SUSTAINABLE MATERIALS IN CONSTRUCTION

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Abstract: The construction industry is one of the largest exploiters of both renewable and non- renewable natural resources. It was inevitable that it would find itself at the centre of concerns regarding environmental impact. The process and operation of building construction consumes a great deal of materials throughout its service life cycle. The selection and use of sustainable building materials play an important role in the design and construction of green building. This chapter sets out to present an overview of sustainable building materials and their impacts on the environment. Materials used for the structure of buildings require properties of strength, whereas other parts, such as the envelope, are selected for their insulation or aesthetic properties. Comparisons become more complex when materials perform more than one function such as load-bearing walls that provide good thermal insulation. There is also a need to distinguish between finite resources and renewable resources when reviewing the sustainability of a material. Some materials, despite being non-renewable may be considered plentiful on earth; however, the consequences and impacts of mining them may be considered unacceptable. The effect of construction material selection will impact upon sustainability throughout the lifetime of both the material and that of the building itself. The need to maintain the building, replacing individual components, disposing of the old, and procuring the new will have environmental impact from cradle to grave.

Keywords: **Sustainable material, concrete, maintain, selection, renewable resource**

I. INTRODUCTION

The building industry indirectly plays a major role in environmental damage, so it is our responsibility to find more environmentally friendly construction techniques for development. One of the solutions is to search for a new sustainable material that can be recycled and reused. Therefore, it is necessary to go for a new material that is naturally available, such as bamboo, glass, ceramic, silica, cellulose fibre, iron oxide, fly ash, plastic, alumina, cork, reclaimed wood, plant-based polyurethane rigid foam, blast furnace slag, etc. These materials are one of the renewable natural resources known to us. By studying the beneficial physical characteristics of these materials, research has been conducted on their use as sustainable materials in concrete. With the development of science and technology, new techniques are implemented for treating these materials to make them durable and more workable in terms of construction materials. In this project, these materials will be used in concrete to study strength Characteristics.

1.1 Sustainable building material selection criteria

Sustainable building and development involve considering the whole life cycle of buildings that are designed to minimize all adverse impacts on the built and natural environment through sustainable building design and material selection. The selected building materials impact the environment throughout the life cycle of a building. This life cycle can be divided into five stages: feasibility, design, construction, operation, and demolition. Materials are used from the construction stage of a building through the operation stage, which involves building maintenance. The replacing, renewing, and renovating of building materials and components remains until the end of the building's service life. Fundamentally, materials play an important role in enhancing the overall performance of a building and in achieving the goal of sustainable construction in the industry. Buildings are responsible for a substantial amount of material and energy consumption. However, the environmental properties of materials have not traditionally been a design or construction priority, where cost, performance characteristics, and aesthetics are the main items that determine material selections in buildings. In a study for the development of an optimization model for sustainable material selection,

Sustainable building materials are about choosing materials manufactured from resource-efficient processes, such as choosing materials with low embodied energy content, using locally provided and renewable energy sources, and selecting materials that contribute fewer amounts of GHG emissions to the atmosphere. Commonly used building materials, such as steel, concrete, and aluminum, consume energy and release CO2 during the production process. Therefore, research into new material production, manufacturing methods, recycling of building materials, and low-embodied energy materials has become extremely important. In addition, techniques and technologies are improved so that natural resources are minimized and conserved in buildings. Resource minimization and conservation are considered important aspects of the construction industry. In considering the importance of sustainable building materials in green building design and construction, The ‗5 Rs' approach to dealing with issues related to resource conservation refers to refuse, reduce, reuse, recycle, and repair. Refusing refers to setting guidelines on what is and is not acceptable material in buildings. In 2003, the European Commission released the integrated product policy (IPP) to identify products within the construction sector that have the greatest lifetime environmental impact potential. The IPP has led to the development of environmental product declarations (EPD) to communicate the environmental performance of materials from a life cycle perspective. The EPD is being recognized by the USGBC LEED program and is being encouraged by the European Union. Reusing building materials deals with a serious resource issue. Reduce relates to the reduction in the use of resources, space, or elements. This need not undermine a good design solution, such as by reducing the number of mechanical services. It involves the adaptation of existing buildings instead of demolition and the reuse of salvaged materials to minimize raw material consumption. The reuse of materials involves the consideration of the material and joining techniques so as to enable the reuse and replacement of components, either in parts or as a whole.

