Green Building

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Abstract— Green building also known as green construction or sustainable building. It is a way of enhancing the environment. It benefits humans, the community, and the environment in order to reduce resource consumption while enhancing quality of life. this ultimately results in reduction of greenhouse gases which will help to reduce greenhouse effect. this paper presents an overview of application of modern green infrastructure construction technology which makes a significant impact on conservation/proper utilization of resources like land, water, energy, air, material thereby reducing the overall cost of construction as well as adverse impacts of climate change. Green Building refers to a structure and using a process that is environmentally responsible and resource efficient throughout a building's lifecycle. Since buildings consume nearly 50% of World's Total Energy, Green Buildings, on the other hand, consume minimum amount of energy with the use of energy efficient materials. This paper can help readers to better understand the status quo and development trend of green building and to easier recognize the shortcomings in the development of green building, so as to provide a promising direction for future research.

Keywords: Green Building, Cluster

I. INTRODUCTION

Green or sustainable building defines constructing healthier, more energy efficient and eco- friendly buildings. A Green Building uses less energy, water and natural resources creates less waste and is healthier for the people living inside compared to a standard building. GRIHA, an acronym for Green Rating for Integrated Habitat Assessment, is the National Rating System of India. GRIHA has been conceived by TERI and developed jointly with the Ministry of New and Renewable Energy, Government of India. It is a green building design evaluation system, and is suitable for all kinds of buildings in different climatic zones of the country. There are many benefits of green buildings like: Green Buildings consume 40 - 50 % less energy and 20 - 30 % less water than normal buildings. If all the structures in the world are constructed giving due importance to the ecosystem and energy efficiency, the harmful effects on the environment and the earth's eco-system such greenhouse effect, ozone layer depletion, global warming etc., can be prevented or minimized. The scale of urban expansion in India is and will continue to be enormous, driven by economic and population growth. By 2030, India is expected to have 68 cities with a population of more than one million, 13 cities with more than 4 million people and six megacities with populations of 10 million or more, with Mumbai and Delhi among the world's largest cities in the world (McKinsey Global Institute, 2010). This rapid urban expansion is likely to impose tremendous pressures on the natural environment.

The resource footprint during the siting, construction, and operation of buildings as well as during extraction of building materials is huge. Globally, buildings are responsible for about 30%– 40% of all material flows, and in India the construction sector alone accounts for 23.6% of the national greenhouse gas (GHG) emissions (Parikh et al., 2009). There have been a lot of research works carried out on the aspects of the green building in different contexts but they all lack in systematic reviews of the existing material of knowledge. The systematic research is very important to identify the common search problems and also highlight the future research methodology. This study will play a critical role to highlight the state of art and future need in this topic for our country India and also for other developing countries interested in developing green construction. This research paper will help developing green buildings and eco-friendly homes in India as it includes easy and simple ways to be implemented for achieving green homes and also the importance and long-term profits involving green homes. Over the past few decades, scholars have increasingly focused on the research on green building, and have issued an increasing number of papers. This may make it tough to grasp the research focus and status quo from thousands of papers, posing a major risk of neglecting essential questions and areas for research and practice improvement According to the Bureau of Energy Efficiency, two-thirds of India's building stock that will be required by 2030 has yet to be built. The infrastructure investments that are made now will play a critical role in determining future resource intensity, and affect India's ability to decouple resource consumption from economic growth in line with national policy. Urbanization in India is currently lower than it is in many countries, so there remains an opportunity for India to avoid being locked into energy- and resource-intensive urban infrastructure. The promotion of green construction offers one way to achieve this A literature review is considered to be an effective way to deeply understand the field of research. By systematically combing the existing research, we can figure out the current research situation and development trend of the field, thus providing a direction for future research. It should be pointed out that the development of knowledge is a dynamic process. The growth and development of our communities has a large impact on our natural environment. The manufacturing, design, construction and operation of the buildings in which we live and work are responsible for the consumption of many of our natural resources. As scientific literature is constantly updated, we may not have enough time or non-visualization technology.

