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A Sustainable Approach to Urbanization

Architecture

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ABSTRACT

Urbanization can be a synonym of modernization. In the fast pace of life with the event of industrialization, the transportation system developed giving rise to the process of movement of people from rural areas to urban areas. In the run of changing lifestyle and becoming modern, people started moving towards cities. Cities which were not planned to take the extra load could not bear this and hence dilapidation started.. The problem now aims to find out the sustainable solution for the urban population. This paper deals with the process of finding ways and means of making things sustainable by 3-fold methodology. These can be categorized as: sustainable planning, sustainable energy systems and sustainable material selection. The decisive factors can be quoted as socio-economic, climatic, geological conditions etc.

INTRODUCTION

Urbanization in developing countries like India is an old phenomenon. It relates to the drift or migration of people from rural to urban areas, with reasons unlimited. The invent of fast mode of transportation and good network of roads added to this process at a fast rate. The quest for better economy, lifestyle and better education facilities has always motivated people to leave their origins and shift to urban areas. People in search of better job opportunities, health, wealth, better services, modern housing facilities etc. move to urban settings. Once they visit a city, the attractions and charm of the city, compel them to leave their parental agricultural practices and move towards urban areas. The cities were not planned to take the extra loads that fell on them and hence overcrowding and slum development took place. The overcrowding in the cities, gradually forced the upper middle and high class to move to outskirts of the cities for better environmental conditions.

PRESENT AND FUTURE SCENARIO

The census of India witnesses interesting facts about our rural and urban population. The population of India in 2001 was 1,028,737,436 and the rural: urban percentage was 72.18:27.82 i.e. almost 2 & ½ times is the rural population. Provisional report released on March 31, 2011 about the 15th Indian National Census conducted, states that the population of India has grown to 1,210,193,422.

Hindustan times, June 27, 2007, reported that, the urbanization in India is taking place at a faster rate, than rest of the world. The United Nations State of the World population 2007, report said, "By 2030, 40.76% of India's population will be living in urban areas compared to the population in 2001". The report also added that, "the metropolitans like Mumbai and Kolkata have far greater number of people moving out than coming in. Over 90% of slum dwellers live in developing countries with China and India accounting for 37% of them and about 56% of slum population lives in slum conditions."

If the prediction proves out to be true, then almost half of the population will be urban. The question to worry is: What will happen to our food? What will happen to the cities?

PROBLEMS OF URBANIZATION

One of the side effects of urbanization is the slum development. It occurs because the city is not ready to house the extra population and unable to provide the required infrastructure. Slums are generally low rise structures with unhygienic services, sprawling in urban settings. The vacant land is occupied by the slum dwellers, which is unauthorized. There is a trend in the growth of suburban areas also.

Loss of agricultural land is an important issue. More and more land is acquired for housing and agricultural land is being sold for the same purpose. Another important reason for loss of agricultural land is the utilization of the soil, which is excavated from the land and sold for construction purposes as infill. The farmers are trying to earn profit by selling the soil, which is causing the environmental problems in turn. The land next to the existing excavated plot is gradually eroded away, causing much problem to the neighbours, in case it is next to agricultural land.

Loss of open spaces is taking place, as more and more population is migrating from rural areas and occupying the otherwise available open space for urban people. Perhaps this has been a driving factor for people moving to outskirts of cities, in search of better natural environment. With the ease of transportation, they settle away from the city centers, as these are overcrowded. Loss of open spaces also results in loss of biodiversity. All these factors can accumulate to economic losses also, as the value of land in such degraded areas goes down.

Increase in crime rate and corruption has taken place in our society. More demand and less supply ultimately reflects in loss of socio-cultural merits. When people migrating to cities encounter financial crisis, they turn to easy means, which are generally illegal. The newspapers have been successively giving reports, as, follows:

- In 2000, Delhi had the highest crime rate in India (TOI, September 12, 2002).
- Delhi tops for crime chart for 5th year in row (TOI, January 01, 2008)

Times of India, January 21, 2011, reported, "Figures released by National Crime Records Bureau of Home Ministry (NCRB) show, among 35 mega cities in India, Delhi reported 404 out of 1696 rapes, 1379 out of total 3544 of kidnappings and abduction of women, 104 out of 684 of dowry deaths and 491 out of 3477 of molestations during the period".