1.2 Scope of Work

In view of the aforementioned problem statement, aim, and objectives, the scope of work of the proposed work is given, which first examines the underlying sustainable materials as a way for the building industry to move towards protecting the environment. The demand for concrete will always be high as we need to repair and rebuilt structures all the time (World Cement & Concrete Additives) and concrete is one of the best materials for construction due to its flexibility and cost, so the question is not will be their demand for concrete but is the production of concrete sustainable with present practises and the answer is a big NO. And thus, making concrete by replacing some of the content of cement with waste can make the production of concrete more sustainable, as these replacement materials are already produced. In order to identify the effect of concrete with sustainable materials, tests are to be performed. To satisfy the main objective of this study, this is to find the best material to be used in concrete as a replacement or as an additive

II. LITERATURE REVIEW

2.2.1. **Hyeonseok Choi, Young Cheol Choi**, ―Setting characteristics of natural cellulose fiber reinforced cement composite‖, Construction and Building Materials, Vol. 271, Pp. No. 121910 -121922, 2021.

In this study, the setting characteristics of natural cellulose fiber-reinforced cement composites were investigated based on the hemp and jute fiber dosages (0, 0.25, 0.5, 1, and 2%) as the main variables. The fiber cross-section was observed to have a hollow bundled tube structure via scanning electron microscopy. The compressive strength of the composite with a fiber mix proportion of 0.25% was greater than that of the plain sample. The compressive strengths of the other composites decreased gradually with increased fiber mix proportion, presumably an effect of agglomeration of fibers. The ultrasonic pulse velocity (UPV) and heat of hydration over time were measured to verify the effect of fibers on the cement hydration reaction. Further, the initial and final setting times were calculated based on the measurement results. The experimental results indicated that the higher the dosage of the hemp and jute fibers, the longer the initial and final setting times become. This appears to be the effect of cellulose and pectin comprising the fiber. In the case of the specimen with high fiber content, it was difficult to predict the setting performance by measuring UPV owing to the fiber network configuration and the chemical reaction between fiber and cement.

2.2.2. **Shadheer Ahamed M, Ravichandran.P, Krishnaraja.A.R,** ―Natural Fibers in Concrete – A Review‖ Vol. 1055, 2021.

The latest thesis deals with the issues of natural fiber in order to observe the strength properties and even a reduction in the replication of the shrinkage crack problems in concrete. The organic fibers such as coir, palm, kenaf, jute, sisal, banana, pine, sugarcane and bamboo etc. Various researchers are studied as building materials that can be found in cement paste, mortar, concrete. It was observed that the results of few fibers are most promising and given below. The present work focuses to improve the ductility and strength properties of concrete on bringing out. The same proportions of different fibers cannot be changed by all the normal concrete. This research may include the characteristics, behaviors and consistency of the fibers between themselves. Finally, the study focuses solely on similarities and variations between all kind of natural fibers. The goal of this analysis is to provide an analysis of the factors influencing the overall performance and reliability. The proportions for comparisons and conclusion were studied.

2.2.3. **Edward Harrison, *et. al*** –Recycling of waste glass as aggregate in cement-based materials‖, Environmental Science and Ecotechnology, Vol. 04, Pp. No. 1-8, 2020.

Glass is a common material made from natural resources such as sand. Although much of the waste glass is recycled to make new glass products, a large proportion is still being sent to landfill. Glass is a useful resource that is non- biodegradable, occupying valuable landfill space. To combat the waste glass that is heading to landfill, alternative recycling forms need to be investigated. The construction industry is one of the largest CO2 emitters in the world, producing up to 8% of the global CO2 to produce cement. The use of sand largely depletes natural resources for the creation of mortars or concretes. This review explores the possibilities of incorporating waste glass into cement-based materials. It was found waste glass is unsuitable as a raw material replacement to produce clinker and as a coarse aggregate, due to a liquid state being produced in the kiln and the smooth surface area, respectively. Promising results were found when incorporating fine particles of glass in cement-based materials due to the favorable pozzolanic reaction which benefits the mechanical properties. It was found that 20% of cement can be replaced with waste glass of 20 mm without detrimental effects on the mechanical properties. Replacements higher than 30% can cause negative impacts as insufficient amounts of CaCO3 remain to react with the silica from the glass, known as the dilution effect. As the fine aggregate replacement for waste glass increases over 20%, the mechanical properties decrease proportionally; however, up to 20% has similar results to traditionally mixes.

