Green Construction and other Sustainability Trends

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Abstract: ***Sustainable development is a hot topic in today's world since it could help us to meet the needs of today without compromising the ability of future generations to meet their own needs. As a civil engineering student, to meet our needs, we must be willing to learn and adapt and to continue to do so in the future. For example, infrastructures for changing climate, and earthquake and flood resistant buildings. It is our responsibility to be innovative in our practices and find solutions for the issues that our planet faces. Green material plays a key role in sustainable development. They are the local and renewable materials that are used to construct energy efficient structures. Green buildings are not just about little more efficiency. But it creates less waste and greenhouse gases and supports clean environment and healthy living. Materials, energy, water and health are the key elements of green building. This paper is a review on green materials and green construction and its importance in growing sustainability trends. It is a question that disturbs minds of civil engineers around the world that how could construction industry bother sustainability. Construction industry, from energy usage to emissions, by its very nature is a large user of natural resources. Besides having potential for building over wild habitats, it also has larger environmental impact. It uses fossil fuels for its heavy machinery. World's 36% energy usage and 40% CO_2 emissions are solely from construction industry. Thus, this industry is under pressure to decrease its environmental impact. So, usage of renewable and recyclable resources, and reducing energy consumption and waste should be the major goals of this industry which could fulfil the idea of green construction. It should also adhere to the idea of Corporate Social Responsibility- the idea that business should support good causes.***

Keywords**: *Corporate Social Responsibility, Green Building, Sustainability Development, Sustainability Trends.***

I. INTRODUCTION

Construction industry is one of the fastest growing industries in theworld. It is an important sector that contributes to the quality of life and economic growth of a nation. It is largely dependent on natural resources and thus have much to do with arising environmental and sustainability concerns [1]. Since stated in

Our Common Future[1], or even before that, people around the world know what actually sustainable development is. Regrettably, civil engineering does not do this all the time and this has a harmful effect on our planet [5]. If there is something that could counterbalance such huge environmental impact, it is sustainable development. One of the sustainable solutions to arising environmental concerns is green construction which demands sustainability in all its aspects.

II. OBJECTIVES

The paper aims at discussing on green buildings and its importance. It also reviews some of the sustainability trends and practices in civil engineering which could take us to the next level of sustainability. It discusses the need for introduction of the idea of corporate social responsibility.

III. GREEN BUILDING

"It is not wealth that makes good infrastructure possible, but good infrastructure that makes wealth possible." - John F Kennedy, former US president. Most of the people around the world, especially the developing countries refuses to choose sustainable design since it is expensive. Many of them are not ready to invest in such expensive project when there is cheaper unsustainable one. But it is a shocking fact that they will have to 'pay' a lot for it. The penalty will be not only in cash, but they will also have to bear deterioration of environment, society and health. A green or sustainable building design, is the practice of increasing efficiency with good use of materials, energy and water, and therefore reducing the harmful impacts on human health and the environment, for its entire lifecycle. Being the key elements of green building, materials, energy, water and health need to meet optimality in efficiency in order to attain sustainability [5].

Materials: Building materials play a vital role in construction as it is the fundamental unit of a building. Thus, the fundamental properties of the materials, civil engineers specify and design for construction should be well studied at the fore and checks should be done for sustainability along with its suitability for the purpose. We should decipher in finding the most appropriate and eco-friendly building material.

Energy: Buildings should depend on renewable resources for energy rather thannon-renewable resources. Exploitation of resources is one of the hot topics around the world. Thus, the future generation will be able to survive on the planet only if the present efficiently conserves resources without compromising their own needs. It will be great if we could also be able to store renewable resources, rather than being worried about the comparatively lower performance of renewable resources (since the existing techniques are not yet able to use renewable energy 100% efficiently due to the lack of know-how).

Water: It is one of the most important compounds. Water is life. We cannot survive without water; something so essential for houses, farms, institutions and companies.

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[1] Our Common Future (1987) is the report of World Commission on Environment and Development (WCED,1983), which was later named as Brundtland Commission in recognition of Gro Harlem Brundtland who chaired the commission.

About 70% of our body is made from water. Not only humanssurvive with it, but the entire ecosystem. So, importance of water in a building is not just as a building material. It is vital for almost all processes and is the fundamental part of life. Therefore, clean, free water should be readily available to all. Even when almost 70 % of Earth's surface is covered with water, only 3 % can be used as drinking water. Thus, the growing demand for water makes it a necessary to construct ecologicalbuilding which could minimize the use of resources and reduce the harmful effects on environment. In this way, we could achieve a clean and sustainable environment.

