

Environment Friendly Low Cost Housing Opportunities 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.

Key words: Environment, Low Cost Housing, Rural Housing, Sustainable Development.

INTRODUCTION

Dwellings are the most fundamental rights not only for human being but also for all living beings among the vast flora and fauna levels of the universe. It is thus awareness goes to empowered not to hamper the peace of nest niches as well as others. That's why the housing sector objectives must be of eco friendly abloom with maintaining equilibrium to all masses available in surroundings. Moreover in widespread, the housing sector plays vital roles both in the context of the economy of Bangladesh and serving the fundamental human right of shelter which actually call for the awareness and analysis regarding various pertinent issues involving the sector. These analyses include the size and contribution of the housing sector to the economy, current market structure and trends in this sector, regulatory framework governing this sector, various government policies and associated challenges arising from recent economic crises and policy changes. Without adequate information the players in this sector cannot plan and prepare themselves for the challenges and opportunities. Besides, the government cannot make appropriate policy interventions to make an appropriate balance between the facilitation and regulation for the betterment of both this sector and its contribution to the overall economy. Availability of proper information is also necessary from the perspective of the investors so that they can make efficient investment decisions. This is very vital as the sector grows to its matured phase, investors has to be well aware of the facts and status of the industry.

Who depend solely or heavily on the housing sector need accurate information, facts and forecasts to safeguard their interests. And last but not the least consumers cannot make the best use of their scarce savings for their accommodation if they do not have proper information of this sector. Thus, availability of more market related information will define, with greater accuracy, the nature of the future development required in this sector. Despite the significant growth of the housing sector in the recent past, good research dealing with the development of this sector is lacking. This is compounded by the fact that there is a lack of adequate statistical information.

OBJECTIVES OF THE ARTICLE

Broad Objective

The broad objective of this study is to do a widespread research on the housing sector specially housing in urban, sub-urban and rural areas of Bangladesh, i.e. to gather and compile all possible relevant data regarding the environment friendly low cost housing sector of Bangladesh and to provide accurate market related information for the decision makers.

Specific Objectives

The specific objectives of this article are:

1. To justify the efficacy of low cost housing in Dhaka city 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.

Housing- Bangladesh Perspective

A fair view

Housing and settlement interrelated burning issues in Bangladesh in comparison to get-at-able land and population burden. Putting bird's eye views towards the world wide, overcrowded mostly might be spectacted in Bangladesh ever. Statistically on computation, the area of Bangladesh is 147570 sq. kilometer, its population 16.75 crore (BBS prediction upto July 2019). Person

per sq. kilometer is 1135 nos. Severe points of ponder is, chain of population emerging towards town from remote area for better livelihood creates burden to city life; these are threats for all of our people. That's why we should assert highest attention to our every inch of land. Contrariwise, taking consideration and one country in the world named Canada; her area is 9980000 sq. kilometer. Whole World population is 761.63 crore, if entire population is entered in Canada, people per sq. kilometer will result 763 nos. From this statistics, anybody can easily guess the viral ambience of Bangladesh in population environment. So our country land is our living being, above all, is of our life.

Crucial status is, Bangladesh runs highest crowded country than six Small Island and one city state in the world. An available year wise demography of Bangladesh is shown below according to BBS census.

Table: 1

Census year	Population in million	Growth rate %	Remarks
1801	14.50	--	--
1851	20.30	0.72%	
1901	28.00	0.68%	
1911	31.60	0.94 %	
1921	33.30	0.60 %	
1931	35.60	0.74 %	
1941	42.00	1.70 %	
1951	44.20	0.50 %	
1961	55.20	2.26 %	
1974	76.40	2.48 %	
1981	89.90	2.35 %	
1991	111.50	2.17 %	
2001	130.50	1.59 %	
2008	140.00	0.8%	
2010	144.00	0.61%	
2011	147.30	1.34 %	
2012	152.50	1.12%	
2018	171.50	1.33%	UNO Data

The above table shows one crore forty five lacs people in 1801 and seventeen crore fifteen Lacs people in 2018 in Bangladesh within limited area at a duration of 217 years. This table at a glance clearly discloses the human stress on our country.

An example of population progression of Dhaka city shown below with prediction.

