A Review Study on Sustainable Development

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Abstract— Environment is one amongst the fundamental public assets of a personality's system, and it should be thus specially protected. According to our gift data, the property is critical for all human systems and it's necessary to invoke the property development principles all told human system assets. Sustainable development is known as a development that doesn't erode ecological, social or politic systems on that it depends, however it expressly approves ecological limitation underneath the economic activity frame and its full comprehension for support of human wants. The paper summarizes the conditions for property development, tools, strategies and techniques to unravel the environmental issues and also the tasks of government within the environmental phase.

Keywords: Sustainable Development, Environmental aspects, Green Building

I. INTRODUCTION

As tremendous increase in population and migration from villages to cities from last century, there are requirement of shelters in developing cities like Pune. To fulfil the needs and wants of human the consumption of natural resources is continued without considering their environmental effects.

Pune is expected to record a high house demand – supply gap of nearly 70% where demand is expected to be as high as 180,000 units while supply will remain low at around 53,000 units [6].

The present rate at which the development is going on is resulting in the tremendous degradation of environment. Sustainable development is only solution to control the degradation of environment. It can create clean, green and less carbon intensive world which will achieve environment sustainability. From the last decade the demand for

'Sustainable Development' is increased for resource planning. There are some certifying agencies like IGBC, GRIHA, LEED, ASHARE, USGBC etc. [10].

Sustainable development is undertaken as an organized effort to design buildings, providing facilities for comfort living using proper materials and processes that achieve sustainability.

Green practices in construction of new buildings contributes to the reduction of dependency on natural resources like water efficiency, energy efficiency and reduction in use of fossil fuel for handling waste [1].

A. Cavity Walls:

The walls facing west and south directions are constructed as cavity walls using burnt bricks. The cavity is continuous from plinth level to lintel and from lintel to slab level. (Case Study No.3 Prof S.D. Suryavanshi`s residence) thus maintaining the temperature inside the building in summer and winter season. Cavity walls prevent heat gained through exposed walls to enter inside the building because air vacuum in cavity walls acts as a barrier for heated air.

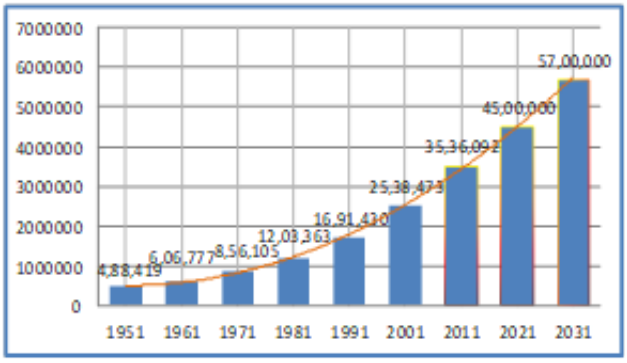

Fig. 1: The rising urban population in Pune (Census 2011)

B. Openings in Walls:

The openings of nominal size 0.6 m x 0.6 m are provided in external & internal walls immediately below slab level & above lintel level. Self-operating exhaust fans are placed in the openings provided in external walls. Openings in internal walls are simply kept open. The floor to floor height of a building is increased by 10% i.e. 3.3 m in place of 3.0 m increasing its volume correspondingly. When inside room temperature increases and air is heated, air starts rising up due to decreased density. This heated air finds exit through the openings provided in external walls. The habitants feel the cooling effect inside the building.

II. PROBLEMS DUE TO INCREASED POPULATION IN CITIES

Due to increased population and migration of people from villages to cities there is a very heavy and unexpected load on providing basic facilities and services on concerned authorities like Municipal Corporations. Fiscal impact is one of the major effect out of them. Global warming, shortage of resources, food scarcity, air pollution, water pollution, land pollution, are some products of urbanization. This has given new vision to the need of self-sufficient and energy efficient buildings.

A. Site and Facility Management

Choosing a building's site and managing that site throughout construction area unit necessary issues for a project's property. As a result of which, the operation and maintenance cost of the building can reduce.