2.2.4. **Jun Kil Park and Min Ook Kim, "**Mechanical Properties of Cement-Based Materialswith Recycled Plastic: A Review‖, Vol. 12, Pp. No. 1-21, 2020.

This study summarizes existing studies on plastic recycling to determine whether ocean plastics with high pollution degrees could be used for cement-based materials. In particular, the methods to recycle plastic waste, the effects of recycled plastic on the physical and mechanical properties of cement-based materials, and their effective usage were investigated. Workability, density, compressive strength, split tensile strength, and flexural strength of cement-based materials with recycled plastics were reviewed and divided into recycled aggregates and fibers. Based on the previous investigation, the direction of research necessary to recycle marine plastics is suggested. As the amount of recycled plastic aggregate increased, the mechanical strength of cement-based materials decreased. The recycled plastic aggregate lowered the density and increased porosity of the cement-based material. Meanwhile, recycled plastic fibers reduced the compressive strength but improved the tensile strength; to effectively improve tensile strength, a volume content of less than 1.5% should be added to prevent balling fibers. Furthermore, an appropriate aspect ratio should be determined based on the type of plastic to be used.

2.2.5. **Karthikeyan Kumarasamy, *et. al*,** –Strength Properties of Bamboo Fiber Reinforced Concrete‖, Journal of Construction Engineering and Management, Vol. 981,Pp. No. 1-10, 2020.

A comparative study is the experimental results of the properties concrete with variable percentage of ratios natural fiber with Concrete. The Bamboo was used in structural element like supports, columns, roofs etc. and in the construction of the building. For the construction work concrete is used as the basic materials. The concrete is strong in compression but fragile in the tensile strength. It has become involved in making concrete using natural materials. Bamboo fiber with high tensile strength is expected to contribute significantly to quick growth, large growth distribution and low-cost earthquake-resistant construction and seismic retrofit skill. This thesis explores the mechanical properties of reinforced concrete made of bamboo fiber. In order to study the basic concrete properties such as compressive power, split tensile strength, this research was carried out to study the basic concrete properties such as compressive strength, split tensile strength and Flexural strength by adding in volume of concrete at 0%, 0.5%,1.0%,1.5%,2.0% and 2.5% with concrete and finally the results were compared with conventional concrete and bamboo fiber concrete.

2.2.6. **Lilesh Gautam, Jinendra Kumar Jain, *et. al*, —**A review on the utilization of ceramic waste in sustainable construction products‖, Pp. No. 1-8, 2020.

The increasing infrastructural development has resulted into continuous depletion of natural raw materials required for concrete works. Concrete is a homogeneous mixture that consists of cement, fine aggregate, coarse aggregate and water in different proportions (as per prescribed mix design). Cement is one of the costliest and scarcer construction materials used for preparing concrete. Also, due to large consumption, substitutes of cement are widely being researched and used. The waste material substitutes are being majorly preferred as they follow a sustainable approach. The growing industrial sector is causing the production of massive solid waste. The utilization of solid waste in concrete has brought interest to many researchers, who are using waste as a cement replacement. This also in a way results in the reduction of global greenhouse gas emission. Cement production produces CO2 which is a major contributor to greenhouse gases. In this review paper, the effect of ceramic waste on physical, chemical, mechanical and durability properties on different forms of concrete is mainly considered. Better mechanical and durability properties were reported for the concrete containing ceramic waste as a replacement of cement and aggregate. It was concluded that the use of ceramic waste in the construction sector not only reduces the cost of construction material but also helps in attaining sustainability.

2.2.7. Marcus Maier, Alireza Javadian, *et. al*,
‒Mechanical Properties and Flexural Behavior of Sustainable Bamboo Fiber-Reinforced Mortar‖, Vol. 10, Pp. No. 1–15, 2020.

