GREEN BUILDING CONCEPT AND SMART CITIES INITIATIVES IN VIEW OF SUSTAINABLE DEVELOPMENT

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1. Concept of Green Building

A green building is an environmentally sustainable building, designed, constructed and operated to minimise the total environmental impacts.[1] The general perception as regards the green building is that they cost more but the fact, in reality, is that many green strategies and technologies actually cost the same and some even cost less than traditional ones.

The basic idea behind the green building is to carve out fine techniques and skills to bring down the effct on the environment and human health to a lesser degree and by promoting the optimal use of renewable resources, e.g., using sunlight through passive solar, active solar, and photovoltaic equipment, and using plants and trees through green roofs, rain gardens, and reduction of rainwater wastage. It, in fact, lays emphasis on the energy efficiency and conservation, water and air quality by a careful designing. Green building concept is popularly known as "*Sustainable Architecture*", and "*Ecological Design*" because of basing upon the idea of sustainable development.[2]

Green buildings have only been building up by individuals and companies for the past thirty years. During the energy crisis of the 1970's, green building moved from research and development to reality.[3] Green measures can help in improving the ecological environment and helps in reducing energy uses by at least 30-35%, carbon emission by 35% and wastages by 70% and use of water by more than 40%.[4] On the aesthetic side of green architecture or sustainable design is the philosophy of designing a building that is in harmony with the natural features and resources surrounding the site. There are several key steps in designing

[1] *Available at*: https://buildgreen.co.nz/definition.html (last visited on May 3, 2016).
[2] "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their, own needs…. Sustainable development requires meeting the basic needs of all and extending to all opportunity to satisfy their aspirations for a better life."
[3] *Available at*: https://www.ijlret.com/Papers/Vol-2-issue-1/5-B2016006.pdf (last visited on May 3, 2016).
[4] *Ibid*.

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sustainable buildings: specify green building materials from local sources, reduce loads, optimize systems, and generate on-site renewable energy.[5]

2. Features of Green Buildings

During the construction and operation, it minimises the demand on fossil fuel based energy, maximises the recycle, reuse, renewable energy and energy efficient devices and appliances. It utilises energy efficient building materials, besides taking care of water conservation, waste management, energy conservation etc. Green buildings promote the use of renewable energy systems i.e. solar water heating systems, rooftop PV system, waste recycling for energy generation etc.[6]

The overall sustainable mechanism of construction industry depends upon various factors. The consideration of natural/ecological concerns primarily measures the green performance rating of a building. Green performance of a building is based on broadly five key parameters i.e. sustainable site, water efficiency, energy, materials and atmosphere.[7]

2.1 Energy efficiency

Green buildings designs are prepared in such a manner as the energy requirement in a building could be minimised to a maximum extent. Keeping the same objective in mind, the designers often suggest measures like sensors, ventilation, high-performance windows and extra insulation in walls, ceilings, and floors. They orient windows and walls and place trees to shade windows and roofs during the summer while maximizing solar gain in the winter. Apart from this all, utmost attention is given for the use of renewable energy and effective window placement to ensure natural light. Emphasis is also given for onsite generation of renewable energy through solar power, wind power, hydro power, or biomass so as to reduce the environmental impact of the building.

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[5]Jong-Jin-Kim; qualities and use of sustainable development; published by national pollution prevention center for higher education; *available at*: https://www.umich.edu/~nppcpub/resources/compendia/ARCHpdfs/ARCHsbmIntro.pdf. (last visited on May 3, 2016).

[6]*Available at*: https://www.mnre.gov.in (last visited on May 6, 2016).

[7]Jones Lang Lasalle Meghraj, Cost Efficiency of Green Buildings of India. *Available at* : https://www.joneslanglasalle.com/ResearchLevel1/research_greenomics_cost_efficiency_of_green_buildings_in_india.pdf (last visited on May 6, 2016).