The property sites class discourages development on antecedent undeveloped land; minimizes a building's impact on ecosystems and waterways; encourages regionally acceptable landscaping; rewards sensible transportation choices; controls storm-water run-off; and reduces erosion, light pollution, heat island effect and construction-related pollution.

Provision of maximum shading for non-roof areas, use of heat reflective material on roof, reduction in external lighting and its pollution and building's operation and

maintenance practices leads reduction in dependency on natural recourses.

Building owners, architects, consultants, developers, facility managers and project managers need to design, construct and operate green buildings. A voluntary certification program is often applied to any building kind and any building lifecycle section. It promotes a whole-building approach to property by recognizing performance.

B. Water Efficiency

Buildings are major users of potable water supply. The goal of the Water Efficiency is to encourage smarter use of water, inside and out. Water reduction is typically achieved through more efficient appliances, fixtures and fittings inside and water-wise landscaping outside. Planning and storage of different quality of water with respect to use increases water efficiency. Planning and execution of rainwater harvesting, waste water treatment, separate water supply for non-potable purpose etc. results more efficient use of water. Water efficient homes can save potable water to an extent of 30-50%. [13]

C. Energy Efficiency

It encourages a wide variety of energy strategies. Energy use monitoring, efficient design and construction, separate energy meters for regular supply and back-up supply, efficient appliances, systems and lighting in rooms and common areas the use of renewable and clean sources of energy, generated on-site or off-site; and other innovative strategies which results in the efficient use of energy. There can be saving of energy up to 30% by use of energy efficient application.

D. Health and Comfort

By no smoking policy implementation during construction and prohibited smoking in common areas, ill effects of smoking can be minimized. Using eco-friendly material for construction like low VOC paints will be beneficial for workers as well as user. Providing ramps near lifts, elevators and special W.C and bath rooms in common area will offer comfort for physically challenged occupants. Provisions of jogging track, gymnasium, swimming tank leads to fitness of users which results in reduced absenteeism for their workplace and increases productivity.

E. Material and Resources

During both the construction and operations stages, buildings are a source of waste generation and uses a lot of materials and resources. This encourages the selection of sustainably grown, harvested, produced and transported products and materials. Due to which, there is reduction of waste as well as reuse and recycling of material, and it takes into account the reduction of waste at a product's source.

F. Indoor Environment

Indians spend about 90% of their day indoors at their residences, schools and workplaces, where the air quality can be significantly worse than outside. Maintaining Healthy and working Indoor Environmental Quality promotes strategies that can improve indoor air as well as providing access to natural daylight and views and improving acoustics [13].

III. Various Agencies for Certification of Self-Sufficient and Energy Efficient Residential Buildings

In India Indian Green Building Council (IGBC) and Green Rating Integrated Habitant Assessment (GRIHA) are major rating systems.

A. IGBC

This rating system provides a roadmap for measuring and documenting success for every building type and phase of a building lifecycle. It offers four certification levels for new construction -- Certified, Silver, Gold and Platinum -- that correspond to the number of credits accrued in above mentioned green design categories. IGBC, formed by Confederation of Indian Industry (C.I.I) in the year 2001, is continuously striving towards wider adoption of eco-friendly / green building concepts in the Indian Industry.

Certification Level	Points Earned	Recognition
Certified	50 - 59	Good Practices
Silver	60 - 69	Best Practices
Gold	70 - 79	Outstanding Performance
Platinum	80 - 89	National Excellence
Super Platinum	90 - 100	Global Leadership

Table 1: Rating System for Green Buildings

With a modest beginning of 20,000 sq. ft. (1,900 m^2). Green built-up area in the country in the year 2003, as on date, 3088 projects in India have registered under the IGBC Rating programmes, with a total footprint of over 2.68 billion sq. ft. Charges per new building certification is (Registration Rs.25000 + Precertification Rs.150000+ Certification Rs.140000) total Rs.315000 for IGBC members. For non-members it is (Registration Rs.30000 + Precertification Rs.185000 + Certification Rs.150000) total Rs.365000 for non IGBC members.

