

Design Features of Eco - Friendly Home for Sustainable Development

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Abstract: Technology used for construction of Eco-friendly home reduces its carbon footprint and lowers its energy needs. Constructions of building are rapidly increasing along with the latest technologies and advancement. Physical development of a country does not only cover construction of buildings in the cities but also the residential area. There are many design aspects which need to be carefully implemented into a house so it works well with the climate and economical. This paper outlines the main design parameters like energy efficient design, recycled and sustainable building materials, waste-water treatment and reuse for eco-friendly home. The building industry will be greatly benefited by the research and development of sustainable house design. This paper includes a 3BHK eco-friendly home planning with solar panel, rainwater harvesting system, plantation, energy efficient fixtures and proper ventilation. The ecological and social potential of eco-homes are being undermined by a technocratic focus, the capacity and behaviour of occupants, and a weakening of design as developments are scaled up. In order to maintain the continuance of sustainability housing programs, the programs need to always evaluate the economic viability, socio-cultural acceptability, technical feasibility and environmental compatibility.

Keywords: Eco-friendly homes, sustainability, Environmental, waste water management, solar Energy

INTRODUCTION

It is about time that the world starting creating more eco homes. We are far too dependent on fossil fuels, our resources are slowly diminishing, and the way many of us are living is having a horrible impact on the environment. Eco-homes are houses designed, built and occupied to have less environmental impact than conventional homes. They lower environmental impact and are cheaper to live in. Regarding notions of 'sustainable homes', it must be noted that the concept itself encompasses more than simply energy-efficient buildings. Sustainable housing is an important thing to support human health, sustainability and safety, while sustainable housing practices need to integrate the three aspects environmental, social and economic together. It implies a holistic view on environmental preservation in relation to social development within the political idea of sustainable development [1]. Figure 1 shows all features of eco friendly home.

DESIGN FEATURES OF ECO-FRIENDLY HOME

Orientation of Home:

The orientation of a house can have a huge impact on its sustainability, especially if the house is in an area that experiences extreme weather, either cold or hot. In cold regions, it's preferable to design the orientation so that most of the windows face the south so that the interiors can benefit from direct sunlight during winter. Similarly, in a warm region, it's best to restrict the number of windows in the west as it will result in overheating the interiors, besides increasing the glare.

Material Used:

Sustainable houses should be built using materials that have a minimum impact on the environment. This could be locally sourced or recycled materials, among other options.

- **Local materials:** The idea behind using locally sourced materials is that it minimizes transportation. For instance, using local granite for the flooring is a greener alternative to using imported Italian marble. Not every region has access to local materials. In such cases, sourcing from the nearest supplier is the recommended solution for sustainable design.

- Recycled materials: Not every city or region might have access to recycled materials that can be incorporated into sustainable house design. However, if it can be easily sourced, it's worth considering reducing the environmental impact of construction. Among the materials that are available are recycled steel, reclaimed wood, reclaimed bricks, plastic components made from recycled materials and recycled glass countertops. For the landscaping or garden planning, reusing soil from the excavation is another idea for improving the sustainability of the build. The production of cement will also produce carbon dioxide as a by product which will cause the greenhouse effect. In order to reduce the greenhouse effect, we need to search for alternatives that will help us to reduce greenhouse emissions. The normal cement concrete can be replaced by geo-polymer concrete which will produce an eco-friendly house [2]. Fly Ash is considered as eco-friendly green material because it is recycled material. Industrial waste is one of the foremost problems faced by many industries. Fly Ash is one of them. If power companies are going to burn coal there is huge amount of waste material i.e. [3][4]. Fly Ash is going to be produced every day. It makes sense if you can reuse this material for a good use [5]. This can save money and energy both in the construction industry.

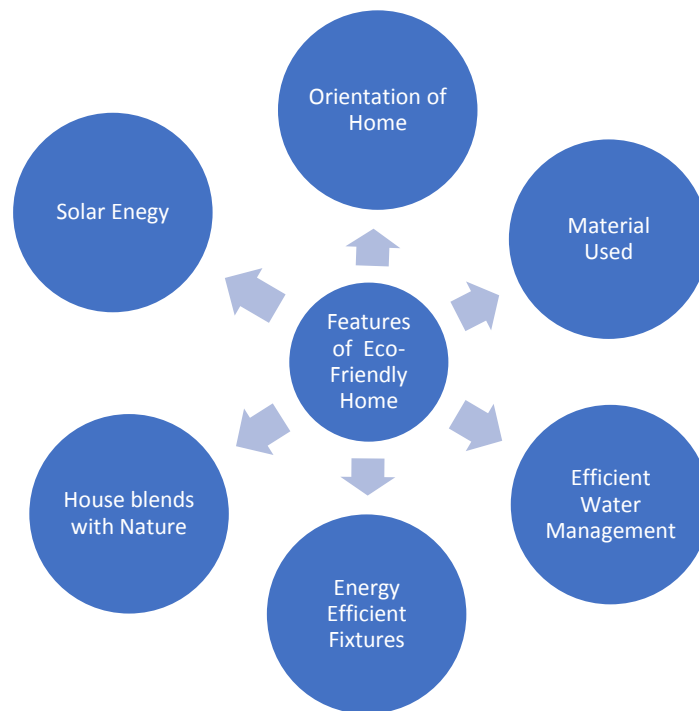


Figure 1: Diagram for all Features of Eco-Friendly Home

Efficient Water Management:

Water is among the precious natural resources that should not be wasted. It's essential to incorporate features that efficiently manage water to build a sustainable house. Dual flush toilets and low-flow taps and faucets can help to reduce water consumption. Additionally, providing underground tanks for rain water collection or installing systems that recycle grey water can ensure that the house uses every drop of water as efficiently as possible.

Size and Shape

When it comes to sustainability, small is always better than large for house layouts. The reason is that small houses use less energy and resources compared to large ones. A **smaller home** needs fewer building materials and requires less energy to cool down and warmth. When planning a replacement home, ensure to honestly assess your needs, both in terms of the amount of rooms needed, and therefore the size of these rooms.

Additionally, for simple sustainable house plans, a compact layout is preferable to one that is spread out. For instance, when designing a 3000 square feet house, it's better to have two floors of 1500 square feet each rather than a single floor of 3000 square feet. In terms of shapes, it's best to stick to conventional cubes or spheres rather than irregular shapes.

Energy Efficient Fixtures:

One of the simplest ways to introduce sustainable house design features to both existing as well as new homes is to install energy efficient fixtures and appliances. These include:

- Energy-efficient windows and doors: Whether it's to maintain a cool indoor temperature during the summer months or to keep the house warm in winter, insulation is the key to saving energy spent on keeping the indoor temperature comfortable. When choosing the material for doors and windows, opt for those that provide the right amount of insulation as well as sealing. Insulated glass windows and doors are more expensive than regular glass, but it helps to save energy in the long run [6].
- Appliances with an energy-star rating: As far as possible try to install appliances with a high energy-star rating as they are more energy efficient than ordinary appliances. In general, the higher the rating, the more efficient is the appliance. In India, these ratings are available for most household appliances, including televisions, refrigerators and air conditioners.
- Lighting fixtures: Install LED lights or other energy-efficient options that consume less electricity than incandescent bulbs. The advantage of using LED lights is that even though they are slightly more expensive, they last longer and don't need to be replaced as often as incandescent bulbs.
- Depending on the area, windmills are another alternative for generating power for a sustainable home.

House Blends with Nature:

One of the most significant factors of sustainable home design is to ensure that the house blends with nature. Gardens and landscaping, when carefully planned, can contribute to improving the insulation and energy-efficiency of the house. For example, growing tall shade trees outside the windows in the west or the south will ensure that the house doesn't get overheated, thereby reducing the energy spent on cooling down the interiors. Similarly, growing a lawn on the terrace will provide an extra layer of protection from the sun and keep the upper floor cool during the summer.

There are many elements of smart and sustainable housing that one can adopt when designing a new house. However, it's not easy to find the best solution for a home as the conditions vary depending on the local climate, availability of materials and a range of other factors. [7][8] That's why we recommend that you consult a professional architect for advice on how to build a sustainable house. From evaluating the plot to get an idea of the best orientation for the house to designing the layout to optimize the existing natural features such as trees or slopes to reduce the home's energy dependency, an architect can provide sustainable home design ideas that are best suited for your home.

It's not enough to have greenery outdoors. Incorporating indoor landscaping such as living walls, indoor courtyards, or even balcony gardens into an eco friendly house model can go a long way towards improving the indoor air quality as well as regulating the indoor temperature. For sustainable home design, passive features such as planting trees to provide shade over the windows in the west or fixing sunshades to minimize the glare can be incorporated based on the orientation of the house.

Indoor greenery not only adds a sustainable feature but also enhances the aesthetics of home, and with automatic watering or self-watering planters caring for the plants becomes relatively maintenance-free. Before you build eco friendly houses in India or undertake a renovation or makeover, it's advisable to consult an expert who can advise on the best way to include indoor landscaping to the house. [9-12]

Solar Energy:

Once used mostly for water heating, solar power is gaining momentum in India as an alternative to electricity. By using photovoltaic panels that convert solar power into electrical energy, one can add another sustainable feature to the home. In some states, power authorities currently have a buyback arrangement so that the excess energy can be transferred to the grid and adjusted against actual consumption. To overcome the solar panels with low efficiency, a microcontroller, servo motor and other electronic components are utilized to align the solar panel with the sun's position in the sky, this allows for optimum power production by the solar panel during daytime [13-15].

METHODOLOGY

This paper includes 3 BHK eco-friendly home planning as shown in figure 2 and 3.

Following facilities have been included for planning of eco friendly home in planning of 3BHK eco-friendly home.