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2.2 Water efficiency

An attempt is to be made to reduce the consumption of water as the availability of fresh water is limited on the earth. Therefore, at water-scarce places, the used water is collected, used, purified, and reused on-site itself. Waste-water may be minimized by utilizing water conserving fixtures such as ultra-low flush toilets and low-flow shower heads. Moreover, it is believed that preserving existing forest and mature vegetation in the nearby area playa a pivotal role in the natural water cycle by absorbing and disbursing up to 30% of a site's rainwater through evapo-transpiration.

2.3 Indoor Environmental Quality

It is needless to mention that without ensuring good indoor air quality, proper ventilation, natural vegetation, a healty life is not possible for the residents in any building. While constructing a building, it should always be kept in mind that biodegradable and environment-friendly materials should be used so that they could not give rise to health hazards.

2.4 Sustainable Site Design

The selection of a sustainable site plays a vital role to make the idea of green building a great success. As we all know that the land is non-expandable. Therefore, a careful dessignig, in this regard, helps to have green space so as to make the life healthier and lively. Higher density urban development and urban renewal needs to be promoted at a large scale.

2.5 Materials and Resources

Bearing this fact in mind that natural resources are not unlimited therefore, the teachniques for recycling and reuse should be taken into consideration. The use of renewable and sustainable materials needs to be utilized to a great extent.This method serves the dual purpose i.e. *firstly*, useful from the occupant's point of view and *secondly*, unharmful for the nature point of view also.

3. Green Building Rating

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Following the international initiatives, the concept of green building rating is gradually getting momentum in India also. As the level of awareness among the people is increasing regarding the environment, attempts are being made to make the building sustainable by reducing their negative impacts on the environment. Over the years, green building rating has seen a sea change in view of its increasing demand in the market.

However, the rating is not a mandatory practice in the whole world. Some private players in the market determines the rating on the ground of green initiatives followed during the construction of buildings. Globally, this is emerging as a popular tool to drive the building construction sector to adopt sustainable practices.[8]

The building sector in India is set to grow exponentially in view of increasing demands of houses. It already has a huge environmental footprint, with the domestic and commercial sectors consuming some 30 per cent of India's electricity. The Bureau of Energy Efficiency (BEE) has issued the Energy Conservation Building Code (ECBC) to improve energy performance of buildings by 40-60 per cent.[9] In India, there are three rating systems which are in vogue that can be grouped into three categories:

I. LEEDS[10]-IGBC[11] Initiatives:

The idea of LEED-India has been adopted from the United States Green Building Council. This initiative has been undertaken by the IGBC. The IGBC, which is part of the Confederation of Indian Industries- Sohrabji Godrej Green Business Centre (CII-GBC). However, this initiative is a private initiative. The LEED Green Building Rating System is a voluntary, consensus-based standard to support and certify successful green building design, construction and operations. The rating system is organized into five different environmental categories: sustainable sites, water efficiency, energy and atmosphere, material and resources and innovation.[12]

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[8] *Available at*: https://www.cseindia.org/userfiles/04%20Green%20Building.pdf (last visited on May 12, 2016).
[9] *Available at*: https://www.cseindia.org/userfiles/Making%20sense%20of%20green%20building%20rating.pdf (last visited on May 12, 2016).
[10] Leadership in Energy and Environmental Design.
[11] Indian Green Building Council.
[12] Green building; guidembook for sustainable architecture; *available at*: https://library.uniteddiversity.coop/Ecological_Building/Green_Building Guidebook_for_Sustainable_Architecture.pdf. (last visited on May 12, 2016).

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II. GRIHA[13]-TERI[14] Initiatives:

The GRIHA-TERI initiative acts under the aegis of the Ministry of New and Renewable Energy. The ministry has started GRIHA as a national rating system. This is a government initiative which is being promoted by the government of India form 2007 onwards.

III. EPI[15]-BEE[16] Initiatives:

This initiative has been started by the Bureau of Energy Efficency, Government of India which gives star rating to the building out of the five star scale for a time span of 5 years.