II. LITERATURE REVIEW

(Kushagra Varma, Mayank Chaurasia,Prasenjit Shukla)The pressure that man exerts upon nature for fulfilment of his needs is greater than ever and is escalating at an alarming rate.

Whether one considers the availability of fresh water, resources, or ecological balance, the MEA (Millennium Ecosystem Assessment) study of 2005 has found that there has been a 62% decline over the last four decade, which in turn has brought about the undeniable realization that the system is under the risk of destructive and possibly irreversible changes. Another possible consequence of all this is the escalation of poverty on countries that rely on the resources produced by the collapsing eco systems. According to the reports published by MEA (millennium ecosystem assessment), the ability of the global ecosystem to nurture future generations can no longer be counted upon.

(Usman Aminu Umar)Materials are the essential components of buildings construction. Chemical, physical and mechanical Properties of materials as well as an appropriate design are accountable of the building mechanical strength. The design of green buildings should thus begin with the selection and use of eco-friendly materials with related or better features than traditional building materials. Building materials are usually selected through functional, technical and financial requirements. However, with sustainability as a crucial issue in the last decades, the building sector, directly or indirectly causing a considerable portion of the annual environmental deterioration, can take up the obligation to contribute to sustainable development by finding more environmentally benign methods of construction and building.

(Jian Zuo)Green building is one of measures been put forward to mitigate significant impacts of the building stock on the environment, society and economy? However, there is lack of a systematic review of this large number of studies that is critical for the future endeavor. The last decades have witnessed rapid growing number of studies on green building. This paper reports a critical review of the existing body of knowledge of researches related to green building. The common research themes and methodology were identified. These common themes are the definition and scope of green building; quantification of benefits of green buildings compared to conventional buildings; and various approaches to achieve green buildings.(Samreen S. Makandar May 2019)Green buildings work on the principle of "whatever it derives from the nature returns to it". Green buildings are resource efficient and environmentally responsible structures. There are a set of standards which a building has to fulfil to be called as a green building. Various criterions are considered for evaluation of buildings and they are ranked accordingly. Various green building rating systems such as LEED, BREEAM, CASBEE, GB-Tool etc. are adopted across the world by different countries for rating and certifying green buildings. These ratings classify the buildings performance with respect to the green building techniques adopted. This paper considers few of such green building rating systems for the study. The study emphasis on two of the most widely used rating systems in India namely LEED and GRIHA. The rating patterns, rating criterions, award of marks etc. are studied in detail and compared. Few of the limitations of these rating systems are listed and a possible solution for the same is proposed at the end. According to (Neo Yi Lin (2017)) deputy director at the workplace health and outreach division at the Health Promotion Board (HPB), more companies are realizing these benefits and recognizing the business value of putting health at the centre of workplace design. She said: "People in these spaces found work more enjoyable and there was more tenant engagement and greater awareness of the developer's brand. In a very competitive market, you cannot be competing on rent alone. Avinash Shivajirao Pawar. "Green buildings". Journal of Engineering Research and Studies aimed to design green building in order to minimize the demand on non-renewable resources, maximize the reuse, recycle and optimize the use of onsite resources. Green building is define as the one which focuses on increasing the efficiency of resources and thereby reducing building impact on human health and environment. Paper outlines that the green building experiences in India have been exciting and challenging as well and serves to assist the country to conserve energy and natural resources by spurring increased recovery and recycling of building materials. Sunita Bansal, S.K. Singh, Srijit Biswas. "Green quotient evaluation of existing buildings." International Journal of Advanced Research (2013), Volume-3, Issue-5.A Case Study at Delhi regarding an organization's methods to improve a building's performance. Issues were evaluated regarding water audit to establish the areas of the building consuming large amounts of water and targeted for improvement. Waste audit to find out total amount of solid waste generated and how much of it being recycled and sent to incineration and landfill. Condition audit to determine the current condition and expected remaining economic life of building's components. Ries; Robert Bilec; Melissa M Gokhen; Nurvi Mehmet Needy and Kim Lascola had published a paper on the economic benefits of green buildings which was a comprehensive study which was supported with a case study. they stated that in building design and constructions both the green building and standard construction techniques are considered for many building projects. their final decision also well routinely made based solely on schedules and budgets and also on the long term effects are often overlooked their assumption effects is that the benefits largely exceeding any added cost of the green building .their research investigated the relationship between the composite conventional and green building features which would contribute to the development of the green building metrics. Their results comprised of four sections: - Productivity, health and safety include absenteeism, energy and IEQ. They also specified that pre and post move surely responses were analyzed with paired t-tests to understand whether there is any static significant change in the mean values of the variables. They also concluded the excessive of active and passive technologies can even be counterproductive. The researchers concluded that the analysis of cases found in literature showed that life cycle energy use of buildings depends on the operating (80-90%) and embodied (10-20%) energy of the buildings. Normalized life cycle energy use of conventional residential buildings falls in the range of 150-400 kwh/m2 per year and office buildings in the range of 250-550 kwh/m2 per year.

