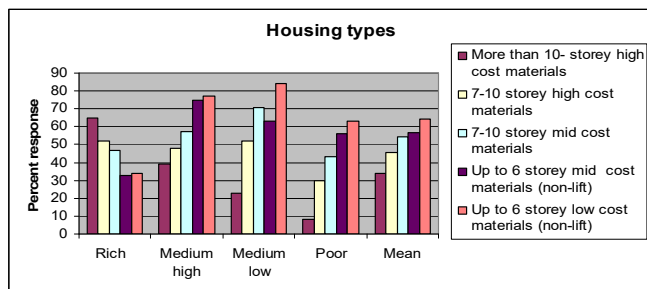
Table 2: Response on the types of building choice

Sl.	Variables	Rich	Medium high	Medium low	Poor	Mean
1	More than 10-storey high cost materials	65	39	23	8	33.8
2	7-10 storey high cost materials	52	48	52	30	45.5
3	7-10 storey mid cost materials	47	57	71	43	54.5
4	Up to 6 storey mid cost materials (non-lift)	33	75	63	56	56.8
5	Up to 6 storey low cost materials (non-lift)	34	77	84	63	64.5
6	Mean	46.2	59.2	58.6	40.0	51.0

Notes:

- a. Building at present more suitable for a typical person (covering > 30% of the urban and sub-urban population)? More than 10- storey high cost materials
7-10 storey high cost materials
7-10 storey mid cost materials
Up to 6 storey mid cost materials (non-lift)
Up to 6 storey low cost materials (non-lift)
- b. Rich -Monthly income: Tk. 2-3 lacs
Medium high: Tk. 1-2 lacs
Medium low: Tk. 0.3-1 lacs
Poor: <0.15-0.30 lacs

Fig. 4: Types of Housing



3. Reducing Costs

Table 3: Ways of reducing the cost of building

Sl	Variables	Engineers	Managers	Habitants	Environ	Mean
1	Arranging low interest capital cost	76	61	64	57	64.5
2	Using low cost materials	44	40	43	36	40.8
3	Phasing construction cost separating fittings and luxuries	57	78	81	41	64.3
4	Reducing Storey	35	35	51	64	46.3
5	Using traditional materials	24	23	32	59	34.5
6	Mean	47.2	47.4	54.2	51.4	50.1

4. Size of the Flat

Table 4: Size of a flat for 3-member low cost house

Sl.	Variables	Rich	Medium high	Medium low	Poor	Mean
1	700 sq ft or more	25	38	45	27	33.8
2	600-700 sq ft	22	68	57	36	45.8
3	500-600 sq ft	23	49	77	62	52.8
4	400-500 sq ft	13	35	65	59	43.0
5	< 300 sq ft	11	27	34	33	26.3
6	Mean	18.8	43.4	55.6	43.4	40.3

5. Design Choice

Table 5: Design of a flat you prefer of a flat for 3-member low cost house

Sl.	Variables	Engineers	Managers	Habitants	Environ	Mean
1	Design 1 = 550 sq ft	56	61	61	46	56.0
2	Design 2 = 500 sq ft	44	69	83	58	63.5
3	Design 3 = 450 sq ft	37	68	67	61	58.3
4	Design 4 = 400 sq ft	35	44	49	54	45.5
5	Design 5 = 350 sq ft	24	29	46	52	37.8
6	Mean	39.2	54.2	61.2	54.2	52.2

Note

1. Design 1 = 550 sq ft 2 rooms one room with attached bath
2. Design 2 = 500 sq ft 2 rooms one room with attached bath
3. Design 3 = 450 sq ft 2 rooms one room with common bath
4. Design 4 = 400 sq ft 1 rooms one room with bath
5. Design 5 = 350 sq ft 1 rooms one room with bath

Solution & Benefits

Therefore, a resistant and decent home to every Bangladeshi household should be offered. The affordable prices and customized mode of payment, corresponds perfectly to the needs of low and middle-income people living in rural areas can be ensured as well.

Furthmore, the benefits of low cost housing are as bellow:

- Research shows construction speed increased by 50%
- Thermal performance improved by 30%
- Construction waste reduced by 50%
- Construction cost reduced by 35-40%
- Funding related costs reduced by 10-12%
- Impact on the local community dramatically reduced.

Country Benefits

- The aim of Government is, day by day each village will become into a city.
- As a result, the traffic jam of the city will be reduced.
- The people density on Dhaka city will be reduced.
- The beauty of Dhaka city will be increased.

- Improving Worker and Employer Attraction.