Environmental hazards are to be handled at a universal level. The most important and dangerous problem related to urbanization is unplanned and huge exploitation of resources. These problems range from water, air and noise pollution to loss of biodiversity. This is reflected as environmental problem globally and as a result we are facing global warming, cyclones and other natural hazards, which are threatening the entire world today. Unexpected seasonal variations are causing agricultural losses, thus affecting the economy of country. Water resources are endangered and air is polluted more and more by increasing transportation system. The amount of CO_2 emission from various sources like factories, vehicles, industries have all added to the environmental hazards. The problem of degradation of natural resources and CO_2 emission is the major concern for sustainability issues.

SUSTAINABLE SOLUTIONS

It is difficult to stop urbanization but if it continues at the same rate, it will add to problems of sustainability. Brundtland Commission of United Nations on March 20, 1987, defined sustainable development as, "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". With the growing demand of increasing population and urbanization, it becomes very important to find sustainable solutions. The whole exercise of sustainability can broadly be divided into 3 categories:

- Sustainable Planning
- Sustainable Energy Systems
- Sustainable Material Selection

1. Sustainable Planning

Properly planed buildings and their surroundings can help reduce the environmental hazards to great extent. The built environment is the responsibility of the Planners, Architects and the Policy makers. The key to sustainability is "Save energy". The only question that needs to be answered is: How to save energy? The solution to all problems lies in finding out ways and means to save the energy, as it is rightly said, energy saved is energy produced. Our aim should be to save energy, anyhow.

Form and function are two different yet interrelated aspects of building design. The ideal purpose of design should be to achieve a combination of these. Construction Industry Institute (CII) based in Austin gave the concept of constructability. In simple words, it means, the ease with which a building can be constructed. Buildings which are easy to construct shall be saving energy, which may otherwise be wasted in generating resources or delay in the construction process. The resources i.e. labour and time if wasted, is the wastage of energy and money. The building plan and form together with the site on which construction is to be done should be studied well in advance for easy and speedy construction. The faster the process, the lesser is the energy consumed. For example: if the site of construction is not studied carefully in advance and unexpected hindrances occur, the construction process in unnecessary delayed and resources held up. Buildings which are easy to construct are also easy to maintain. In other words, more is the constructability, lesser is the maintenance required during life cycle of building. Less maintenance will ultimately save the energy.

Building orientation should be such that it makes the best utilization of wind and solar energy. The building should preferably be South facing. The openings should allow for proper ventilation depending upon hot dry, warm humid or composite climate. Maximum amount of daylight should be utilized together with lively and interesting views from the vicinity of the building. Open spaces, getting sunlight for plantation, should be created to bring nature into built environment. Glass should be used depending upon the orientation of building and movement of the sun.

2. Sustainable Energy Systems

To conserve energy, it is advisable to switch over to renewable sources of energy like solar energy, wind energy, biomass, hydroelectric power etc.

India has a large source of solar energy. It posses almost, 300 sunny days, in most parts of the country. Average solar radiation on India varies from 4Kwh/day to 7 Kwh/day. It is estimated to be about, 5000 trillion Kwh/year. Hence it becomes important to explore the possibilities of both solar thermal and photovoltaics. Solar thermal energy can be collected and used for water and space heating. The solar collectors should be planned and used without obstructions like tall buildings and trees in the neighbourhood. The massing of structures should allow for maximum solar radiations to reach all the vertical blocks for usage of solar thermal energy.

Photovoltaics (PVs) were discovered by Antoine Becquerel with a hope to utilization of solar energy. PVs produce electricity, directly from solar radiations. These are based on silicon and when exposed to sun direct current flows. The output from PV's depends upon daily variations due to rotation of earth, solar radiation available at site, the tilt orientation w.r.t. south, shadowing and temperature. Taking care of these factors at planning and design stage can help in best utilization of available energy resource. The Jawaharlal Nehru Solar Mission (JNSM) was launched by PM in Jan 2011, with a target of 20,000 MW grid solar power, 2000MW of off-grid capacity including 20 million solar lighting systems and 20 million sq.m. solar thermal collector area by 2022. The efforts of planners in incorporating these facilities in their design can add to the national mission.