Health: Being healthy means being physically, emotionally and socially well. It is very important in handling stress and to live a long and active life. We can live a full life when we are free from all types of stresses. Going green will make us adapted and adhered to nature. Nature is the best medication for all diseases and tensions in this world. The aim of green building itself is to reduce the harmful impacts and thus it could create a healthy living. Green buildings concern a lot on human health. This is the reason why health remains as one of the key elements of green building.

IV. GREEN BUILDING AND ITSIMPORTANCE

It is a dirty secret that tons of greenhouse gases are being released during the production of commercial concrete (Kibert, 1994) [1]. Similarly, the construction industry largely depends on and affect the natural resources or the environment system as a whole. Here comes the urgent need of a system that could create a sudden solution for the issues that our planet faces. Green building techniques are modifying the industry and becoming a fundamental part of it [6]. Green building materials, modular construction, zero energy construction, flexible space design, resilience and durability contributes to the recent sustainability trends that could engender sustainable development of society. According to researches, the most important factors considered for sustainable construction are the quality of working conditions, strengthening of regulatory legislation, encouragingmanagement of construction waste, and the design for flexibility and adaptability [2]. A Green building or Green construction refers to both an environmentally friendly and resource efficient structure and processes. It creates a clear balance between the classicaldesign of building and the efficiency of economy, utility, durability, and comfort. The recommendations for construction industry through which it could evolve towards sustainability are: increased profitability and competitiveness, ensuring user satisfaction and well-being, respect for people and environment, and reduction in the reliance on non-renewable energy. To achieve this, it is necessary to revolutionizethe way construction is delivered and managed [3].

V. TRENDS IN SUSTAINABLE CONSTRUCTION

Green building brings together a wide range of practices that could reduce and ultimately eliminate the impact of building on environment and human health and, the skills or techniques that could help a building to efficiently produce and use its energy. In simple terms, a building with zero waste and zero energy opensthe way towards being green [5]. Part of the recent sustainability trends in construction, as shown below, could clearly define this fact.

Modular construction: It is an efficient method for maximum resource efficiency. It is a method in which pre-fabricated units (homes, rooms, etc.) are delivered onsite. It is known for its speed of construction and minimal impact and wastage at site since it is constructed offsite (mainly in factories). It is a high-quality environment-friendly construction.

Green building materials: They are the materials from renewable or recyclable sources that helps to reduce harmful emissions during construction [6]. They are locally available and easily affordable. For example, concrete and steel produced via eco-friendly processes are good examples of GBM [2]. They have lower carbon footprint [3] and better efficiency. It creates less waste when dumped in landfills and even during renovation or demolishing processes. There are also a wide variety of materials which could be considered as GBM, some of which are discussed here. The best example is timber which is the eco-friendliest material. However, it is not recommended, since it leads to serious deforestation. Properly sealed straw hales are also used. Grasscrete[4] reduce concrete use and is very efficient in stormwater absorption and drainage. A lightweight GBM, hempcrete[5] is known for its economic efficiency along with sustainability. Bamboo is the most popularly used conventional lightweight material that is good in tensile strength. The fungus mushrooms called mycelium is another example. Steel dust is used to create concrete like material named Ferrock. Since it resembles concrete in its properties, it is also a good substitute for concrete. It is very strong, carbon neutral and less CO_2 intensive. The main advantage of Ferrock is that it absorbs/traps CO_2 for its drying and hardening and thus helps in reduction of CO_2 level in atmosphere. The list of green building materials goes on like Ashcrete, Timbercrete, Recycled plastic in concrete and so on. The sustainability indicators of materials include: resource efficiency; energy and carbon; risk to human or environmental health; promote social and general well-being; and support for sustainable processes [3].

Zero energy construction: It is a process in which energy is produced as much as it is consumed, thus creating a zero-net impact on environment. Civil engineers these days are incorporating zero energy techniques to design more efficient, durable and sustainable structures at a competitive cost. Unlike in previous decades, people are more aware and concerned about issues related to sustainability. They are therefore looking for sustainable construction that improves quality of life, the environment and health. Thus, manufacturers are also incorporatingnew design techniques which could achieve this objective. Some of the widely used zero energy techniques are:

[2] Green Building Materials
[3] Amount of carbon dioxide released into atmosphere as a result of the activities of a particular individual, community or organization.
[4] Continually reinforced, ready mixed concrete that has a defined pattern of voids achieved through the use of a disposable form that once removed and replaced with stone or grassed soil that allows water to pass through the concrete. It is commonly known as Void Structured Concrete.
[5] Bio composite material formed from the mixture of hemp shives and lime, sand or pozzolans

- Use of renewable energy to power the building
- Use of efficient air ventilation that could remove harmful pollutants
- Provision for better insulation to minimize leakage of air and noise pollution
- Use of efficient interior appliances

Flexible space design: One of the most useful and fashionable trends in sustainable construction is flexible space design. It is the versatile design, i.e., the construction of an office which couldeasily betransformedinto a residential building at a later stage, if necessary, or a hotel that could be a condo[6]. Ex: Theatre in Dallas.

