

Innovations in Eco-Friendly Housing

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Abstract: This study has been undertaken to understand and list the upcoming innovations in eco-friendly housing in India. Considering the global climate change and increasing population it becomes necessary to look out for ecofriendly housing options which will be cost effective as well as sustainable. “Green building,” is the terminology used for constructing eco-friendly housing. It is based on the belief that it is important to conserve the current natural resources as well as meet the demands of the increasing housing needs. With the bloom of green industry in 21st century “the demand for “Green Building “has increased.

Index Terms – Eco-friendly housing, Solar Panel, Energy Efficient, Bamboo, Ventilation. Building Temperature.

I. INTRODUCTION

Population and housing are a two-sided relationship. With the increasing population and increasing demand in the housing sector it is important to look for options considering durability, sustainability, eco-friendly, cost effectivity, maintenance rate, carbon footprint, portability, and water efficiency.

An Eco-Friendly house is a house which is built with the help of materials which have less carbon footprint and have less energy need as compared to their traditional counterparts. Due to the use of these building materials the impact of construction on environment also decreases significantly. Eco-Friendly houses help with water conservation, pollution control, decreasing CO2 emission, improving indoor environment quality, material efficiency, and reducing strain on local resources.

A. RESEARCH OBJECTIVE

- To build a house which is eco-friendly.
- To know about the construction material available which are eco-friendly in nature.
- To know how innovative building design can help maintain good ventilation.
- To achieve the goal of having a house with a good thermal comfort inside the building.
- To understand the use of energy efficient materials which consume less energy for manufacturing.

II. RELATED WORK

A. PREVIOUS INNOVATIONS IN ECOFRIENDLY HOUSING

1. Mud House in Kerala, India:

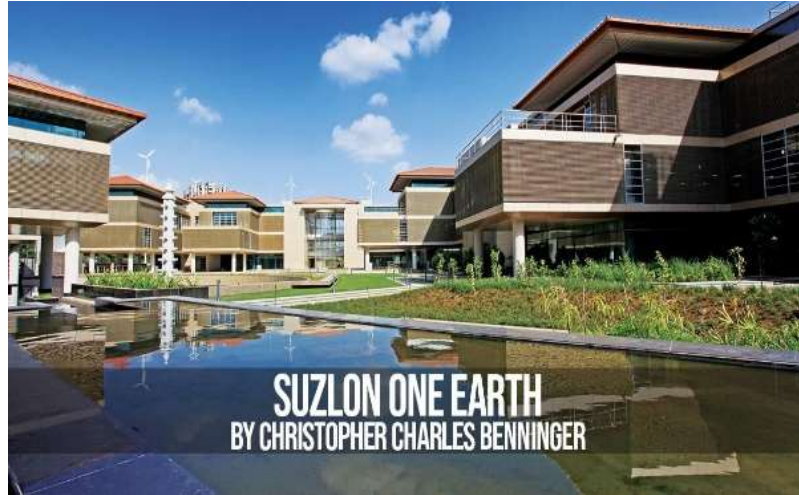
This house has been built by Sunny Nelson in Kannur district of Kerala. This house is built with the help of a mixture of laterite soil, sand, cement, and laterite bricks. This way of construction has not only helped with regulating the humidity but at the same time it is eco-friendly. The outside of the house has not been plastered or painted as the material itself gives off an orange hue and as the bricks themselves have an uneven texture, the product came out to be aesthetically pleasing as well. The roof of this house is made up of clay tiles which were acquired from the houses that were demolished in that district in recent past. Basic mud plaster is done on the interior walls giving them a smooth finish. The interior flooring is covered with red oxide tiles. Use of all these materials have helped to achieve the end goal of having a cool house during summers as well without the use of any cooling electrical appliances.



Mud House.

2. Suzlon One Earth, Pune:

This is a building with LEED Platinum rating designed by famous architect Christopher Charles Benninger which is in Pune region of Maharashtra state, India. This entire project is spread over an area of 10.3 acres. To reach the end goal of being environmentally friendly this building meets its 100% energy need with the help of onsite and offsite renewable sources. This building produces 154 KW of electricity on site. Out of this 80% is met with wind turbines and rest 20% is met with the help of solar panels. Remaining need is met with the help of offsite wind turbine farms. LED lights are used with advanced technology which works with daylight and occupancy sensors. Now coming to design aspect, this building has taken inspiration from Indian historical campuses like Fatehpur Sikri. There is wide use of pergolas, open courtyard, over hangs, louvers and water bodies to help with keeping building temperature low, allowing a lot of natural light penetration, and good ventilation as well.



Suzlon One Earth.

