

# Keeping Alive Green Buildings in Today's Environment

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**Abstract:-** The analysis of global urban development in the last couple of decades has been greatly influenced by the "sustainability debate" and with the increasing recognition that we are all part of one eco-system (Therborn 2000). This debate focuses upon the interplay between the environment and the natural resources it contains - water, energy, soil, air, and the pollution and the consequent corruption of the eco-system that has taken place between industrial and urban development. In much of this debate "sustainability" is still a largely contested arena. This paper takes a look at how in today's environment of concrete jungles and excessive levels of harm caused to the environment, some people in some corners of the world try their best to safeguard their environment and contribute in a small way to curbing a huge menace. A case study was done of a house owned by Mr. Arun Miranda in the beautiful state of Goa and how sustainable he has constructed the house for himself.

**Key Words:** Sustainability, Environment friendly, Green Housing.

## 1. INTRODUCTION

The cost of a house can be counted in dollars, but the construction and running of a house takes a toll on the environment that's harder to measure. There is an increase in the number of people who are looking to minimize both environmental impact and financial outlay by outfitting their homes with sustainable technology. As a result of this boom in sustainable building, new levels of architectural innovation are coming into the picture.

Nowadays, a lot of households and other living areas in which people inhabit most of the time, contribute a lot to the CO<sub>2</sub> emission and green house effects as much as global warming, which is a threat to all humans and their health, as well as natural resources. This balance was disturbed a long time ago. Sustainable house or Green house or Eco House is one of possible solutions, which can partly contribute in solving this global burning issue.

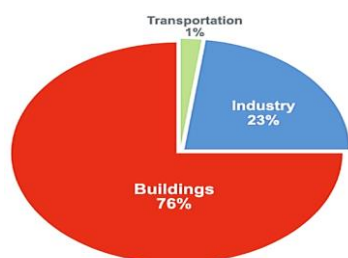


Chart 1 Electricity Usage

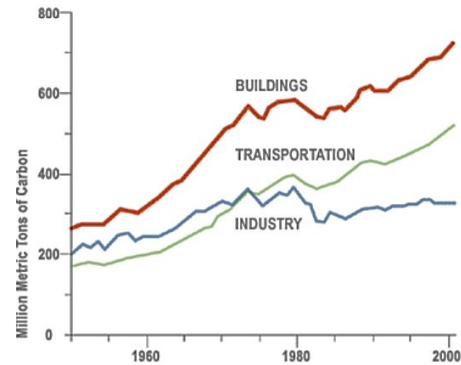


Chart 2 Carbon Emissions

source: [www.architecture2030.org](http://www.architecture2030.org)

## 2. What are Sustainable Housing / Green Building?

The term sustainable is thrown about quite a bit these days, but there's more to it than adding some solar panels to the roof of an inefficient building and calling it a day. True sustainability is made up of many facets, from building materials to the use of renewable energy sources to design that strives for efficiency and harmony with the surrounding environment.

### 2.1 Key Elements

Sustainable homes have three key elements based on which the designs are conceptualised and made to become a reality. They are:

#### 1. Environmental sustainability

The house is designed to reduce greenhouse gas emissions, save water and energy and reduce waste during construction and the house's lifetime.

#### 2. Social sustainability / universal design

The house is designed to prevent injuries through built-in safety features. It has security elements to reduce crime and improve the occupants' sense of security. Features are also used to provide flexibility and comfort for people of varying abilities and at different life stages, including children and people with limited mobility.

#### 3. Economic sustainability

The house is designed to save money during construction and over the lifetime of the house. Careful

planning avoids the need for major future renovations and reduces costs associated with energy use, water use and maintenance.

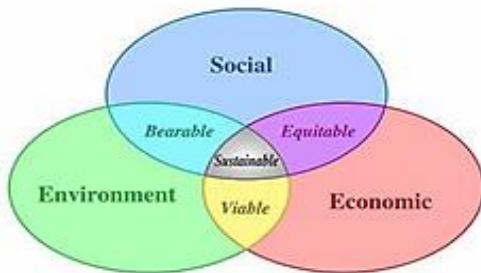


Figure 1 The sustainable elements mix

## 2.2 Models of Sustainability

In the 1990s the way that ‘sustainability’ was taken into national debates was often through improved environmental management. This was an advance on previous practices but it failed to fully engage the longer term and integrated understandings of change required to shift to a sustainability agenda. There is the need to incorporate actively both environmental and ecological concerns with issues of social justice, income generation and poverty eradication (Perkins and Thorns 1999, Satterthwaite 1999, PCE 2002). This has led to the identification of different ‘degrees’ of sustainability from strong which fully embraces the multi-dimensional and extensive understanding through to ‘weak’ forms which are still largely only about taking on some of the rhetoric and focus more on the management of the bio-physical/environmental resources. The following image shows the two models.

