Imperial Journal of Interdisciplinary Research (IJIR)
Vol-3, Issue-3, 2017
ISSN: 2454-1362, http://www.onlinejournal.in

Reduction of Carbon Emissions for Buildings

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Abstract: *The carbon contain in atmosphere is increasing daily for satisfying growing human needs and its population. The temperature of earth will increase by 5-7◦F due to carbon footprints. The need for smart buildings and green buildings has increased by the time. This report is illustrating the reduction of carbon footprint from the buildings it was given in a survey that the consumption of energy in buildings adds up to 1/3rd of total consumption .It is also responsible for equal emission of carbon footprints in developed countries as well as the developing countries, which are at a race of urbanization and industrialization. In this paper we will understand the present scenario of building energy consumption and the means by which we can reduce carbon emission from buildings.*

Keywords*: carbon footprint, environment conservation, concrete, construction.*

1. INTRODUCTION

As the world is moving towards urbanization in a hurried pace so as the global carbon emission rate effecting vegetation, humans ,habitat etc. Global warming is increasingly permeating the fabrics of national discourse across many countries globally .The world energy consumption has been categorized as: i) buildings; ii) transportation and; iii) industrial. Out of these three sectors, buildings is sub-divided into a) residential b) commercial c)light commercial and d)institutional denote for about 1/3 of the entire energy intake compared to former energy using sectors. This drift of energy consumption in structures is influenced by numerous key aspects such as population growth, urban concentration of population, spatial organization, economic development, building dimension, building operation, building lifespan, occupant nature, geographical location, climatic aspects and service demands. Thus, there is the need of in-depth studies of the fundamental mechanisms that can lead to a deeper understanding of the facet and effect of energy consumption in buildings should be recognized in the future that will help in finding new ways and tactics for the overall energy reduction, making more sustainable energy consumption patterns and understanding the low-carbon economic development. According to the Intergovernmental Panel on Climate Change (IPCC), it is the undeveloped sector which can presents the most cost effective opportunities for greenhouse gas(GHG) reductions. The 4th Valuation Report of the Intergovernmental Panel on Climate Change (IPCC) said that building-related greenhouse gas emissions has reached 8.6 billion metric tons (t) CO2 equivalent (e) in 2004, and predicted to grow to 26% by 2030, reaching 15.6 billion t CO2 e under their high-growth situation. Carbon dioxide emissions from buildings account for 30 to 40% of the total greenhouse gas emissions which have been rising gradually since the1950s. In the coming 25 years, these emissions are estimated to rise faster than any of the other economic sectors. The energy consumed by the buildings and carbon dioxide emission in this process has been categorized as: i) direct emissions from on-site combustion of fuels for transportation, heating and cooking and; ii) emissions from the end use of electricity utilized for heating, cooling and providing power to buildings. The relation among these two types of carbon dioxide emissions and building service demands can vary significantly year-on-year subjected to their influencing factors. To understand this, several approaches are used to study the association between the energy consumption and carbon dioxide emissions, which is leading to energy conservation and carbon dioxide production reduction. The methods of system accounting for overall energy consumption and carbon dioxide emissions induced by buildings are illustrated in terms of a combination of process and input-output analyses. In addition, the carbon dioxide emissions and energy consumption also can be evaluated using life cycle assessment which sees into account all the stages in production and operation of structure. Based on the approaches, further improvements in providing quality and improved standard of life. Environmental and energy management and its conservation can be done with a concrete technique to cover various materials, manpower input, equipment and operational cost.

2. BUILDING ENERGY CONSUMPTION

Globally the carbon emission due to construction industries is 30% and they uses 32% of the total global natural resources. By 2050,about 40% of carbon emission will be due to construction and buildings carbon footprint.