Table: 2

Year	Population nos.	Growth rate%	Growth nos	Remarks
2035	31233651	2.15%	3157991	
2030	28075660	2.63%	3422796	
2025	24652864	3.25%	3647004	
2020	21005860	3.56%	722308	
2019	20283552	3.62%	2686375	
2015	17597177	3.62%	2866640	
2010	14730537	3.62%	2399658	
2005	12330879	3.70%	2045932	
2000	10284947	4.30%	1952473	
1995	8332474	4.71%	1711777	
1990	6620697	7.27%	1960313	
1985	4660384	7.37%	1394721	
1980	3265663	8.01%	1044608	
1975	2221055	10.09%	847337	
1970	1373718	10.85%	552978	
1965	820740	10.07%	312819	
1960	507921	4.43%	99055	
1955	408866	4.02%	73106	
1950	335760	0.00%	--	

Sources: 1) BBS-2016

2) World urbanization prospects: United Nations population estimates and projections of major urban agglomerations.

Some related terms and definitions regarding housing:-

Environment: The everything surrounding of us is called environment. It is both living (biotic) or non-living (abiotic) elements physical, chemical & other natural forces includes it. Environment may also be termed as an ecosystem concern. On the other way, an ecosystem (an environment) is a natural unit consisting of all flora and fauna i.e. all plants, animals and micro-organisms (biotic factors) in an area functioning together with all of the non-living physical (abiotic) factors of the environment. Environmental some factors are visible (soil, water, climate, natural vegetation, land forms), while others are invisible (air, heat, cool, electron).

Environment is whole of physical and biological systems surrounding human & other organisms along with biotic and abiotic factors influencing them.

Peoples are thus inseparable parts of an environment. Human and environment plays very close relationship with each other. All life continuously affected by environmental phenomenon vigorously. So, close existence of habitation and conducive environment should be well balanced.

Friendly: Friendly explains befitting or relating to a close one exhibiting consistent kinship, absence of antagonism. Environment friendly implies a disposition to live on natural embellishing, encompassed by requisite biotic and a biotic element.

Ecosystem: An ecosystem is a community of living organisms in conjunction with the nonliving components of their environment, interacting as a system. These biotic and abiotic components are linked together through nutrient cycles and energy flows. Energy enters the system through photosynthesis and is incorporated into plant tissue. By feeding on plants and on one-another, animals play an important role in the movement of matter and energy through the system. They also influence the quantity of plant and microbial biomass present. By breaking down dead organic matter, decomposers release carbon back to the atmosphere and facilitate nutrient cycling by converting nutrients stored in dead biomass back to a form that can be readily used by plants and other microbes.

Biodiversity is defined as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.” The importance of this definition is that it draws attention to the many dimensions of biodiversity. It explicitly recognizes that every biota can be characterized by its taxonomic, ecological, and genetic diversity and that the way these dimensions of diversity vary over space and time is a key feature of biodiversity. Thus only a multidimensional assessment of biodiversity can provide insights into the relationship between changes in biodiversity and changes in ecosystem functioning and ecosystem services.

Housing: Housing or more generally living spaces refers to the constructions and assigned usage of houses or buildings collectively, for the purpose of sheltering people- the planning or provision delivered by an authority with related meanings. This living space is to comply balanced ecosystem ability, so that the house becomes comfortably habitable i.e. the friendly housing.

Habitat: It indicates the strolling, hunting ground or growing places of animals and plants in suitable area.

Habitation: The secured dwelling places of human and animal are termed as habitation.

Habitant, Resident: Habitants or inhabitants are the persons, who are allowed of dwelling in the houses.

Building, House, Home, Dwelling and Residence: These are inhabitable residing home, which also residential place, where human being does inhabit.

Hut, Cottage: Temporary occasional wandering shelter for respite, leisure.

What is Town- In any habitation, if there is an arrangement of autonomous facility as in the name of Municipality, Corporation, Cantonment Board or marked notified area called Town or Statutory Town.

On the other hand, Census Towns are appellate as a place where minimum populations framed to 5000, less than 4 hundred people lives in per sq. kilometer at least, below 75% of the male people engaged in non-agricultural pursuits.

This definition of town is not confined to eternal but every country reserves the right to ascertain their own definition. Other than India, more five countries include the nature of jobs of their citizens in the definition. Usually town is almost bigger gradually extends and the inhabitants there are permanent although. In many countries, the town authorities enjoy their own rules and regulations as a whole.

Capital: Capital is a town of the country, domain, and kingdom or of any segment pertaining to the center, from where govt. runned & all decisions are furnished to the whole state.

City: It is indicated as a place where maximum peoples are non-agrarian but fully engaged in commercial entity and enjoy full modern facilities.

Mega city: In any city when its demographic figure exceeds to fifty lacs, denominated as Mega city.

Urban: The term relating to, or designating, characteristic of, or constituting, comprising a city or town. In US census use, designating or of an incorporated or unincorporated place with at least 50 thousand inhabitants is called Urban or Urban area. In common, Big City is designated as Town and very big City demarcated as Metropolitan City.