III. METHODOLOGY

This study is aimed at research, study and development of the green building construction techniques in order to save our planet from pollution and global temperature rise. Also, it

aims at spreading awareness among the people all over the world, about the advantages and also the long-term cost savings from green buildings. Further, the structural methodology is structured as below:

1) Introduction
2) Literature survey
3) Study of the research topic in detail
4) To study the research papers, articles and magazines related to the topic of study.
5) Data collection from the proposed areas of study which includes large, medium and small-scale construction projects.
6) Collection of information with the help of web surveys.
7) Finding out new ways and techniques for development of green
8) Construction.

A literature review is considered to be an effective way to deeply understand the field of research. By systematically combing the existing research, we can figure out the current research situation and development trend of the field, thus providing a direction for future research. It should be pointed out that the development of knowledge is a dynamic process. The construction sector poses a major challenge to the environment. Globally, buildings are responsible for at least 40% of energy use. An estimated 42% of the global water consumption and 50% of the global consumption of raw materials is consumed by buildings when taking into account the manufacture, construction, and operational period of buildings. In addition, building activities contribute an estimated 50% of the world's air pollution, 42% of its greenhouse gases, 50% of all water pollution, 48% of all solid wastes and 50% of all CFCs (chlorofluorocarbons) to the environment. India too faces the environment challenges of the construction sector. The gross built-up area added to commercial and residential spaces was about 40.8 million square metres in 2004–05, which is about 1% of annual average constructed floor area around the world and the trends show a sustained growth of 10% over the coming years. With a near consistent 8% rise in annual energy consumption in the residential and commercial sectors, building energy consumption has seen an increase, from a low 14% in the 1970s to nearly 33% in 2004–05.1 Energy consumption would continue to rise unless suitable actions to improve energy efficiency are taken up immediately. As per TERI estimates, there is an increased demand of about 5.4 billion units (kWh) of electricity annually for meeting end-use energy requirement for residential and commercial buildings. With the development of science and technology, many visualization tools have emerged in recent years, such as VOS viewer, CoPal Red, Bibexcel, Sci2, Vantage Point, and Cite Space. All of these tools support document co-citation analysis and keyword co-occurrence analysis, which can help us conduct quantitative and objective analysis of the relevant fields, and reveal the quantitative relations among various studies. Buildings are major consumers of water during construction and operation (for occupants, cooling, and landscaping). Per capita water consumption in 1990 was 2464 m3 per capita per annum, but by 2025 with an expected population of 1.4 billion, it will almost certainly be in the stress category with less than 1700 m3 per capita per annum. The Indian Green Building Council (IGBC) was formed by the Confederation of Indian Industry (CII) in 2001. The council is based out of the CII Green Business Centre Hyderabad which is India's 1st Platinum rated green building.
a) Go solar- The sun has long been lauded as one of the top forms of clean energy. If you are planning a new build, this presents a clean slate for your solar infrastructure. Essentially, this is because you will be able to optimally situate your building and position your panels for performance (and the best return on investment on your solar technology).The passive solar design should be the main aim of commercial buildings in the construction process. This allows buildings to be lit, heated, and cooled using the sun and without extensive mechanisms. Another way of leveraging solar energy is through the use of building-integrated photovoltaic (BIPV). Photovoltaic materials that are used to replace conventional building materials in parts of the building exteriors – such as the roof, skylights, or facades. BIPVS are increasingly being incorporated into the construction of new buildings as either the principal or ancillary source of electrical power. Integrated photovoltaic offer a 'two-in-one' benefit by both reducing the amount spent on traditional building materials and labour and by reducing the building's dependence on the conventional energy grid. Thus, the initial investment in BIPVs will pay itself off over time.Re-tank water harvesting can be as far-reaching or as simple as you choose. Sustainable plumbing options exist to help your commercial building use its water responsibly. The first option is rainwater harvesting. This depends on a catchment system on the building to capture and store rainwater for different applications or recharge our ever-dwindling groundwater sources. You don't need clean water for everything. Greywater harvesting is another way to divert the need for fresh, potable water in different parts of the commercial space. This gives greywater life beyond the drainpipe in other applications within your building. These include irrigation and flushing toilets. There are also other water-savvy ways to re-think water in commercial buildings. This includes water-efficient appliances and technologies designed to reduce drips, leaks, and unnecessary pressure and flow. Also, give some thought to water heating. Often, water is heated for a few menial tasks in business buildings and there is a high energy cost attached to this. Consider installing solar geysers or point-of-use water heaters for this purpose. Cooling Towers-Green buildings make use of evaporative cooling systems to save on energy. Such systems use water for cooling. Keeping in mind the huge need to conserve water, the water used such cooling towers is non-potable water and the same is not drained out but recycled time and again and reused. As the structure, rules, and distribution of scientific knowledge are presented by means of visualization, the generated visualized graphics are also referred to as "mapping knowledge domains". Cite Space effectively helps readers to better understand the areas of research in which they are engaged.