4. Smart Cities Initiatives in India

Across the world, the stride of migration from rural to urban areas is increasing. By 2050, about 70 per cent of the population will be living in cities, and India is not an exception in this regard. It will need about 500 new cities to accommodate the influx.[17] Interestingly, urbanisation in India has for the longest time been viewed as a by-product of failed regional planning. With increasing urbanization and the load on rural land, the government has now realised the need for cities that can cope with the challenges of urban living. A "*smart city*" is an urban region that is highly advanced in terms of overall infrastructure, sustainable real estate, communications and market viability .[18]

The Ministry of Urban Development provides benchmarks for various services-maximum commute time should be 30 minutes in medium-sized cities and 45 minutes in metros; water availability must be 135 litres per capita per day; 95 per cent of homes should have shops, parks, primary schools and recreational areas within 400 metres, and so on.[19]

[13]Green Rating for Integrated Habitat Assessment.
[14]The Energy and Resources Institute.
[15]Energy Performance Index.
[16]Bureau of Energy Efficiency.
[17]*Available at*: https://www.thehindu.com/features/homes-and-gardens/green-living/what-are-smart-cities/article6321332.ece (last visited on May 24, 2016).
[18]*Ibid.*
[19]*Available at*: https://www.thehindu.com/opinion/op-ed/what-makes-cities-really-smart/article7134886.ece (last visited on May 24, 2016).

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The idea of a smart city, for most of the 20th century, was science fiction. But cities can now integrate critical infrastructure such as roads, rails, subways and airports; optimise resources better; and plan preventive maintenance. Given India's finance crunch, any smart city we plan should focus first on three things: urban transportation, e-governance and land titling.[20]

4.1 Challenges in the Way of Smart Cities

The smart city concept is not without challenges, especially in India. For instance, the success of such a city depends on residents, entrepreneurs and visitors becoming actively involved in energy saving and implementation of new technologies. There are many ways to make residential, commercial and public space sustainable by ways of technology, but a high percentage of the total energy use is still in the hands of end users and their behaviour.[21]

Ecological impacts should be given paramount consideration, more so when resources are nonrenewable or where the result is irreversible.[22] In order to reinforce sustainable development, an effective environmental protection mechanism is needed.[23] In India, the policy related to the green building are a few like: National Building Code (NBC), Energy Conservation Building Code (ECBC), The Bureau of Energy Efficiency (BEE), and Environmental Impact Assessment (EIA). Even the only standard that exists for energy i.e. the Energy Conservation Building Code (EGBC) is voluntary. Therefore, it is quite pertinent for the implementing authority to have a deep insight into the judgements delivered by various courts before proceeding towards making the smart city concept a reality.

In this regard, some of the landmark cases are worth mentioning: In "*A.P. Pollution Control Board v. M.V. Nayudu*"[24] case, the apex court observes that "where the State Government makes an attempt to balance the need of the environment and need of the economic development, it would not be proper to prohibit it from doing so."[25] Further, in

[20] *Ibid.*
[21] *Supra* note 17.
[22] Stephen R Gliessman; (edited by*) Agroecosystem Sustainability: Developing Practical Strategies*, CRC Press 2000. Demirbas A ;(Edited by) *Biofuels – Securing the Planet's Future Energy Needs*, Springer 2009.
[23] Report of the U.N. Commission on Environment and Development titled as Our Common Future (1987) p. 43.
[24] (1999) 2 SCC 718.
[25] William E. Rees : Understanding Sustainable Development (1998) p. 20.

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"*A.Jagannath v. Union of India*"[26] case, the court observes that activities of the industries violative of environmental legislations must be discouraged.