3. Indira Paryavaran Bhawan, Delhi:

This is a building of Ministry of Environment and Forests which is situated in Jor Bagh area of Delhi, India. This building is built in such a way that it wraps around a pedestrian friendly shaded green open courtyard. Special emphasis has been given towards the orientation of building to minimize heat ingress and maximize window to wall ratio. 50% of area outside the building is covered with plantation and the circulation roads are made up of grass pavers which helps with ground water recharge. The design has helped with achieving 75% of building floors be lit with natural daylight. The central courtyard has helped this building with having its own natural ventilation system which works due to stack effect. To meet buildings energy requirements 930 KW solar system has been installed and at the same time led lighting is used to decrease energy requirements.



Indira Paryavaran Bhawan.

4. Sharma Springs, Bali:

This is a building in Bali which has been built mainly with bamboo. This building mainly uses natural ventilation. The bamboo is arranged vertically which helps with providing openings on the façade which helps with cross ventilation throughout the interior of the building keeping the entire building cool. The building even features curving roofs so that breeze can be caught easily. The entire building material i.e., bamboo is locally sourced and widely grown all around the region. This building a fine example of constructing with help of ecofriendly building material.



Sharma Springs.

B. MATERIAL RESEARCH

1. Timbercrete:

When sawmill waste, cement, sand, binders, and a non-toxic deflocculating additive are blended and later on cured with the help of natural resources like air and sun the end product that we get is known as Timbercrete. This product is unique and has a good flexibility to be used as bricks, blocks, pavers, and panels. It is 2.5 times lighter as compared to traditional cement blocks. Timbercrete even helps in decreasing CO₂ emission from atmosphere as sawdust is a waste product which is generally burnt but by using it for making timbercrete we can save our environment and contribute towards decreasing global warming. It has good thermal efficiency, is easy to work with, has good load bearing capacity, takes less energy to process, and has good sound absorption properties as well.



Structure made up of Timbercrete blocks.

2. Bamboo:

It is the most easily grown and renewable building material available for construction purpose. It has been found that bamboo is twice as strong as concrete and has also seen to be slightly stronger compared to steel. The product that we get from processing bamboo is aesthetically sound as well. It has lighter weight over longer spans. It is durable and can withstand good load and can protect against bending or breaking. It can be used for beams, floors, and walls.



Bamboo Frontier.

3. Recycled Wood or Metal:

Recycled metal works as a ecofriendly material because metals are generally high embodied energy material as processing metal includes extraction of ore, transporting, and shaping product which require a lot of energy as has high carbon foot print but when we use recycled metal all these activities are cut down. So, the end product that we receive is one with low embodied energy. Metal does not decay so if not reused it will as it is be left around. Recycled metal is long lasting, does not attract pests and is water resistant as well.

Recycled wood decreases the need to cut down new trees for making new products. Recycled wood can be used for a lot of building activities like structural framing, flooring, and cabinetry.



Structure made up of Recycled steel.



Flooring made up of Recycled wood.

4. Recycled Plastic:

Plastic takes thousands of years to decompose. It is widely available and can be used as a construction material. Plastic ticks all the basic boxes for being considered as a construction material as it is strong, durable, waterproof, lightweight, and easily moldable. Plastic can also be mixed up with other materials to form a good construction material.



Recycled plastic brick house.

III. SCOPE OF RESEARCH

- To help understand feasible ecofriendly material that can be used.
- To explore previous and upcoming innovations in the ecofriendly housing sector.
- To understand the benefits of eco-friendly housing.

IV. RESEARCH METHODOLOGY

Initially a personal visit to most of the places was scheduled to interview the individuals who had worked on all these innovative building ideas. But due to the second wave of COVID-19 the survey could not be conducted. Hence, a survey was done with the help of google search and talking to concerned individuals over call.

V. DATA COLLECTION

The data was acquired with the help of Google Research and telephonic conversation with the required individuals and companies.

VI. RESULTS

Through this research a lot of things have become clear. Following are the points that are our opinions and views on the basis of the research, and we concluded –

- A lot of new Eco-Friendly materials are being researched on.
- Few materials need more research to be done.
- Few materials have very unique properties and can be a viable alternative for traditional construction materials.
- With technological advancement the cost of building an Eco-Friendly house will decrease significantly.
- We are moving towards a new future where humans will be able to coexist with nature without any problem.

VII. CONCLUSION

Eco-Friendly housing is the future of housing industry. As more and more people are getting aware of the bad impacts that human as a species has caused on our mother nature a way out needs to be discovered and Eco-Friendly housing is the answer to it.

A lot of research is being put into solving our problem and many new solutions are coming up for construction of Eco-Friendly house. This research has already shown good results on small scale but needs to be tried out on a larger scale and should reach each country. As our population increases, we will be harming the environment more but with Eco-Friendly housing we have a solution which will let us grow as well as coexist with mother nature without any damage.

I feel more emphasis must be given on recycling construction debris and reusing it for new construction. We already have a lot of waste material which is produced daily which needs to be used and converted into a valuable product. Construction industry is an ever-growing industry and has the capability to put this waste to good use.

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