It was stated that about 35 to 40% of total energy was used up in buildings in the developed countries with about 50 to 65% of electricity consumption overall. The rate of energy consumptions in the developing countries is also likely to go up because of the need of urbanization along with

3. REDUCTION OF CARBON FOOTPRINT

There are numerous approach for reducing carbon dioxide emissions from the energy system while still providing the daily energy services in buildings. This includes the organization of renewable energy technologies such as biomass, solar, geothermal, hydro, ocean and wind in a viable manner that can aid the full range of energy services required in the buildings. Most of these renewable energy technologies unlike fossil fuels produce minimum or no carbon emissions. Furthermore, we can significantly reduce energy consumption and carbon dioxide emissions from buildings by attaining through a range of measures which includes, energy efficient technologies, smart design, green construction, low carbon appliances and high efficiency HVAC systems that are already well established and widely used .Despite the capability to reduce carbon dioxide level, the contribution of these technologies relies heavily on the economic competition with the old technology. These technologies along with society aspect influenced considerably by country and region .Thus, the role of this new technologies in reducing carbon footprint emissions and climate change specifically for energy service in buildings should be further inspected by taking consideration of the total cost; end-use efficiency measures; economic analysis; and socio-cultural benefits and barriers.

4. LOW CARBON BUILDINGS

Low-carbon buildings (LCB) are buildings which are specifically designed and engineered by keeping in mind ther reduction of GHG. So by definition, we can say LCB is a building which emits considerably less GHG than regular buildings.

There is no emissions benchmark under which a building would qualify as a LCB. But to be sincerely "Climate Change neutral", a LCB would have to accomplish at least 80% GHG reduction compared to the old traditional buildings. According to a survey done on Economics of Climate Change, our emissions would have to be significantly reduced by 80% in order not to exceed the Earth's natural capacity to remove GHG from the atmosphere in its natural speed. In general, a regular building emission is about 5,000 kgCO2e/m2 during its entire period of life (though it varies a lot, depending on the project type and where it is located).

5. LOW CARBON BUILDING TECHNOLOGY

GHGs are being released in the atmosphere during each stage of a building's life period:

- Building construction
- Building operation
- Building restoration and deconstruction

GHG reduction calculations should be calculated on considering all stages of the building life: construction (incl. renovation and deconstruction) and operation.

Construction

GHG emissions from the construction industries are generally coming from:

1. Materials manufacturing (e.g., concrete)
2. Materials transport
3. Demolition wastes transport
4. Demolition wastes treatment

The construction, restoration, and deconstruction of a typical building on average responsible for the emissions of 1,000-1,500 kgCO2e/m2 (around 500 kgCO2e/m2 for construction only).

The strategies adopted by LCB to reduce GHG emissions during the time of construction include:

1. Use of smart design.
2. Selecting materials having low emissions factors associated (e.g., recycled materials, ecofriendly)
3. Select materials suppliers as close as possible from the construction site.
4. Demolition wastes should be used in recycling instead of landfills or incineration.

Operation

GHG emissions during the building operation are generally coming from:

1. Electricity consumption
2. Consumption of fossil fuels.(on-site for the production of electricity, hot water, heat, etc.)
3. On-site waste water treatment

4. On-site solid wastes treatment
5. Industrial installation housed in the buildings
   Fossil fuels include natural gas and propane.

Carbon emission is also depending on the region where the building is being located and the building energy mix, operation emissions can vary from 0 to over 100 kgCO2e/m2 per year.
LCB usually has less than 10 kgCO2e/m2 per year emission.
Strategies adopted by LCB to reduce GHG emissions during operation time are:

1. Reduce energy consumption
2. Switch to renewable energy sources

Renewable energy sources include:

1. Solar
2. Wind
3. Low-impact hydro
4. Biofuels (under certain conditions)
5. Geothermal
6. Wave and tidal

5.1 LOW CARBON BUILDINGS IN TODAY'S WORLD

LCB, as part of "green buildings", are developing very rapidly and can be seen all around the globe. Recent examples include:

- Aldo Leopold Foundation Headquarters, Fairfield (USA)
- Kroon Hall, Yale University's School of Forestry & Environmental Studies (USA)
- Sustainable Energy Technology Center, The University of Nottingham, NingBo (China)
- Mud Decisions, Bangalore (India).

6. CONCLUSION

In Today's world building sector utilizes a significant amount of energy and contributes to almost equal amount of carbon dioxide emission. The percentage will increase in carbon emission as the nations are in a race to be more urbanized and economically stable. Around 50% of carbon emission is done by only handful of nations. The newer technology in building construction are not fully developed but will soon be and they will have to be cost efficient in order to be more productive. Few steps towards a better future have been taken but there is lot more to be taken.

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