Moreover, in the case of "*M.C. Mehta v, Kamal Nath*"[27], the court observes that "*Polluter Pays Principle*" has been recognised as fundamental objective of Government's environmental policy to prevent and control pollution. The calculation of environmental damages should not be on the basis of claim put forward by the party, but it should be on the basis of examination of the situation by the Court, keeping in view the factors such as deterrent nature of the award.[28]

Lastly, in "*Vellore Citizens' Welfare Forum v. Union of India*"[29] case, the supreme court directed the central government to constitute an authority under Section 3(3) of the Environment (Protection) Act, 1986 and confer on this authority all the powers necessary to deal with the situation created by tanneries and other polluting industries in the state of Tamil Nadu.

5. Conclusion

Technological advancement has enabled human beings to exploit natural resources to fulfil their material pursuits. Following this pursuit, we forgot our motherly relationship with the nature and started behaving with her as a competitor which resulted in a sharp depletion of natural resources to an alarming stage. Even the life-supporting elements like air and water is polluted to such an extent as we never thought of. However, attemps have been made by the world community at different world fora[30] to mitigate these ever-growing challenges by evolving the concept like "*Sustainable Development.*"

Deleberations are on all across the world to focus on sustainable technology. The gravity of the situation is quite deplorable especially in developing countries wherein the problem of vast population and urbanization has put a serious question before the governments. Hence, in most parts of the world, natural resources have faced the challenge of extinction mainly because of rapid urbanization.

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[26]AIR 1997 SC 811.
[27](1997)1 SCC 388.
[28]Heinberg, Richard*: The End of Growth: Adapting to Our New Economic Reality*, New Society Publisher Canada, 2011.
[29]*Ibid.*
[30] At Stockholm Declaration in 1972, Rio Declaration in 1992, and WSSD, 2002.

In this connection, our Prime Minister's vision "*Digital India*", has set an ambitious plan to build 100 smart cities across the country. Modi in his speech quoted, "*Cities in the past were built on riverbanks. They are now built along highways. But in the future, they will be built based on availability of optical fiber networks and next-generation infrastructure*."[31] The Union Finance Minister Arun Jaitley has earmarked Rs.7,060 crore in the Union Budget to brainstorm the creation of a 100 new smart cities.[32] In a bid to re-engineer cityscapes, the emphasis is clearly on infrastructure.[33]

Therefore, India is, at present, experiencing rapid construction activities in all spheres, which, in turn, is leading to an increase in the demand for energy. It is due to rapidly growing urbanisation and the increasing affordability of the people. Buildings are the major consumers of energy in their construction, operation and maintenance. Globally, about 40 per cent of energy consumption is estimated to be in the building sector.[34]

In case of redevelopment and greenfield models of smart cities at least 80% buildings should be energy-efficient and green buildings. Additionally, of the total housing provided in greenfield development, there should be at least 15% in the affordable housing category. It must be emphasized that, since cities are competing with each other for selection under the "*Smart Cities Mission*", the SCPs have to be prepared with great care and the proposed smart city made "*smart*" enough.[35]

On the one hand, to fulfil the aspirations of millions of people in the country and on the other, to maintain environmental suatainability, a balance must be there between environment and development. It is pertinent to note that there is an inter-linkage among population growth, poverty and environmental degradation. To eradicate the poverty, infrastructure development is a must, which can not be ignored at any cost and at the same time, the protection of environment can also not be sidelined as the very survival of all beings on the earth is possible because of it. In this connection, the concept of Green building is capable enough to strike a balance between development and environment. Therefore, the

[31] *Available at*: https://www.makeinindia.com/article//v/internetofthings (last visited on May 24, 2016).
[32] *Available at*: https://www.frontline.in/the-nation/not-so-smart-idea/article6275328.ece#test (last visited on May 12, 2016).
[33] *Id*. at 2.
[34] *Supra* note 6.
[35] Government of India, Smart Cities Mission Statement & Guidelines (Ministry of Urban Development, 2015.

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need of the hour is to develop and implement the "*Green Building Concept*" with renewed vigour to mitigate the challenge effectively.