A. Application of Green Building Energy Saving Technology-

Reasonable building layout can significantly reduce the energy consumption during construction use-After the size, function, and area of a building are determined, the building shape and orientation will have a significant impact on

building energy consumption. It is generally believed that the building shape coefficient is proportional to the size of the surface area corresponding to the unit building area. Reasonable building layout can reduce the power consumption of the heating and air conditioning system. From the perspective of thermodynamics and aerodynamics, the smaller body shape is proportional to the smaller external load. And the use of residential buildings for external load instability of its energy consumption accounted for the main factors. And for sports venues, cinemas and other large public use of the building, the internal heat is much higher than the external heat, so the design of the larger body shape more conducive to heat. In other words, ordinary residential and large public buildings because of the use of different, the heat of the factors are not the same, from the energy point of view, the design of its body shape requirements are the opposite. Building exterior wall insulation can significantly reduce the energy consumption of the building during use-The external wall insulation of the building is a green energy-saving project that can greatly improve the thermal performance. The thickness of its external wall insulation material and its insulation effect is proportional to the relationship. The wide application of the external wall insulation technology not only in the cold winter to effectively avoid the rapid loss of indoor temperature, but also in the hot summer can also be effectively avoided due to solar radiation caused by the external wall temperature and then promote the indoor temperature rise, Thereby reducing the air conditioning and other refrigeration equipment working load. In this way, through the laying of building exterior insulation layer not only to enhance the thermal insulation performance in summer also makes the winter insulation performance can be strengthened. This reduces the winter heating pressure and the summer cooling power load, so that the building's energy consumption is reduced. Therefore, from the point of view of reducing energy consumption, we should vigorously promote the building exterior wall insulation technology and technology for a wide range of implementation. The indoor environment for system control to achieve the purpose of a comprehensive system of energy conservation-One of the major features of green building is the comprehensive utilization of air treatment, as much as possible the use of natural light, optimization and improvement, natural ventilation design, and many other integrated systems, integrated, multi-faceted optimization and system integration. The integration and optimization of various functions are carried out organically, and the energy consumption of buildings is reduced systematically and scientifically. HVAC system plays a very important role in the overall integrated control, because the HVAC system accounts for more than 50% of the total energy consumption in the general buildings. It is of great importance to optimize and integrate the HVAC system of the building scientifically and reasonably. To reduce the energy consumption of HVAC system, the first step is to start with the optimization of HVAC system design, and the key factor of its success or failure is the automatic control of HVAC system. From the current HVAC design of air conditioning system implementation effect, the highest energy efficiency basically is the green building system based on Distributed Control Technology in general, the HVAC system energy efficiency up to 30%. Make full use of clean and rich solar energy natural energy- Currently, solar energy is the most important has been the development of green energy in energy is inexhaustible, widespread natural energy, it has very many advantages such as cheap and clean. At present, solar energy air-conditioning, solar water heaters and solar cells are the main solar energy utilization in residential buildings. For our country, solar energy resources are still relatively abundant, the average annual sunshine hours is 2100~2500 hours. This provides favorable conditions for the development and utilization of clean solar energy resources in china. Now the biggest factor restricting the use of solar energy is the