Resilience and Durability: Buildings must be adapted to climate change and natural disasters. All buildings must be durable enough. All the adaptionsrequired for resilience and durability must be well thought out first.

VI. CORPORATE SOCIAL RESPONSIBILITY

Nowadays, the only objective of companies is to have an augmented economic profit. They are even ready to stoop so low to achieve this goal. So, if the idea of corporate social responsibility is introduced, it will make them socially accountable while still being rooted in profit motivation. The corporates will be accountable to itself, to its stakeholders and to the public. CSR[7] is a self- regulating business model that helps company to do the business that supports good causes [4]. Being socially responsible, company could use its resources to do good rather than running behind money. Thus, the company will be able to make socially and environmentally conscious investments. The six core characteristics of CSR are:

1. Voluntary
2. Beyond Philanthropy
3. Practices and Values
4. Stakeholder Management
5. Alignment of Responsibilities
6. Management of Externalities

CSR is totally a new idea by which corporates play a more socially responsible role in the world. If properly studied and executed, it is a win-win game in which both company and society enjoys equal benefits. Some benefits of CSR are included here;

- Corporates get recognition as a brand
- High reputation and positive business
- High financial performance
- Increased competitive advantage
- Productive workforce

CSR is important in bringing long term prosperity in business by making it stable. It will help them to maximize their opportunities and minimize the harmful impacts on society.

VII. CONCLUSION

Building a solid and sustainable business becomes more and more difficult in the current scenario of growing political and social unrest. So, we need to understand the trends in sustainability in order to avoid such problems. Sustainability is no longer a recommendation, but is the need of the hour. Understanding trends helps create sustainable practices in the construction industry. According to the study, some of the recommended practices are:

1. Renewable energy: -We need to find a way to store renewable energy in batteries so that we could use it efficiently. This would help us to be more sustainable and energy efficient. Extracting energy from renewable energy sources is very expensive and the process is less efficient. So, if we are able to store energy for future uses, more and more people will depend on renewable energy sources.
2. Circular economy: -The common trend that we see today is ‘take, use, eliminate’. This creates a lot of waste in the economy. We must therefore be able to adopt the tendency, ‘take, use, transform, repeat’. This will help us reduce the exploitation of resources and the generation of waste. In simple words, we must adhere to 3R principle–reduce, reuse and recycle.
3. Social awareness and education: -Society must be created aware ofthe problems of sustainable development concerned. Unlike before, people are looking for sustainable construction. This is the result of awareness programs and education. Thus, many efforts should be made for making people aware of the importance of sustainability.
4. Plastic recycling: -Plastic is something thatcreates lots of environmental concerns these days. Since plastic has become an important part of our life, it is not easy to eliminate it completely. Thus, efforts for plastic recycling should be encouraged.
5. Sustainability reporting: -Sustainability reporting is no longer voluntary. Governments of different countrieshave already taken initiatives in sustainable practices. They ask us to take the path of sustainability and penalizes if required. A recent ban imposed in Kerala is a good example for government initiation. Taking into consideration the alarming environmental and health issues related to mounting plastic waste, Kerala government has completely banned the use of single-use plastic in the state from January 1, 2020 onward. It is said that strict actions will be made against offenders (arrest, penalty. etc.).

To conclude, the sole solution to the current environmental issues is a set of sustainable practices. The public must be aware of the need for green construction and other sustainability trends in order to meet the growing demand for environmental protection and development. Researches and studies show that incorporating an advanced level of sustainable practices intoacademic curriculum of students will increase general awareness and encourage young innovators. Thus, sustainability could be achieved from the lower level itself. Now, there is no time to wait for someone to take up the initiative.It is the responsibility of the society to grow to individual level. For decades, various Governments, organizations, NGOs, scholars and environmentalists have been trying to persuade us to move towards sustainability.

[6] A Condonium, often shortened as condo is a residential building structure divided into several units that are separately owned, surrounded by common areas.
[7] Corporate Social Responsibility.

Now, it is our turn to go green and do something innovative. The examples around us show that we do notneed to be environmentalists to advocate sustainability, because it is our responsibility to protect our mother nature. We must be able to consider our fellow beings and be ready to appreciate the good. Byworking together, we could make this planet a better place to live in. Do good and have good. That is what even the corporate social responsibility has to say.

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