In this study, a sustainable mortar mixture is developed using renewable by-products for the enhancement of mechanical properties and fracture behavior. A high-volume of fly ash—a by-product of coal combustion—is used to replace Portland cement while waste by-products from the production of engineered bamboo composite materials are used to obtain bamboo fibers and to improve the fracture toughness of the mixture. The bamboo process waste was ground and size-fractioned by sieving. Several mixes containing different amounts of fibers were prepared for mechanical and fracture toughness assessment, evaluated via bending tests. The addition of bamboo fibers showed insignificant losses of strength, resulting in mixtures with compressive strengths of 55 MPa and above. The bamboo fibers were able to control crack propagation and showed improved crack-bridging effects with higher fiber volumes, resulting in a strain-softening behavior and mixture with higher toughness. The results of this study show that the developed bamboo fiber-reinforced mortar mixture is a promising sustainable and affordable construction material with enhanced mechanical properties and fracture toughness with the potential to be used in different structural applications, especially in developing countries.

2.2.8. **Arpita Bhatt, Sharon Priyadarshini, *et. al***,
‒Physical, chemical, and geotechnical properties of coal fly ash: A global review‖, Vol. 11, Pp. No 1-14, 2019.

In 2015, fly ash utilization rates were 70% for China, 62% for India, and 50% for the US. This leaves substantial potential for increased utilization. This article summarizes available literature concerning physical and chemical and geotechnical properties of fly ash which affect its options for re-use. Fly ashes is broadly classified worldwide into two chemical types for their industrial applications, mostly in cement industries, namely class C and class F. Class C fly ash, with its higher levels of calcium oxide, generally has self-cementing properties. In terms of global fly ash composition, fly ash from India on average contains higher levels of silicon dioxide than that from the US and China. In terms of particle size, studies report that fly ash more often is poorly graded than well-graded; fly ash from India in particular tends to be poorly graded. Optimum moisture content (OMC) values for fly ashes vary from 11 to 53%, and maximum dry density values range from 1.01 to 1.78 g/cm3. Country-specific trends in terms of fly ash OMC and maximum dry density values are not readily apparent. Fly ash tends to be non-plastic, meaning it will not swell if used as a foundation material for structures. Reported fly ash shrinkage limits range from 38 to 65. Permeability of pure fly ash generally varies from 104 to 10-7 cm/sec, and angle of friction varies from 25º to 40º.

2.2.9. **Bernard A. Zulu, Shingo Miyazawa and Nobukazu Nito,** ‒Properties of Blast-Furnace Slag Cement Concrete Subjected to Accelerated Curing‖ Vol. 4, 69, Pp. No. 1-13, 2019

Accelerated curing is used for mass production in the precast concrete industry. Autogenous shrinkage and drying shrinkage occur in concrete, during and after accelerated curing. Thus, thermal cracks may occur in concrete due to both heating and cement hydration at early age, whereas drying shrinkage causes cracks after demolding. Ground granulated blast-furnace slag cement (GGBS), a byproduct in steel manufacture, has been used to improve concrete strength development during accelerated curing but poses a challenge of increased shrinkage. In this paper, two types of granulated blast-furnace slag cements were used to study mechanical and shrinkage properties of water cured and concrete subjected to accelerate curing. Limestone powder and gypsums, with two different types of fineness, were other additives used. An accelerated one day curing cycle was adopted that consisted of a 3 h delay period, heating to 65 C, a peak temperature maintained for 3 h, and, finally, cooling. The results indicated that increment in gypsum fineness increased concrete expansion at one day for both sealed and accelerated cured concrete. In drying condition, similar shrinkage was observed. The addition of gypsum provided slightly lower shrinkage, and this may help to reduce cracking of concrete. Limestone powder improved concrete strength at early age. The difference in blast-furnace cement fineness did not have significant differences in compressive strengths, especially at 28 days.

2.2.10. **Daman K. Panesar,** ‒Supplementary cementing materials‖, Pp. No. 55 – 85, 2019.

