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Study on Sustainable Architecture

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Abstract: ***Sustainable architecture is a way of architecture that seeks to minimize the negative environmental impact of buildings through improved efficiency and moderation in the use of materials, energy, development space and the ecosystem at large Sustainable architecture is architecture that seeks to minimize the negative environmental impact of buildings through improved efficiency and moderation in the use of materials, energy, development space and the ecosystem at large. In sustainable architecture the raw materials used are ecofriendly. There are many techniques in sustainable architecture like rammed earth, adobe bricks, sterilized bricks and plastering.***

Keywords: Sustainable architecture, rammed earth, adobe bricks, sterilized bricks and plastering

1. Introduction

Sustainable architecture is a general term that refers to buildings designed to limit humanity's impact on the environment. An eco-friendly approach to modern-day building encompasses every aspect of the planning and construction process, including the choice of building materials; the design and implementation of heating, cooling, plumbing, waste, and ventilation systems; and the integration of the built environment into the natural landscape.

The World Commission on Environment and Development defines sustainability as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

When applying this complex concept to architecture, it then refers to design that creates healthy living environments while aiming to minimize negative environmental impacts, energy consumption, and use of human resources.

Sustainable architecture is reflected in a building's materials, construction methods, resource use and design in general. The design must also facilitate sustainable operation during the building life cycle, including its ultimate disposal. While it has to be functional and aesthetically superior, the space has to be constructed with the mind-set of achieving long-term energy and resource efficiency.

Sustainable architecture is also referred to as green architecture **or** environmental architecture. It challenges architects to produce smart designs and use available technologies to ensure that structures generate minimal harmful effects to the ecosystem and the communities.

Figure 1: Building built with naturally obtained materials and using sustainable architecture techniques
Sources: https://tropicalhousegarden.com/building-with-mud-in-tropical-regions/

2. Methods

Ongoing deep into the field off sustainable architecture we get to know about the different techniques that are followed which are listed below. Let's consider the importance pros and cons of the following

Adobe Bricks: Adobe bricks (mud bricks) are made of earth with fairly high clay content and straw. If produced manually the earth mix is cast in open molds onto the ground and then left to dry out. Adobe bricks are only sun-dried, not kiln-fired. When used for construction they are laid up into a wall using an earth mortar.

The bricks can be cast from a wider range of soils and can cope with higher clay content than is suitable for in-situ techniques. Due to the production process and the nature of clay, adobe bricks have good water resistance. Nevertheless, it is very important to provide adequate weather protection of the earth walls, especially in exposed situations. This is normally done with the provision of adequate eaves. The small Adobe units provide great flexibility in the design and construction of earth buildings. Adobe bricks can be easily cut for fitting and can be provided with holes for reinforcing and services. Many people find the pattern and texture of Adobe walls very attractive adobe construction needs dry, temperate weather (wet or freezing conditions are not conducive to putting up a mud-brick house) and that

sometimes critters can burrow through the bricks and weaken walls.

Rammed Earth:

Rammed earth has been used in construction for thousands of years, with evidence of its use dating as far back as the Neolithic Period. Commonly used especially in China, the technique was applied to both ancient monuments and vernacular architecture, with the Great Wall utilizing the technique. Though interest in rammed earth declined in the 20th century, some continue to advocate its use today, citing its sustainability in comparison to more modern construction methods. Most notably, rammed earth structures use local materials, meaning they have low embodied energy and produce little waste. Below, we describe how to build with this material.

According to scientific experiments, both stabilized and unstabilized rammed earth structures are extremely strong and durable. They are strong enough to bear loads and resist winds, and durable enough to withstand harsh weather conditions for long periods of time.

They require roof overhangs to protect them from the rain and erosion, they're terrible insulators in colder climates, depending on the circumstances and the need for experienced labourers it isn't exactly cheap.

Mud Plastering

This type of plaster is applied in two layers, and the second is applied only after the first has dried. Lime-soil plaster can be made with one part hydrated lime mixed with two parts of clayey soil and 3 to 6 parts sand, the optimum amount of sand depending on the clay content of the soil.

The wall surface should be made moist before applying the plaster. Mix is applied and spread using hands or trowels. The surface is then smoothened by applying water and brushing it. Cracks will appear for 2-3 days, so we have to cure it by hammering with a wooden hammer gently.

Earthen plasters are less toxic and energy intensive than many other wall coverings, which makes them appealing to the environmentally conscious. Earthen plasters are also easily repaired and inexpensive. They resist water penetration but are permeable to water vapor.

They resist water penetration but are permeable to water vapor. However, earthen plasters are often more labor-intensive than other forms of wall covering. If the mix does not have the correct component proportions, then many other problems may occur, such as dusting and cracking.

3. Results

- Improved Indoor Environment: Quality of Life
- Saving Water: Reduce, Reuse, Replenish
- Enhanced Health: Eco-Friendly for Life
- Energy-Efficient: Non-Renewable vs. Natural Resources
- Carbon Footprint Reduction: Saving the Planet One Step at A Time
- Keep It Clean: Protecting Our Ecosystem
- Efficient & Sustainable Material: Minimal Use for Maximum Impact
- Durability For the Green Homeowner: Built to Last
- Reduced Operational Cost and Maintenance: Traditional vs. Green
- Reducing The Strain: Shared Resources, Increased Efficiency.

4. Discussions

The system of designing, creating, constructing, and operating a ‘Green’ building is something that minimizes the negative effects of construction and human intervention on the environment. Such architecture makes efficient use of the resources available, like land, water, energy, and materials.

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Sustainable architecture uses locally available materials because they reduce the overall cost and energy consumption that goes into the transportation of materials. Buying and using local materials also boosts the local economy and re-energizes the local community.

Often commonly used materials like concrete, are not sustainable materials because they cannot be reused after the end of the lifecycle of the building. Further, using such materials is highly inefficient because of the energy consumption during construction. Instead, building with reusable and sustainable materials like wood, mud, or developing less energy-hungry materials is the way forward towards building ‘Green’.

Most people when asked to picture a ‘Green’ building only imagine rural and basic structures with few facilities, barely incorporating any of the amenities that modern construction has. This is a fairly false notion since sustainable architecture does not necessarily limit itself to the smaller scale of construction but can even extend and adapt to all levels of design and creating.

Many common building materials are quite harmful to the overall health of the users. Plastics, toxins found in paints, inorganic building materials, and even products cause irritation and sometimes create adverse long-term effects on some users. Using better and more environmentally friendly materials decreases this risk and increases the overall wellbeing of the users.

Many authorities and even governments offer greater incentives to people buying or building sustainably – amounting to large tax cuts and better returns and interest rates. Moreover, energy-efficient options also keep operational costs and utility bills much lower than otherwise normal usage.

What happens after a building comes to the end of its life cycle? Usually, a building only gets demolished, and, in our country, especially, the building waste is dumped into dumping grounds. But with more sustainable materials of construction, the building waste can get reused to create future uses. For example, concrete can be used as aggregate for future construction while steel is recycled to be used again. Similarly, other materials too can be reused such as bricks, wood, and mud owing to their condition and reusability, though it comes down to the architect to incorporate such measures.

As more and more architects and designers and contractors open up to the idea of sustainable architecture, it is important for them to tread down the environmentally responsible path, without falling prey to vague and irrelevant ideas that can only further dilute this idea of sustainability.

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