Urban Conjunction: Side by side, when two Metropolitan City areas gradually increases and in a time meets each other, then this situation is called urban conjunction.

Urbanization: Successive extension of City or Town called Urbanization. The first town ever acquainted in world that established at a place named Irdu in Sumerian in 3700BC. On the good, when city built-it means Urbanization started. Critical definition of Urban as per historian Chandler and political scientist Model sky.

Chandler defines urbanization as: In any habitation resided more than 20 thousand people within the year 800 to 1850 is termed as City. But in case of Asia, he confined population to 40 thousand.

Model sky defines urbanization as: population of any place at era of thousand BC, if ten thousand and in next thousand years, if population is one lac, then the place is called City.

Smart City: These are urban areas accustomed of using modern technology, integrated to information, communication technology (ICT) in the everyday life of human being. Singapore, Dubai, China, Madrid, Amsterdam, Newyork etc, the example.

Satellite Town: Actually it is sub-urban area. To decrease the humane stress of a town- another town of requisite facility is build remote of the main town, is called a satellite town. As a result, population density decreases in main city.

Settlement refers to the physical spaces and environments in which households are sheltered, and how one shelter relates to others. The term is generally used in the context of displaced populations to describe the temporary or sometimes permanent living arrangements of displaced families. In this context settlements can range from planned camps to dispersed accommodation in host villages/neighborhoods, collective centers, spontaneous camps, Rental accommodation etc.

An urban settlement is where displaced populations settle within an urban agglomeration such as a town or city. A master plan usually divides towns or cities into zones regulated by norms based on specific sectors such as housing, hygiene, habitat, and environment. Zones are inclusive of residential areas, services and infrastructures, and spaces for administrative, commercial and industrial activities.

Down Town: Heavy crowded area of a town, where is the conglomeration of extensive transaction, business and commercial trade occurred.

Up-Town: Residential, low crowded area of a town is called Up-Town. It is generally located upward of a city place.

Metro City or Metropolitan City: Both bear the synonym. If the population of a town is less than fifty lacs, then it is designated as Metro City or Metropolitan City. These types of Cities related to the capital of the country, whose basis is citizens.

Mega City: If the demography of a town exceeds 50 lacs, then the town called Mega City.

Cosmopolitan City: The trend of mostly all people intend to better livelihood, for which they choose migration. If any city of the world allows any willing people of any country to be inhabitant of that City, these type of cities are called Cosmopolitan City. In this City, all people charms all equal right, content & merriment without any hindrance.

City Corporation: This type of corporation relishes autonomous power, separate rules and regulations than the town or capital. Dhaka city (population as on 2019 is 20283552 nos) divided into two parts named Dhaka north City Corporation and Dhaka south city corporation. After division, still population is more than crore in each city.

The Slum: Some population of the world in different places congregates due to some reasons, but their dwelling area in that place is not adequate as per requirement. Peoples are bound to reside that area of unhygienic environment. Mostly unplanned urbanization and industrialization caused rural workers emerging in town and sub-urban area and they forced to reside in these shabby places, as this way Slum is produced.

The slum is a servile combination of classic crowded, tinshed cottage, lack of sewage-health facilities, low education institute-financial, social environmental condition is out of imagine remarkably worse. This type of dwelling area mainly is the centre of reprobating crime zone. All concerned designated- slum is no longing to the habitant of the slum as well as or the city or town locality.

The definition of slum by Restart K. is, "The Slum of deprived neighborhood desire of the large city has long as and area of concentration of social and economic problems. Such as inadequate housing, poor sanitation, wide spread poverty, society solution and high incidence of crime and juvenile delinquency and slum are those position of cities in which housing is crowded, neglected determinate and characteristics attributes of pathy and social isolation".

Dhaka town: Dhaka declared as town 4 times respectably in the year 1610, 1660, 1905 and 1947 (5 October 1982, spell of Dacca converted to Dhaka and gazetted in eighth amendment in 1988), where as Dhaka district established in the year 1608. Dhaka as a Capital of Bengal 1st declared in 1610 (source: Banglapedia). In 1905, Dhaka was the capital of East Bengal and Assam. In 1st August 1864 Dhaka entitled to Municipality- in 24 August 1983 as named municipal corporation- in 1990 Dhaka City corporation (DCC) - in 2011, by president order DCC divided as Dhaka north City Corporation and Dhaka south city corporation. Dhaka got first electrification in 7 December 1901 at Ahsan Manjil.