Supplementary cementing materials (SCMs) are used to partially replace the Portland cement component in concrete. Some examples of SCMs are the following: fly ash, slag cement, silica fume, and metakaolin. Although SCMs vary in origin, physical properties, and chemistry, they all exhibit pozzolanic and/or cementitious properties. The chemistry, mineralogy, morphology, and physical properties of SCMs influence the degree to which these materials are reactive, pozzolanic, and/or cementitious, which in turn impacts the properties of concrete. The use of SCMs can effectively improve the concrete‘s fresh, mechanical, and transport properties and long-term durability. Beyond the desirable advantages associated with the performance of concrete containing SCM, their incorporation is also motivated by their ability to reduce concrete‘s environmental burdens related to energy use, greenhouse gas emissions, waste disposal, and the depletion of natural resources. Concrete containing SCMs as partial cement replacement has been used successfully for decades and is widely regarded as a durable, long-lasting, and sustainable structural material. SCMs are used in ready-mix, precast, and prestressed concretes, as well as in mortars and grouts. Some structural applications of concrete containing SCMs include bridges, roads, buildings, massive concrete structures, highway barriers, sidewalks, tunnels, and underground infrastructure.

2.2.11. **David Dominguez-Santos, *et. al*** ‒Mechanical Properties and Seismic Performance of Wood-Concrete Composite Blocks for Building Construction‖, Vol. 12, Pp. No. 1 – 22, 2019.

Recent catastrophes that occurred during seismic events suggest the importance of developing new seismic-resistant materials for use in building construction. Ordinary concrete is one of the most common materials in buildings. However, due to its low ductility and flexural strength, its seismic behavior can be improved upon by different additives. In this regard, wood-concrete composites exhibit desirable structural properties not achievable by either wood or concrete alone, making it an interesting material from a seismic point of view. This work analyzes and compares the performance of blocks built with ordinary concrete versus blocks built using different wood additives (sawdust and wood shavings). This includes the construction of concrete blocks in a lab, determination of their construction and seismic-resistant properties, as well as an analysis of their performance in buildings with a different number of storeys. The results show how blocks with wood aggregates comply with current regulations for structural materials in a seismic country like Chile, while also considerably outperforming traditional concrete blocks in the event of an earthquake.

III. METHODOLOGY

3.1 Materials and Sustainability

The construction industry is booming worldwide. In Ethiopia, governmental policy supports infrastructure development projects to help transform the country from an agricultural economy to an industrial one. As such, there has been increased exploitation of naturally deposited resources for concrete. Concrete is a blend of aggregates of crushed stone, gravel, or sand blended with a paste of cement, water, chemical admixture, and cementitious materials. The cement paste in the concrete helps to make strong bonds between aggregate particles. Aggregates, major ingredients of concrete by volume, are comparatively inactive filler materials that make up approximately 68–85% of concrete and can therefore be expected to influence concrete‘s properties. Cement, which is among the main concrete ingredients, is the costliest and most environmentally inimical material.

Since cement production requires high energy consumption and leads to discharges of greenhouse gas, there continues to be a global search for new binders and admixtures to partially replace traditional ordinary hydraulic cement and improve the environmental sustainability and sturdiness of concrete structures. The application of leftover by-products in construction materials as replacements for concrete is an attractive alternative to disposal and an eco-friendly solution to the challenges of exploitation and shortage of non- renewable natural resources worldwide.

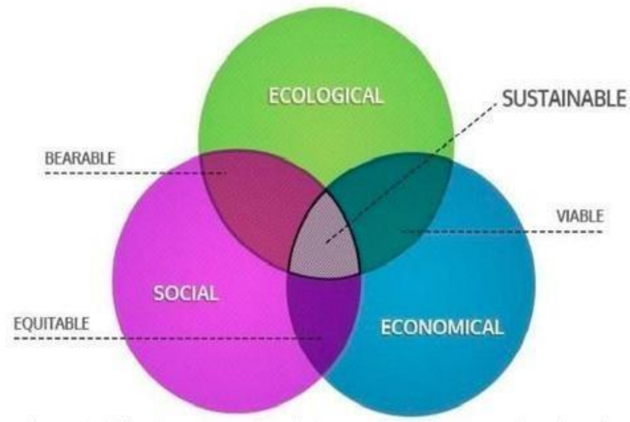

Figure 1. Interrelations among the ecological, economic, and social impacts of construction

Sustainability is a combination of environmental, economic, and societal factors, with environment being the dominant parameter. The deterioration of our environment is driving the current worldwide focus on sustainable development. Generally, almost all scholars agree that definitions of sustainability include ―meeting the desires of the present generation without compromising the ability of future generations to meet their needs.‖ As shown in Figure 1, to have sustainable construction outputs, there should be a balance among environmental (ecological), social, and economic aspects of building (construction) activities.

