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Concept of Zero Energy Building

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Introduction

1.1. General:

Mahatma Gandhi envisioned a society where the man would live in harmony with nature. He Propounded having self-sufficient village communities to achieve this goal, having a civilization built on renewable resources. He insisted for the growth of human beings from every stratum of the society and to avoid wasteful use of resources. It is in the Indian culture system to find use for everything, which may be considered as waste by many. However in the race of rapid urbanization and globalization we have lost these practices leading to unsustainable growth of cities.

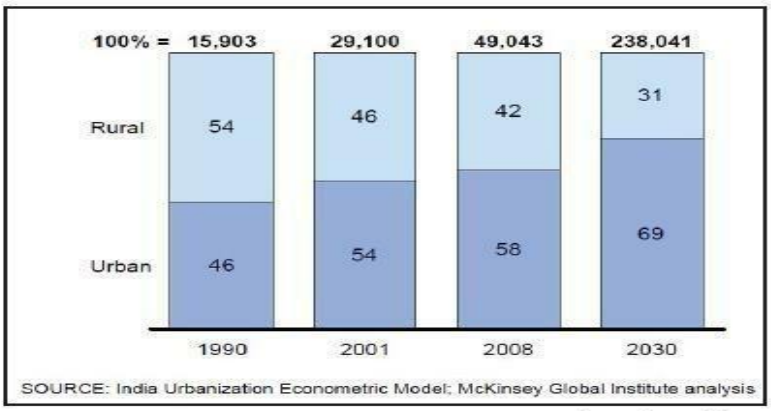
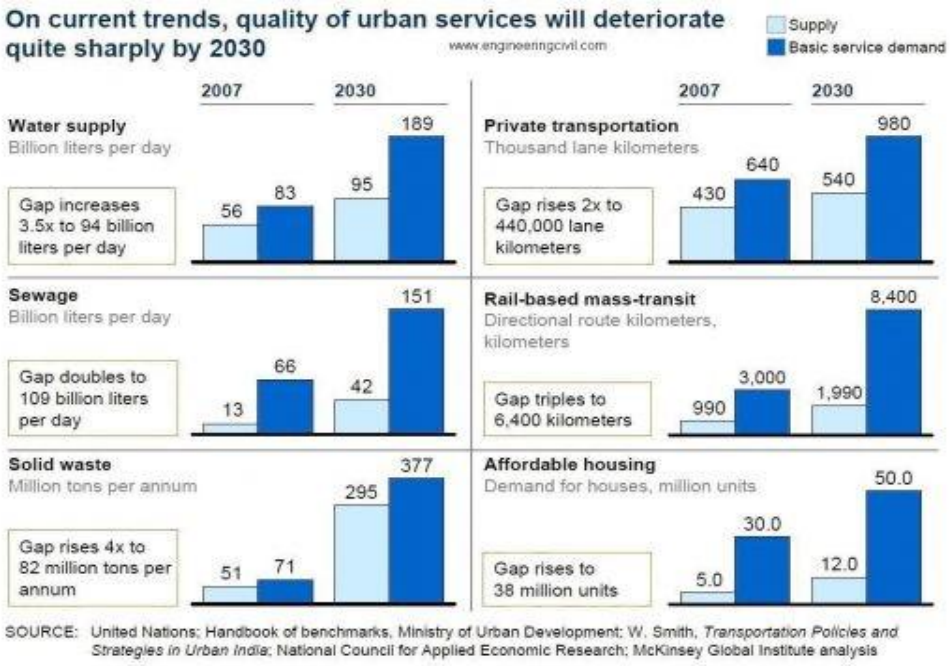


Figure 1.1: Share (in %) of Urban Areas in GDP (in billions of Indian Rupees, real 2008)



(Figure 1.2: Considerable changes in various factors over the years)

The housing stock is also projected to double in the next two decades. The housing solutions, apart from being sustainable, also need to be viable for the target groups in terms of their needs and affordability. The land cost in the cities like Mumbai is so high that majority of the people can't afford to buy houses in Mumbai and the land cost is about 80% of the total cost of a house.

Hence, it is esseintial that India finds a sustaintable, cost effective and energy efficient house, that will help to maintain the low energy consumption as well as become a source of energy thus meeting the electricity demand while saving the environment.

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Definition:

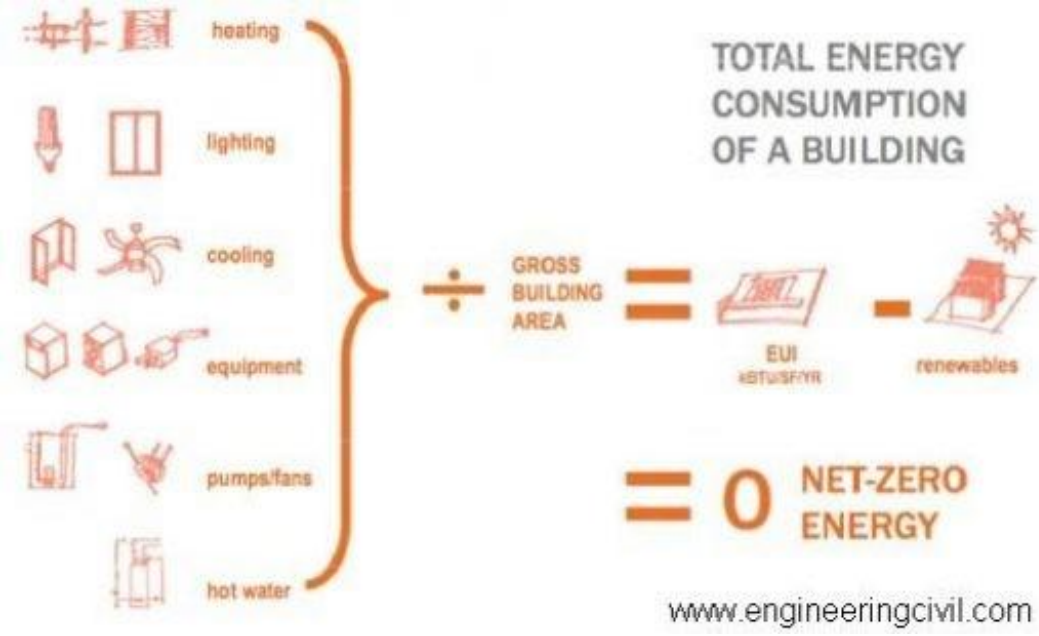
With so many different terms and so many ways to look at zero energy buildings there are inevitably many different definitions available. One of the basic definition may be as follows:

" A net zero-energy building (NZEB) is a residential or commercial building with greatly reduced energy needs through efficiency gains such that the balance of energy needs can be supplied with renewable technologies."

The building is said to be a ZEB,

If its Total energy consumption = 0; i.e.

Total energy use – Renewable energy = 0



(Figure 1.3: Total Energy Consumption Equation)

1.2. ADVANTAGES AND DISADVANTAGES OF ZERO ENERGY BUILDING:

Advantages:

1. Increased comfort due to more uniform interior temperature.
2. Extra cost is minimized for new construction compared to an afterthought retrofit.
3. Reduced requirement for energy austerity.
4. More scalability and reliability of the design procurement and construction process leads to less time frame for the project. Thus, the financing cost is less.
5. The fabrication of the housing is much faster than conventional housing leading to quick project implementation and a faster move-in for the target users.
6. Use of technologies for energy, waste and water efficiency can lead to monetary benefits overlife cycle of the project other than the intangible benefits.
7. Higher resale value as potential owners demand more zero net energy buildings thanavailable supply.

8. Future legislative restriction, and carbon emission, taxes/ penalties may force expensiveretrofits to inefficient buildings.
9. These are designed with so many energy efficient features, thicker walls and triple panned windows that it can create as much energy from its solar collector as the home uses over the course of a year – resulting in a zero net energy bill.
10. Using standardized building technique and energy cost modelling these buildings can bevery affordable to build.

DISADVANTAGES:

1. Initial cost can be higher – effort required to understand , apply , and qualify for ZEB subsidies.
2. Very few designers or builders have the necessary skills or experience to build net zero energy buildings.
3. Challenge to recover higher initial cost on resale of building – appraisers are uniformed –their model do not consider energy.
4. Climate – specific design may limit future ability to respond to rising or falling ambient temperatures (Global Warming).
5. Without an optimized thermal envelope embodied energy and resource usage is higher than needed.

CONCLUSION:

The goal of green building and sustainable architecture is to use resources more efficiently and reduce a building's negative impact on the environment. Zero energy buildings achieve one key green-building goal of completely or very significantly reducing energy use and greenhouse gas emissions for the life of the building. Zero energy buildings may or may not be considered "green" in all areas, such as reducing waste, using recycled building materials, etc. However, zero energy, or net-zero buildings do tend to have a much lower ecological impact over the life of the building compared with other "green" buildings that require imported energy and/or fossil fuel to be habitable and meet the needs of occupants.

Because of the design challenges and sensitivity to a site that are required to efficiently meet the energy needs of a building and occupants with renewable energy (solar, wind, geothermal, etc.), designers must apply holistic design principles, and take advantage of the free naturally occurring assets available, such as passive solar orientation, natural ventilation, day lighting, thermal mass, and night time cooling.

In conclusion, we decided that for our Zero Energy House Project using solar energy was the best energy source in regards to saving energy and cost efficiency. After brainstorming and researching we came to an agreement that photovoltaic solar panels were the best solution to use in constructing our house. We wanted to keep the house on the smaller side so that the amount of energy needed to heat the house was lower than that of a bigger house.

To solve this problem the house we designed was 1050 square-feet, one story, 2BHK and would comfortably be able to accommodate two people. The installation of the solar panels initially would be costly, but in the long run the owner of the house would save money on their energy bill. More importantly, in the scarcity of natural resources we would be providing a selfsufficient, energy saving, non-polluting, Zero Energy House. The solar panels that would be installed would be on the back side of the house, which would be facing south. This would allow for the most direct sunlight to be absorbed by the panels. Also on the south side, there would be three windows that run the length of the wall, allowing the most sunlight to enter in the summer and heat the living room/kitchen area.

We combined the energy efficient qualities of our house with aesthetic beauty to produce a home that satisfies the customers' needs. This would attract people to buy more Zero Energy Houses which

would result in less pollution and less dependence on fossil fuels. As a group we believe that we were successful in providing a Zero Energy Home that is also aesthetically pleasing.

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