Environment Friendly Low Cost Housing Techniques

Constructing Eco-Friendly Building with Green Building Aspects

The need for Environment Friendly Low Cost Housing are to reduce energy consumption, and thus greenhouse gas emissions, during the useful life of the building and to minimize life cycle emissions associated with building materials and techniques. In order to achieve these goals it is important to implement regionally appropriate energy efficient design utilizing low embodied energy materials, and make use of onsite renewable energy within an energy efficient structure. It is important to understand when

designing homes and choosing building methods that it is often the case that a building's total life cycle greenhouse gas profile can be 2/3 to 3/4 in the energy use over its life with the remaining portions in the embodied energy of the materials, although this is not universally the case.

Natural Ventilation

Ideally suited to hot-humid and hot-arid climate zones. Well suited to climate adaptation Natural ventilation describes a number of potential techniques which make use of natural convection currents within air flow to direct air into and out of buildings in such a way as to expel heated air from the space and replace it with cooler air or exchange air without losing heat or cool.

Green Building

Green building (also known as green construction or sustainable building) refers to both a structure and the application of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle: from planning to design, construction, operation, maintenance, renovation, and demolition. This requires close cooperation of the contractor, the architects, the engineers, and the client at all project stages. Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective of green buildings is to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation
- Foundation- a foundation depth of 0.6 m, thoroughly packed with cement mortar of 1:8 boulders and bond stones at regular intervals
- Plinth- A plinth of height 0.2 m above ground level was adopted, constructed with 1:6 cement mortars.
- Rat- Trap Bond Walling with Insulated Cavity Wall
- Doors and Windows- use wooden doors, providing sufficient ventilation and air circulation for giving cooling effect
- Tiles on the Outer Face of the Wall- Tiles provided protection to the walls from coming in direct contact of atmospheric heat ensuring the reduction of the temperature as well as increasing the cooling effects.
- Roofing and Gardening- Normally 12.5 cm thick RCC slabs are used for roofing of residential buildings, absorbing rainwater, providing insulation, and helping to lower urban air temperatures.

Features on Green Building

Green Features:

It includes natural lighting in the building, which results in substantial savings in energy consumption.

- Insulated walls and double-glazed glass windows for lower energy consumption.
- A green lawn around the building improves the quality of air inside the building premises.
- Use of non-toxic house-keeping materials -green seal approved products. Natural manure for plants such as neem-based pesticides.
- Water recycling.

Sustainable Features:

Buildings achieve a 50% reduction in energy use and purchase their electrical power from a renewable energy supplier. The building incorporates many energy-conserving features:

- A well insulated building shell
- Energy efficient window systems supplemental passive solar heating
- Extensive use of natural ventilation and day lighting.

Benefits over Other Buildings:

Green buildings provide several benefits over other buildings. Buildings have an enormous impact on the environment, human health, and the economy. The successful adoption of green building strategies can maximize both the economic and environmental performance of buildings.

- Cost Savings: Energy and water efficient designs reduce monthly utility bills.
- Health & Safety: Proper ventilation and low or non-toxic materials and finishes contribute to a safer, healthier home.
- Added Value: Use of durable green materials, lower operating costs, and healthier indoor air quality can increase a building's market value.
- Ecological Benefit: Making environmentally responsible choices when building helps reduce pollution while protecting forests and wildlife.
- Environmental Benefit: Reduce impact on the environment.
- Economic Benefit: When compared to conventional buildings green buildings are more economic and cheap in cost.

Goals of Green Buildings:

- Operational Savings: Green buildings consume at least 40-50 % less energy and 20-30% less water than a conventional building. This comes at an incremental cost of about 5-8 %. The incremental cost gets paid back in 3-5 years time.
- Daylights & Views: Working in environment with access to daylight and views provides connection to the exterior environment. This has a soothing effect on the mind. Various studies prove that the productivity of people who have access to day lighting and views is at least 12-15 % higher.

Advantages:

- Provide a healthier and more comfortable environment
- Improve long-term economic performance
- Incorporate energy and water efficient technologies
- Use recycled content materials in their construction
- Reduce construction and demolition waste
- Include renewable energy technologies
- Improve indoor air quality
- Reduce environmental impact

Disadvantages:

- While homeowners who live close to larger cities may have no difficulty finding green building materials, the selection may be scarce in other areas. Many materials may require special ordering, which could increase the cost. In addition, some materials may only be available through orders, which will include a cost for shipping and handling.
- Since some green building projects encourage the use of recycled and found materials, time may become a disadvantage. Finding the needed materials may take extra time that the builder and/or homeowner doesn't have for the project.

Conclusion

Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment. Sustainability in building construction is very important now-days, since the earth is becoming non-green. Now-a-days everyone is looking for the concept "Go Green". This can be achieved by lowering the energy demand and consumption of materials, utilizing the reusable or recyclable products in a holistic way which will eventually offer an economic and cost effective sustainable living environment.

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