3.1.1 Waste Materials

Engineers, architects, planners, and builders should reuse industrial by-products and postconsumer wastes in concrete and other cement-based construction materials. Postconsumer wastes that should be considered for use in concrete include glass, plastics, tires, demolished concrete, and clay bricks. To do this successfully, designers must watch for harmful hydration reactions of Portland cement and changes in the volume of concrete. The recycling of industrial by-products has been well established in the cement and concrete industries over the past several decades (UWM-CBU 2007). The use of coal fly ash in concrete began in the 1930s, but volcanic ash has been used in mortar and primitive concrete for several millennia in Egypt, Italy, Mexico, and India. The use of by-products such as rice-husk ash, wood ash, silica fume, and other pozzolanic materials, in addition to coal fly ash, can help reduce the need for Portland cement in addition to creating more durable concrete and reducing greenhouse gas emissions. This will also contribute to the improvement of air quality, reduction of solid wastes, and sustainability of the cement and concreteindustry.

In summary, for sustainability of the cement and concrete industries, use less Portland cement; use less water; use application-specific high-quality, durable aggregates; and use organic chemical admixtures. Fundamental laws of nature state that we cannot create or destroy matter; we can only affect how it is organized, transformed, and used. To manage natural resources, humanity must obey the rules of nature: use only what you need and never use a resource faster than nature can replenish it. Resources are extracted from the earth at a rate of 20% more than the earth produces. Therefore, what is consumed in 12 months will take 14.4 months to be replenished. The use of sustainable development procedures will reduce that rate. ―The issue is not environment vs. development or ecology vs. economy; the two can be and must be" integrated‖.

3.1.2 Cementitious Materials

Cement is a material with cohesive and adhesive characteristics that make it capable of bonding mineral fragments into a compact whole. Although it plays a major role in concrete for the construction industry, it is not environmentally friendly and is the most expensive concrete material.

Using concrete mix with optimum cement content, enhancing cement‘s durability, and developing supplementary cementing materials are the focus areas for sustainability in concrete industries. Therefore, requirements for durable, economical, and more environmentally friendly ingredients for concrete, particularly for cement, have stretched curiosity to other cementing construction materials that can be used as partial or full replacements for normal Portland cement.

Cement is a fine grey powder, and when it reacts with water, it forms hardened, rigid, and stable structures that bond aggregates together, acting as glue and giving the desired strength of concrete. In ancient times, Romans mixed lime ($CaCO_3$) with volcanic ash, producing cement mortar, which was used during the construction of monumental structures such as the Colosseum. Cement is defined as a mineral chemical produced by mixing a well-defined ratio of raw materials at highly elevated temperatures. Producing cement depletes natural resources and emits greenhouse gases into the atmosphere. It is believed that producing one ton of cement clinker creates almost an equivalent ton of CO_2 and other greenhouse gases. This implies that the quantity of cement produced is directly proportional to the amount of greenhouse gases emitted during the production process. Additionally, cement factories contribute tremendously to global warming as well as degrade and disturb the natural existing environment. Beyond this, the cement industry requires high capital investment, energy intensiveness, and high dependence on power and transport.

3.2 Sustainable Building Principles

It is estimated that by 2056, global economic activity will have increased fivefold, global population will have increased by over 50%, global energy consumption will haveincreased nearly threefold, and global manufacturing activitywill have increased at least threefold. Globally, the building sector is arguably one of the most resource-intensive industries. Compared with other industries, the building industry rapidly growing world energy use and the use of finite fossil fuel resources has already raised concerns over supply difficulties, exhaustion of energy resources and heavyenvironmental impacts

ozone layer depletion, carbon dioxide emissions, global warming, climate change. Building material production consumes energy, the construction phase consumes energy, and operating a completed building consumes energy for heating, lighting, power and ventilation. In addition to energy consumption, the building industry is considered as a major contributor to environmental pollution, a major consumption of raw materials, with 3 billion tons consume annually or 40% of global use and produces an enormous amount of waste. The principal issues associated with the key sustainable building themes has been mapped out and collated in the Table 1.1.