energy conversion rate is too low, but from the point of view of development, with the progress of science and technology, the scope of the use of solar energy will be more widely, the energy conversion efficiency will be higher. The reclaimed water system is introduced to make rational exploitation and use of water resources and avoid waste-The average annual water resources in China is 281 billion 240 million cubic meters. The average annual water resources per capita is only 2200 cubic meters, and the average annual water resources per capita is only 1/4 of the world's average annual water resources. China belongs to the United Nations and is one of the countries with shortage of water resources. In normal life, 95% of the use of washing and sewage is drinking water, causing great waste. Drinking water treatment requirements are very high, but only 5% of the use. Not drinking water 95% water diversion system (water, wash, wash) is no longer used in drinking water, after simple treatment can be recycled, saving potable water waste, reduce the cost of water treatment, so as to achieve the purpose of energy saving. Application of daylight lighting technology to reduce lighting energy consumption- In the energy ranking of buildings, building lighting is the number one choice. In some commercial buildings, building lighting consumption sometimes accounts for more than 30% of the total power consumption. Because of the lighting heating factors, some need to reduce the environmental temperature of the regional space, because the lighting heating, resulting in cooling system load is passive. Daylight illumination is the introduction of sunlight into the interior of a building and is assigned in a certain way to provide better quality lighting than man-made light. Daylight lighting reduces the demand for power light sources and reduces power consumption and environmental pollution. Research shows that day-lighting can create healthier and more dynamic environments than artificial lighting systems, which can increase productivity by 15%. Lighting can also change the intensity of light, colour and vision, and help to improve work efficiency and learning efficiency. It is widely used in green buildings. Other energy-saving technologies-During the hot months of summer, building sun shading is an economical, effective and effective way to reduce energy consumption and achieve the purpose of building energy efficiency. In the sun shading design, according to the characteristics of the area and the use of the room, as well as sunset made permanent or temporary sun shading device window. Bamboo is considered one of the best eco-friendly building materials. It has an incredibly high self-generation rate, with some being reported to have grown up to three feet within 24 hours. It continues spreading and growing without having to be replanted after harvest.

Bamboo is a perennial grass and not wood and grows on every continent, except Europe and Antarctica. It also has a high strength-to-weight ratio, even greater comprehensive strength than concrete

IV. CONCLUSION

This paper study reported all the technical and also the economic aspects related to green buildings Green building is a new architectural concept, as well as the development direction of modern construction industry. It will be the sunrise technology concept of construction industry in recent years. Green building throughout the building design, construction and use, from the whole process to achieve the full range of green building. The conclusion for the studies can be classified into three different categories i.e. definitions and scope of green building, benefits and costs of green building and ways to achieve green building. It has been observed that in most of the literature reviews. Across all regions studied, respondents increasingly projected that more than 60 percent of their projects would be green projects by 2018, with a doubling from current projects across the Middle East, North Africa, Asia, South America and Sub-Saharan Africa. The largest percentage of green building activity continues to be in the commercial building segment, comprising 46 percent of respondents' future green building projects. The focuses are on environmental aspects of sustainability such as energy consumption, water efficiency and greenhouse gas emissions and also with their technical solutions. Also, the life cycle assessment approach, which is extensively applied in the environmental aspects of green.

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