Biomass from agro waste like straws, stems and residues like shells, husk, wood and bagasse is also used for power generation. It is assumed to be CO_2 neutral because it is produced from of the crops that absorb CO_2 during photosynthesis. However there will be some emission during their transportation. The current potential for surplus agro and agro industrial waste is estimated to be 17000 MWe and from bagasse of sugar mills is 500 MW. Thus the total energy estimated from biomass is 22000MW.

Wind energy can be employed for running turbines in rural settings and producing energy. Careful design and planning scheme for burning of waste in incinerators and supply to community housing can prove to be helpful. Sewage sludge can also be treated to produce methane gas which in turn can produce green electricity. Waste water like water from washing machines, kitchen sink etc can be treated at low cost and used for purpose of landscaping. Rainwater harvesting is one of the most important emerging areas especially for collection of water from large surfaces.

3. Sustainable building material

"The subject of material is clearly the foundation of architecture and perhaps one would not go very far wrong if one defined architecture as the art of building suitably with suitable material", said William Morris in 1892. In the present scenario, with the growing needs and potential of the society, the responsibility of designers has increased because the market is full of attractive materials having a wide range of cost as well as properties. The choice of building material has an impact on environment and so far has been responsible for some of the major environmental issues like global warming and unexpected seasonal variations. The selection shall be based on some parameters as: Embodied energy, Cost (both capital & maintenance), CO_2 emissions and health issues in production of building material.

Embodied energy is defined as, "the energy required, to get raw materials, convert them to construction materials products or components, transportation of raw as well as finished products and build them into structures". The CO_2 emissions of various building materials should be compared and a combination selected. The embodied energy of fired materials and those transported over long distances may be comparable. It lies totally on the wisdom of the planner, what material should be selected.

Health related issues are equally important. Less hazardous material and paints should be encouraged. For example: Asbestos causes major health hazards if inhaled and hence, their use in some countries, like UK, are prohibited. Timber if treated with hazardous chemicals is dangerous. Paints having toxic metals like cadmium and lead should be avoided.

In other words, the best practices are traditional i.e. locally available building materials and techniques of construction. These can help achieve lower level of energy. For example: stone available in Rajasthan, bamboo in Assam etc. Timber can prove to be a good sustainable material as it does not produce CO_2 in its production, rather it absorbs CO_2. But on the contrary, if too much of timber is exploited without proper plantation, there can be problems like deforestation.

The building material used should be reusable and recyclable also after its useful life is over. For example: concrete, hardware,

timber and its products etc. Well thought off designs help in accomplishing this aim.

The decision to choose a particular combination of material and energy systems, to achieve sustainability, is subjective and depends on various factors like geography, geology and climatic conditions etc. It also depends on the economic conditions of society and locally available resources. The local development authorities need to strengthen the rules and laws by enforcing sustainable ideas and putting architectural controls. Subsidies offered for sustainable systems can help poor to afford thermal equipments. General awareness programmes, related to saving resources and use of energy efficient systems, shall be campaigned among all sections of society, in rural as well as urban areas.

FUTURE PROSPECTS OF STUDY

The combination of building materials can be arrived at, by using techniques such as Operation research and Value engineering. These may help by analyzing material for maximum efficiency and minimum cost or embodied energy. The method of questioning of building material for their alternatives available, for instance the comparative analyses like; What all options are there? Which material has lowest embodied energy? etc. can be explored and best solutions obtained.

CONCLUSION

It is almost impossible to stop the process of urbanization. The solution lies in making the cities efficient of taking up the load without compromising with the quality of life. If the housing solutions at low cost and energy input are devised and made available, these can reduce the problem of slums or unplanned occupation by people migrating and hence provide better living conditions, which in turn can help save energy, that otherwise is wasted in fighting problems of urbanization. Sustainable solutions including energy efficient systems and sustainable building techniques and practices can help solve problems of survival and add to global efforts.

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