Title	Economic sustainability	Principal Issues
Economic sustainability	Maintenance of high and stable levels of local economic growth and employment	Improved productivity; Consistent profit growth; Employee satisfaction; Supplier satisfaction; Client satisfaction. Minimizing defects; Shorter and more predictable completion time; Lower cost projects with increased cost predictability; Delivering services that provide best value to clients and focus on developing client business
	Improved project delivery	
	Increased profitability & productivity	
Environmental sustainability	Effective protection of the environment	Minimizing polluting emissions; Preventing nuisance from noise and dust by good site and depot management; Waste minimization and elimination; Preventing pollution incidents and breaches of environmental requirements; Habitat creation and environmental improvement; Protection of sensitive ecosystems through good construction practices and supervision; Green transport plan for sites and business activities.
	Avoiding pollution	
	Protecting and enhancing biodiversity	
	Transport planning	
	Prudent use of natural resources	Energy efficient at depots and sites; Reduced energy consumption in business activities; Design for whole-life costs; Use of local supplies and materials with low embodied energy; Lean design and construction avoiding waste; Use of recycled/sustainability sourced products Water and Waste minimization and management.
	Improved energy efficiency	
	Efficient use of resources	
Social sustainability	Social progress which recognizes the needs of	Provision of effective training and appraisals; Equitable terms and conditions; Provision of equal opportunities; Health, safety and conducive working

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	everyone	environment; Maintaining morale and employee satisfaction; Participation in decision-making; Minimizing local nuisance and disruption; Minimizing traffic disruptions and delays; Building effective channels of communication; Contributing to the local economy through local employment and procurement; Delivering services that enhance the local environment; Building long-term relationships with clients; Building long-term relationships with local suppliers; Corporate citizenship; Delivering services that provide best value to clients and focus on developing client business
	Respect for staff	
	Working with local communities and road users	
	Partnership working	

Table No. 1.1 Sustainable building issues

Sustainable building approach is considered as a way for the building industry to move towards achieving sustainable development taking into account environmental, socio and economic issues, as shown in Table no. 1.1. It is also a way to portray the industry‘s responsibility towards protecting the environment. The practice of sustainable building refers to various methods in the process of implementing building projects that involve less harm to the environment—i.e., prevention of waste production, increased reuse of waste in the production of building material—i.e., waste management, beneficial to the society, and profitable to the company. Sustainable building starts at the planning stage of a building and continues throughout its life to its eventual deconstruction and recycling of resources to reduce the waste stream associated with demolition.

The use of sustainable materials in concrete is partly motivated by the economic and environmental benefits owing to the fact that they are often industrial by-products. Today, the challenge is not only to advance construction building material technology but also how to choose the optimal material while balancing cost, environmental impacts, and long-term performance. Life cycle assessment is one approach used to quantify the environmental impacts of concrete and the corresponding benefits of using sustainable materials. In this context, improving the quality- of-life cycle assessment models requires up-to-date and geographically relevant inventory data, the incorporation of proper allocation of industrial by-products, an understanding of the sensitivity of the environmental impacts to the changes in the electricity grid mix, and data that more completely accounts for the production processes of sustainable materials such as transportation, drying, and grinding. Some sustainable materials have cementing and pozzolanic properties thus they can used to replace cement in some proportion that will reduce the pollution as well as the cost that is caused by dumping of such materials. when used correctly such materials have positive impact on both fresh and hardened concrete such as increased strength, increased durability, higher workability, reduced permeability, higher resistance to acid attack and reduction of plastic shrinkage cracking therefore in this paper waste materials i.e., Alumina, Ceramic waste, Lime, Bamboo, Cork, Blast furnace slag, Fly ash, silica fume, Cellulose fiber, Glass, Recycled plastic are considered for their use in concrete for construction projects.

IV. CONCLUSION

Ecologically sustainable development is a major concern that embodies both environmental protection and management. The concept of ecologically sustainable development is fundamental in developing the goal of sustainable construction. However, the concept itself is somewhat vague and broad. Generally speaking, sustainable construction concerns attitudes and judgement to help ensure long-term environmental, social and economic growth in the built environment. In buildings, it involves the efficient allocation of resources, minimum energy consumption, low embodied energy intensity in building materials, reuse and recycling, and other mechanisms to achieve effective and efficient short- and long-term use of natural resources. The improvement in the environmental performance of buildings will indeed encourage greater environmental responsibility and place greater value on the welfare of future generations. Within the context of sustainable construction, the selection and use of sustainable building materials play an important role.

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