- Solar Panels
- Harvested water tank
- Horizontal and vertical garden area
- Proper ventilation
- Septic tank
- Backyard provision for solid waste management

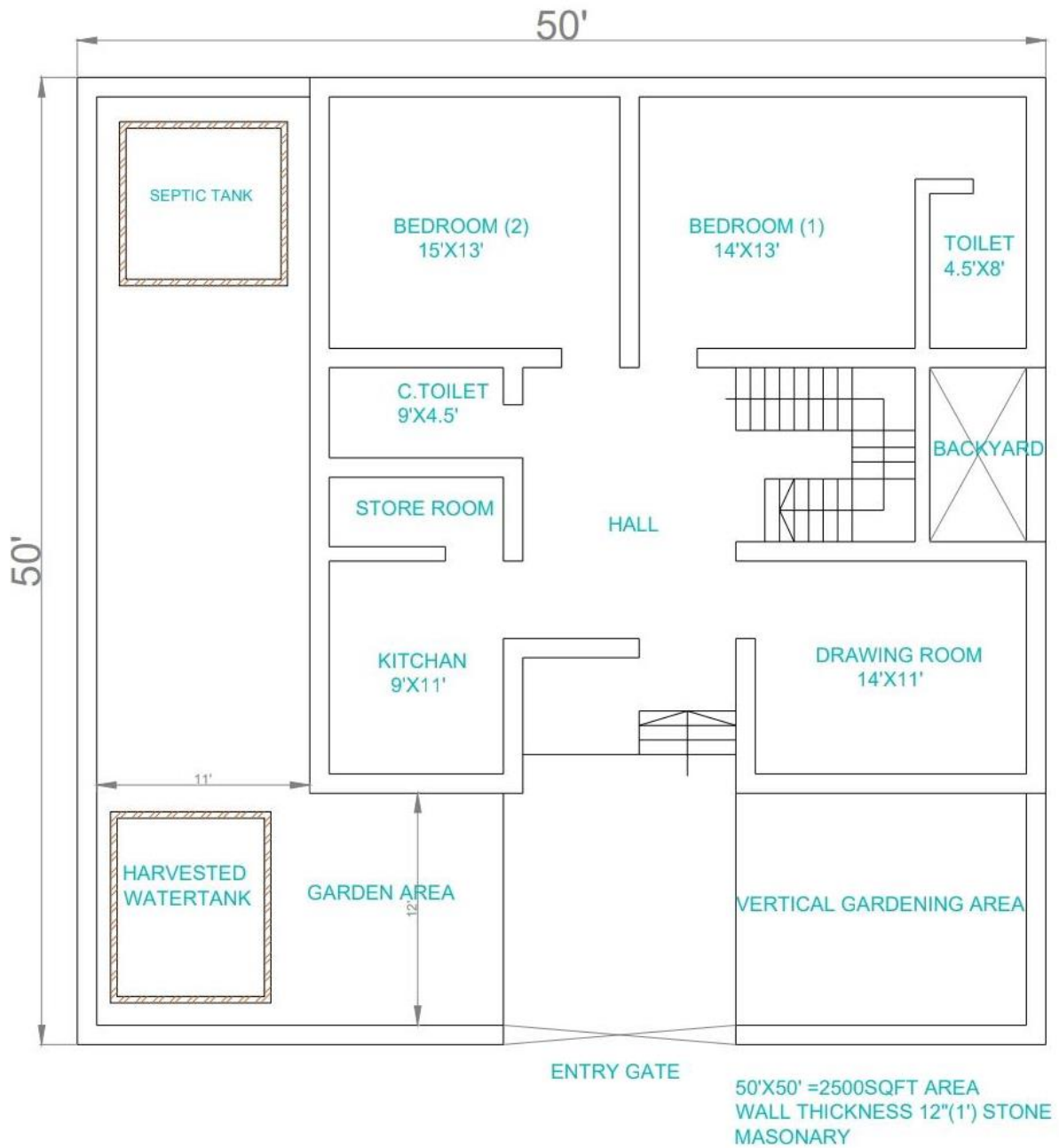


Figure 2: Planning of Eco-Friendly Home



Figure 3: 3 D View of Eco-Friendly Home

CONCLUSION

An Eco Friendly home is a wise choice of home in terms of land use, efficient and effective use of energy and water, considering the material conservation of natural resources, as well as health and safety of the occupants. The treatment and safety of eco-friendly home are also essential since the sustainability of eco-friendly home must be accompanied by the eco-friendly behaviour of its occupants. Understanding the concept of eco-friendly home should be prioritized to avoid a misconception stating that environmentally friendly homes require high maintenance costs or that they just have a lot of green lands. These sustainable housing design parameters can be used to make the parameters or assessment of sustainable housing as an outline, by adjusting the implementation to the prevailing needs. Every criterion has their own purpose that can be more expandable by any research and founding, but we can understand that they all are the way to expand the three sustainable aspects: social, economic and environmental which also needed to apply in sustainable housing.

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