

PLANNING OF SUSTAINABLE VILLA

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Abstract - In present scenario sustainable constructions have taken new steps to stimulate green building practice. Green building criteria basis is energy efficiency, resource and material Conservation and sustainable design of the building itself. This journal includes design of rain water harvesting, septic tank, grey water treatment, biogas plant and solar system for villa. Finally the estimation of proposed villa is also done. Energy efficiency still has a long way to go, due to some barriers that prevail in the practice of energy efficiency and conservation. Similarly, design and materials that are originally used have created various issues related to human health and the environment.

Key Words: Sustainable building, Resource conservation, Cost efficiency, Human adaptation

1. INTRODUCTION

There is a growing demand for sustainable buildings worldwide due to an increasing level of public awareness on the environmental and social impacts of the building sector. The building sector is one of the biggest energy consumers and greenhouse gas emitters. It is a fact that now households and other living areas in which people live, or reside most of the time contribute CO₂ emission and greenhouse effects as much as global warming, which threatens to all humans, as well as natural resources which balance was disturbed a long time ago. Sustainable retirement housing is friendly to the environment. Valuable natural resources are reduced in good qualities each year. It is rapidly becoming evident that this must change now or we are facing difficulties in the next few decades. Concerning such a remarkable influence of the building industry, the sustainable building approach has a high potential to make a valuable contribution to sustainable Development

2. STUDY AREA

Once the site is selected, proper scientific surveying is done on the land. Surveying is done by passing through all the steps, including Reconnaissance, Surveying. Availability of most modern instruments like the Total station in the department is put into proper use for conducting the survey. Thorough knowledge of the instruments is obtained over time from all the possible sources. for this project Site is located at Vendekumpoil, Malappuram District, Kerala. Area for providing residential villa of 1213sqfeet considering sustainable aspects.

3. LITERATURE REVIEW

AbhineyGuptha (2017), Studied on utilizing natural resources efficiently and local resources available, planting trees to control the overall temperature and provide better quality and making an effort towards reducing the carbon foot print and conserving resources. Studies shows that, using green materials like hermetically insulated glass, low VOC paint, UPVC window frame, LED lighting system, etc. are costlier than the conventional materials readily available. But they tend to save more on maintenance and running cost during its lifetime.

Abualrejal et.al (2017), Paper studied on identification of the advantages of energy efficiency and to penetrate into the various methods and obstacles in obtaining energy efficiency and to use proper design and material in green building. The selection of green materials is determined by multiple criteria from the socio-economic, environmental and technical perspectives.

Gidado et.al (2015), Paper studied on the factors that are affecting the adoption of green building technology, with a view to suggest better ways for its successful adoption in the construction industry through developing agree building technology model.

4. METHODOLOGY

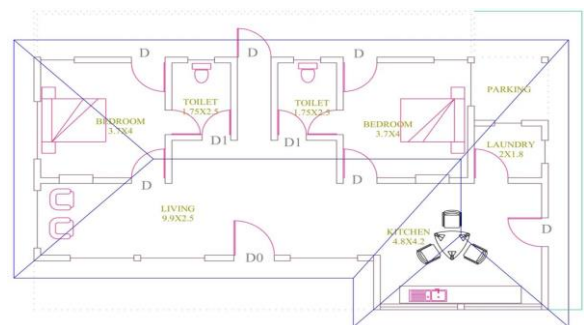


Fig -1: Villa Plan

4.1 Rainwater Harvesting

Rooftop rainwater harvesting: It is a system of catching rainwater where it falls. In rooftop harvesting, the roof becomes the catchments, and rainwater is collected from the roof of the house. It can either diverted to an artificial recharge system or be stored in a tank.

4.2 Septic Tank

Septic tank offers a preliminary treatment of sewage before the final disposal. Sewage is held in these tanks for some prescribed period during which time the suspended solids present in the storage settle down. The settled sludge and the supernatant liquor undergo anaerobic digestion. The digestion results in an appreciable reduction in the volume of sludge and a reduction in organic matter in the liquid.

4.3 Solar Panel

Solar cells are interconnected in parallel and in series to achieve the desired operating voltage and current. They are protected by encapsulation between the glass and a tough resin back. This is all tied together by stainless steel or aluminium frame to form a module. These modules form the basic building blocks of a solar array. Module may be connected in series or parallel to increase the voltage and current and thus achieve the required solar array characteristics that will match the load.

4.4 Grey Water Treatments

Using natural filtration, the reed bed wastewater treatment system also produces grey water, which can be used for agricultural purposes. The first stage of treatment, the collection tank, removes solids and odours. In the second stage, other impurities including finer particles, bacteria, odour and color are naturally removed by the reed beds filtration process. In the final stage, the grey water that the reed bed produces is gravity fed into a settling tank which acts as a storage system.

4.5 Biogas

Biogas is produced by anaerobic digestion with methanogen or anaerobic organisms, which digest material inside a closed system, or fermentation of biodegradable materials gases methane, hydrogen, and carbon monoxide (CO) can be combusted or oxidized with oxygen. This energy release allows biogas to be used as a fuel. It can be used for heating purpose, such as cooking etc.

4.6 Aesthetic Aspects

To increase the whole aesthetic beauty of the project and to have a touch of nature in its overall beauty, different types of trees are placed in the site. Lawns are provided, and proper gardening is maintained. Around the rainwater harvesting pit, different types of plants are planted.

5. RESULTS AND DISCUSSIONS

Here designed a villa of 1213 sq. feet at by considering requirements for green building. Design of septic tank, solar panel, reed bed method of grey water treatment, bio gas plant, and rainwater harvesting system are done in eco-friendly manner. The total cost for solar energy system is estimated as Rs46500.

Table - : Size of designed components

Components	Size
Rain water harvesting pit	Diameter =3m, depth =5m
Septic tank	1.50m X 0.90m X 1.80 m
Grey water collection tank	2.5mx1.5mx1m
Grey water filtration tank	8mx2mx0.5m
Biogas plant	Diameter =1.28m, depth=2.29m

The estimation of the designed villa is done by long wall , short wall method . The abstract of estimated cost is followed as per PWD rates. The total cost for sustainable villa is 4210007 rupees.

6. CONCLUSIONS

This study points to several areas that could be explored in future research. Provides some evidence that the supportive residential environment can buffer the impact of lifespan transitions for those who choose move to a village. The proposed criteria for the design of sustainable villa will give implications on the future retirement village industry development as well as paving the way for future studies on housing older people in an age-friendly manner. . The promotion of sustainable building practices is to pursue a balance among economic, social, and environmental performance in implementing construction projects.

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