Benefits for Village People

- Economic development will happen drastically.
- The work facility of women in the village will be increased and well organized.
- It will be not necessary to go to capital city for higher education/internship.
- The people of the village will be in a good environment, where they get all kinds of benefits.
- Possible to organize House, school, college, hospital, play ground, pond, market, park, office in an inaccessible place or high places in the rural area.
- The people of the village could purchase houses at a very low price every flat size 500/600 sft. Will be able to purchase by 1000/1200 Tk/sft/ Where, Bashundhora R/A needs 10000 TK/sft.
- Women’s job facilities will be increased by hand made products or any other ways.
- The people of the village will be able to know the land surrounding. They will harvest different crops, vegetables, cultivate and so on.

V. SUMMARY

There is no denying of the fact that housing and other facilities are not merely provision of physical refuge but more importantly successful housing and living standard has to ensure psycho-socio-economic shelter against all sorts of internal and external restraints. The paradigm of “participatory development” could have bearing in this regard, at least to begin gaining actual understanding of the situation on the ground and by that means to formulate policy and practice guidelines. A much more widespread and concerted effort is required from all sectors of society to address these constraints, which are structural in nature. Moreover with a backdrop of intricate, fragile ecosystem of the country, provision of ideal housing and living quality is more than that of ensuring basic human rights. To be true, it will be a fundamental impetus for sustainable development. Recognition of the problem and thereby identifying and developing understanding of the constraints could perhaps serve as an initial step towards informing policy and practice.

VI. RECOMMENDATIONS

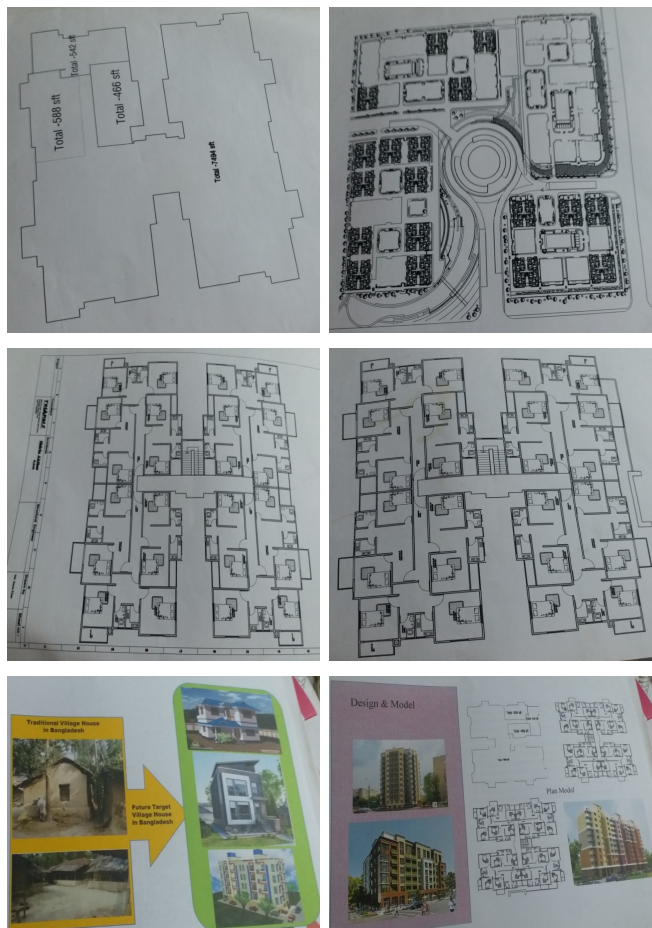
In light of the above summarized research findings. The following recommendations are made though requiring some field level refinements. The major recommendations are:

1. The low cost housing system (LCHS) should be prioritized in Bangladesh for non-lift urban attached hydromerphic laud with wide base: height ratios (1:4/5).
2. The building design should have option so that a 400-600 sq. ft. unit with attached bath, common e-utility services, and integrated border facility management may be done.

3. The 3rd phase cost of the Hats/ units but ready for minimum residence may be transferred to the Hat owners, which he can do at his own convenience.

In all 5 draft design in this regard are finalized after cliental acceptability studies which may be in-built in the LCHS as a patent of me for future welfare and modern livelihood housing.

Fig. 5: Design & Models



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more than 15 years and published many research papers. She has participated many international seminars & conferences.

BIOGRAPHY



Dr. Engr. Masuda Siddique Rozy in an Managing Director of the Rasa Construction & Development Ltd. She also Member, Totho O Gobeshona Sub-committee, Bangladesh Awami League, Advisor, Norsingdi Jela Awami League, Organizing Secretary-1, Bangladesh Tati League, Central Committee, Vice-President, Bangladesh Mohila Awami League-Narshindi, President, Narshindi Woman Chamber of Commerce Industry, Director, REHAB, Director, CISC and Co-Chairman, IEB (Women Committee). She is actively engaged in research activities through his academic career