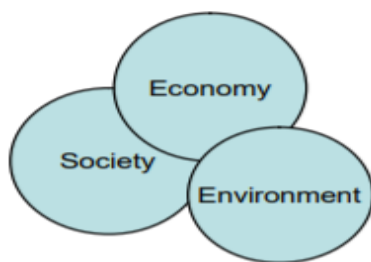


Figure 2 Weak Sustainability

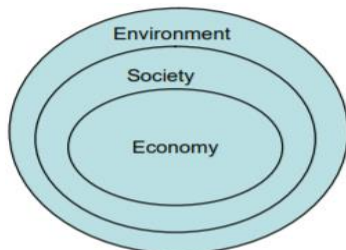


Figure 3 Strong Sustainability

## 2.3 Advantages of Sustainability

### 1. Save money

Reduced operating costs and run on smaller (less expensive) heating and cooling equipment

### 2. ROI

Have increased home value and return on investment

### 3. Health Risks

Healthier indoor environments with reduced risk of health problems

### 4. Water Consumption

Use less water helps in saving money and helping local ecosystem

### 5. Reduce carbon emission

Participate in a national effort to reduce carbon emissions and overall damage to our environment

## 3. CASE STUDY

### 3.1 Project Profile

**Location:** Pilerne, Bardez, Goa

**Owner's name:** Arun Miranda

**Architect's name:** Ar. Hyacinth Pinto

**Type of Structure:** Residential

**Material used:** Rammed Earth

**Number of Storeys:** 2



Image 1 Arun Miranda's House

### 3.2 Project Description

- The owner of the house, Arun Miranda, is the son of well-known architect and musician from Goa, late Lucio Miranda, and nephew of internationally acclaimed cartoonist late Mario Miranda.

- After visiting the site, the architect and clients were convinced that rammed earth would be the most suitable construction material and would be the best cost alternative to conventional building material.
- The site was located on the steep foothills of the rainforest hillock of Pilerne village, towards the leeward side. The site itself was elevated from the access road level by around 2.00 m. We it was decided to utilize this level difference to accommodate the servant's quarters, garage and utilities.
- The level differences were maintained for the main living areas containing the living room, the dining and kitchen areas. The dining and kitchen were kept at the upper level and flowed into the backyard from where a swimming pool is planned as a future addition, against the backdrop of a terraced landscaped hillock which is the backyard of the house. This backyard in the future would also have some viewing gazebos and log cabins to accommodate the guests.
- The entry level, which is 1.2 m below the dining level, also gives access to the guest room with an attached toilet that is accessible to the day visitor too.
- The kitchen is open-plan, and has a corridor access to the utility room which houses the washing machine, dishwasher, janitor's closets, and a toilet for the users of the pool and kitchen level.
- The stairway leads to the cantilevered bridge that gives access to the master bedroom and relaxation space attached to the bedroom, as well as to their daughter's bedroom.
- The dormer in the roof is located such that from the bridge, one can enjoy the greenery of the valley in front of the house. The dormer floods both the floors with natural light, and highlights the woodwork of the roof. The gable ended roof of the daughter's room also lends character to the house, with the simple detail of the balcony woodwork further enhancing the simplicity of the house. Clerestory lighting also brightens up the interiors.
- The house feels very cool and does not need air conditioning. In fact it has not been designed for air conditioning, as cross ventilation is well taken care of and one can feel the breezes flowing through at body level on the ground floor. The dormer in the roof takes care that the breezes flow through at the upper level too. The balcony flanking the entire rear of the house serves as a

spill out for the bedroom as well as protection for the lower walls.