B. GRIHA

GRIHA rating system consists of 34 criteria categorized under various sections such as Site Selection and Site Planning, Conservation and efficient utilization of resources, Building operation and maintenance, and Innovation points. Eight of these 34 criteria are mandatory, four are partly mandatory, while the rest are optional. Each criterion has a number of points assigned to it. It means that a project intending to meet the criterion would qualify for the points. Different levels of certification (one star to five stars) are awarded based on the number of points earned. The minimum points required for certification is 50. on date, 575 projects in India have registered under the RIHA Rating programmes, with a total footprint of over 20 billion sq. m.

IV. Current Scenario of Sustainable Building

A. Consideration of Sustainability Aspects in Building Design and Planning

Architectural planning of observed building is each flat is three sided open which helps to get maximum light and ventilation which ultimately reduces the load on electricity. Building is planned to own most natural light, natural ventilation considering local wind data and solar path analysis, which has been calculated by computer simulation.

No common wall up between any of the flat that achieves superb cross ventilation. Total space of gap (inlet and outlet) is quite half-hour of floor space. As a result of it there is 20-30% saving in indoor energy consumption [13].

B. Landscaping

All trees planted are "Native Fauna" of Pune. e.g. Bahava, Kadamb,Saptaparni, Sitaphal, Shirish, Mango, Sonchafa, Limbu. The trees are planted in such a way that most of the paved area will be covered by shadow of trees. All trees are numbered and allotted to the flat owners who will take care of them. The open parking lots are covered by group of veins such as Jai, Jui, Krishna- Kamal etc. The complex has vegetable patch from where all the flat owners will get daily vegetables which are produced by Organic method [13].

C. Eco-sensitive Measures

Electric charging point for charging of vehicles is provided which will use "Green Energy" only. All W. C's are with dual flush system with a flow rate of 3L & 6L per flush. Building has also provided separate chutes for collection & separation of 100% bio-degradable, and non-biodegradable wastes. Also onsite treatment plant using bio culture for the treatment of 100% of organic wastes. The manure from bio-degradable wastes will be utilized within the site itself.

D. Energy Efficiency

All flats have solar water heating system. Common lighting in outdoor passage as well as parking areas have time & motion sensors i.e. after sunset they will automatically turned on & then turned off only to start when there is any motion, which will again have turned off when there is no motion for 1 minute.

When all 9 floors are dark, to avoid any mishap, every mid landing has 3 W LED light which is sufficient for the entire common area. Thus the building practically runs on only 27 W powers throughout the night, which saves electricity in common area by 80%.

Provided lifts is "Green Lift" i.e. it is machine room less, gear less and weight-sensing. The energy consumption will be as per the weight inside the lift & this lift always run on "Green Energy".

It is obligatory to use energy economical fixtures & fittings in every flat like all Tube Lights- T5-28 W or CFL solely, all Toilets & Terraces- CFL lights only and all Fans - energy saver or power saver -50 W only.

To make positive that the flat owner can use constant energy economical fixtures throughout the life the building incorporates a distinctive system that is as follows:

1) Every flat has Blink Free Changeover (BFC) switch, which limits use of current from "Green Energy" up to 1.5Amp.
2) If the consumption exceeds 1.5 Amp, the system will change automatically from "Green Energy" to "Grid Energy".

This will be shown by junction rectifier on the transformation box, which will create awareness towards energy saving.

Normally minimum three T5 tube lights, 2 CFL, 2 Fans, 1 TV/computer can run in the limit of 1.5 Amp current.

Green energy is freed from price to flat holders which mechanically controls the usage of Grid Energy.