- As one approaches the house, what catches the eye is the roof profile, which is built in traditional style and materials, and flows down to the balcony with a dormer in the main roof. The gable roof of the bedroom area also adds character to the structure. The house blends into the landscape and the owners are gradually adding life to the structure with their personalized bits of décor and drapery, greenery and growth.

### 3.3 Project Salient Features



**Image 2 Front Elevation**

- Skylight in the living room for light and ventilation
- Skylight in the kids bedroom on the right
- Columned verandah in the front
- Ramp up to the front door from the road



**Image 3 Right Side Elevation**

- Servant quarter in the basement
- Internal areas on levels in accordance with the contour.



**Image 4 Left Side Elevation**

- Stairwell tower
- Skylights for light and ventilation



**Image 5 Rear Elevation**

- Swimming pool in the backyard
- Long connected balcony outside bedrooms on the rear
- Skylight in the bedroom kids bedroom on the left



**Image 6 Sectional View**

- Vaulted ceiling in the dining area
- Living area on a lower level
- Dining area on a higher level
- Corridor connecting the bedrooms over look into the living room

### 3.4 Project Construction Details

#### ➤ *Rammed earth dig up*



**Image 7 Step 1**

Digging up the mud from the contoured site for the foundation.



**Image 8 Step 2**

Collecting all the sieved mud and stacking it for use.



**Image 9 Step 3**

Sieving the collected mud to be used for the rammed earth construction



**Image 10 Step 4**

Use of the collected mud to start rammed earth construction.

➤ **Living Room**



**Image 11 Living Room view**

- Granite tiles used for stepped seating in living dining area interface.
- Double heighted living room over looked upon from the internal open corridor.
- Yellow oxide flooring in the living room.
- Red oxide flooring for the stairs and built in seating in the living room.

➤ **Skylight**



**Image 12 View of the Dormer window**

- *“The dormer has been kept open since construction and there never has been the need to close it”*  
- Arun Miranda
- Dormer located in the roof over the double heighted living room
- The dormer helps in ventilation and keeps the living room cool
- 30 degree angle used for the dormer
- Toughened glass used for dormer window
- The dormer lets in cool breeze and sometimes droplets of water during heavy winds. Rains are prevented due to the long overhang of the roof.

➤ **Kitchen**



**Image 13 Kitchen View**

- Brick Vaulted Ceiling over the dining area, kitchen and utility room
- Cabinets made from waste wood
- Pine wood used for the furniture
- Open kitchen concept with attached utility room
- Lime Plaster on the internal walls
- Flooring used is semi polished tandoor tiles embedded in red cement

➤ **Bedroom**



**Image 14 Bedroom View**

- Yellow oxide used for master bedroom flooring
- Green oxide used for guest room flooring
- Toughened glass used for doors and windows
- Pine wood used for furniture
- Lime plaster and paint used for bedrooms
- Acacia wood used for railing in balcony

#### 4. CONCLUSIONS

We are living at a time when the earth is constantly being subjected to UV rays, global warming, and high level of pollution. The disaster is the unhealthy condition in our living. This green building approach as discussed will prove to be very beneficial giving effective result to reduce the extreme heat during the summer thus reducing energy consumption making the building sustainable providing the comfort level for the residents. Though the concept of Green Homes in India is new, yet it will help us to put the first step forward in preservation of the earth's natural resources and cutting down on energy consumption and its cost.

We hope many more people agree to this way of constructing their heavenly abodes thus contributing to creating a healthy living environment for the present and generations to come.

#### REFERENCES

- Alam M, Sathaye J, Barnes D. Urban household energy use in India: efficiency and policy implications. *Energy Policy*. 1998;26:885-91.
- Benedict MA, McMahon ET. Green infrastructure: smart conservation for the 21st century. *Renewable Resources Journal*. 2002;20:12-7.
- French M, Lalande C. Green cities require green housing: advancing the economic and environmental sustainability of housing and slum upgrading in cities in developing countries
- UN-Habitat. Better City, Better Life. [www.worldurbancampaign.org](http://www.worldurbancampaign.org); 2012.
- Choguill CL. Sustainable housing programmes in a world of readjustment. *Habitat International*. 1994;18:1-11.
- Novem (2002) 'Sustainable housing policies in Europe', 3rd European Ministers conference on sustainable housing. Genva, Belgium: The Netherland Agency for Energy and the Environment (Novem).

#### BIOGRAPHIES



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