E. Water efficiency

Uniform pressure water supply system is maintained to reduce consumption of water. Advanced plumbing fixtures have been provided for efficient use of water. Duel flush valve has provided for flushing in toilets to restrict the flow rate to 3-6 lpm. Separate water meter has been provided for water use monitoring. Drip and sprinkler irrigation system has been provided for landscaping. Rain water harvesting is done to reduce the load on sewage treatment plant. Underground storage tank has been provided to store rainwater. Waste water treatment plant has been provided for waste water treatment and treated water. From 86 CMD treated water 19 CMD treated water is used for flushing, 44 CMD treated water is for landscaping and 7 CMD treated water is used for car washing.

V. Energy Consumption Comparison between Tradition and Green Building

Following data has been worked out after carrying out the survey of Conventional building and Green Building by taking the interviews of the flat owners from door to door through questionnaire survey.

As vision and ventilation parameters directly affects the consumption of energy in conventional buildings only tube-light, CFL bulbs and fan is considered rest of all appliances energy consumptions is as per efficiency and other factors.

A. Data Required:

1) Total no of T5 Tube lights: 180
2) Total no of CFL: 54
3) Total no of fan: 108

B. For Conventional Building:

Energy Consumption due to Normal Fixtures:
T5 Tub Lights
180 no's × 28W × 6Hrs × 365 days = 11037 Units.
CFL
54 no's × 9W × 2Hrs × 365days = 354 Units.
Normal Fans
108 no's × 80W × 6Hrs. × 365 days = 18921 Units.
Lift
5kW × 5Hrs × 365 days = 9125 Units.
Total annual energy consumption for normal fixtures = 39437 Units / year.
Energy consumption for Water Heating:
Water required for bathing = 40 liter/person
No. of persons in house = 5 persons (Assuming)
Daily hot water required = 5 × 40 = 200Litre
Consumption of energy required to heat 1 liter of water
37.5 Watt
Energy consumption for water heating
200 × 37.5 = 7500 watt/day = 7.5 Units/day
Annual energy consumption for water heating
7.5 × 300 = 2250 Units/year
Total annual energy consumption in Conventional Building
= 39437 + 2250
= 41687 Units

C. For Green Building:

Energy consumption due Efficient Fixtures:
T5 Tub Lights
180 no's × 28W × 6 Hrs. × 365 days = 11037 Units
CFL
54 no's × 9W × 2 Hrs. × 365days = 354 Units.
Power saver fans
108 no's × 50W × 6 Hrs. × 365 days = 11826 Units.
Green lift
5 kW × 60% × 5 Hrs. × 365 days = 5475 Units.
Thus total energy consumption = 28692 Units / year
Energy saving using Solar water heating system:- 2250 Units
Total electricity saving in existing certified energy efficient building
= 41687 – 28692 = 12995 Units / year
Excavation for foundation in earth, soil of all types, sand, gravel and soft murum, including removing the excavated material up to a distance of 50 m. beyond the building area and stacking and spreading as directed, dewatering, preparing the bed for the foundation and necessary backfilling, ramming, watering including shoring and strutting etc. complete. With Lift up to 1.5 m.

- Cost of Construction for Conventional Building is Rs.820340 only.
- Cost of Construction for Autonomous Building is Rs.1060100.
- Cost of Autonomous Building is more than Conventional Building by 23.19%.

Though India is a country whose footprints for sustainable development is second in the world, awareness at root level is very less. For awareness, sustainable awareness programs should be carried out at root level.

Certification procedure should be made simple by merging all certifying agencies from national level to local level through appointing an officer at local level. As a result of which there will be early, time saving and effective pre-certification and final certification. Also incentives should be finalized and offered at national level for whole country.

VI. Conclusion

With increasing population in the world migration takes place in urban areas due to urbanization. With increase in urban population automatically load on basic facilities provided by concern authorities will get increases with environmental degradation. So to minimize this effect sustainable development should be implemented to preserve the natural recourses and to reduce load on basic services.

It should be planned through different pre-construction activities and effectively implemented through construction activities. Sustainable practice is not hard and fast rule that effects or it may vary with annual climatic condition and which may not same every year and every place.

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