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A Sustainable Eco- Village: A Review

Ms. Mrunalini M. Mohite[1], Prof. Parag A. Kulkarni[2], Prof. Priyanka S. Patil[3]

[1] Department of Project & construction Management, MITCOM, MIT-ADT University, Pune.
[2] Department of Project & construction Management, MITCOM, MIT-ADT University, Pune.
[3] Department of Project & construction Management, MITCOM, MIT-ADT University, Pune

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Abstract – Due to increase in urbanization, the pressure on natural resources is increasing in at higher rate. With the urbanization and modernization people migrate from one place to another to fulfil their human needs. Village is main criteria for national development. Eco village are diversed in elements including permaculture, renewable energy, production or environmentally friendly community building. The aim of this paper is to review the relevant literature that published related to sustainable eco-village. By studying 14 research papers, focused on various strategies, tools and techniques like vernacular architecture, waste water disposal, self-sustain village, permaculture and so on.

Key Words: Eco-Village, sustainability, vernacular architecture, prema culture, global crises, environmental impact assessment.

1. INTRODUCTION

Eco villages are purposefully built settlements recognizing the existence of positive relationships between environment and society. It is traditionally built for achieving the various social, cultural, economic and ecological needs. It gives alternatives to ecologically destructive electrical, water, transportation and waste treatment system for fulfilling ways of life.

The objective of this paper is study various sustainable techniques used for eco village development and to promote rural development.

2. Eco village – an elementary concept of permaculture design

The ideal permaculture design is an eco-village .it is used to design system for creating sustainable human environment and to maximize symbiotic relationships and energetic relationship between site components. It is site specific, client specific and culture specific.

In Social dimension, ecovillages are groups in which individuals feel upheld by and capable to those around them. They give a profound feeling of fitting in with a gathering. They are little enough that everybody feels sheltered, engaged, seen and listened. Individuals are then ready to partake in settling on choices that influence their own particular lives and that of the group on a transparent premise.

In Ecological dimension, ecovillages permit individuals to encounter their individual association with the living earth. Individuals delight in day by day collaboration with the dirt, water, wind, plants and creatures. They accommodate their everyday needs – nourishment, garments, safe house while regarding the cycles of nature.

In Cultural/Spiritual dimension, most ecovillages don't put an accentuation on specific profound practices in that capacity, however in their own particular ways ecovillages appreciation and backing – the Earth and all living creatures on it, social and aesthetic improvement and declaration, and otherworldly assorted qualities.

In Economic dimension, the Ecovillage economy is very powerful and brimming with essentialness contrasted with other neighborhood economies. Economic Vitality implies:

• Keeping the money in the community,

• circulating it through however many hands as would be prudent,

• earning it using it, and putting it in part – possessed retail and administration organizations,

• Saving it in home-grown financial institutions. (Global Ecovillage network, 2014)

Fig -1: Permaculture Design for Eco-Village
(Source: Google)

2.1 PERMACULTURE-The New Way of Life

Permaculture is a new sustainable way of growing food that is inspired by nature. It does not see growing food as an individual practice, but as connected to energy, water, people and houses. Things in nature do not they require involvement and do not pollute their surroundings. It tends to loop

everything. The waste of one is food for the other. Anything that cannot be used by another is considered waste. The goal is to create waste and water cycles in such a way that they perform multiple functions throughout the cycle.

Designers can play a role in planning communities that have spaces to perform these functions. One way may be to keep the layout of the community so that people who live nearby can easily view the food being grown. Cultivated trees should be fruit trees or other trees that can provide some useful product, trees requiring more care should be closer to people's homes. Trees can shade sidewalks and roads. The land for the house can be provided with a garden. If less land is available, roof gardens and community parks can be provided. An active cycle of recycling and composting is needed and places in the community for these activities to take place. This area should be accessible to all, but precautions should be taken to avoid visual contact and unpleasant odors. A large amount of waste in the region can be recycled using this method. Areas where water tends to collect can be converted into lakes that store this water for later use.

4. Components of self-sustaining village

There are certain aspects that determine the self-sufficiency of a location. First, the most important is the fulfillment of basic needs such as food and water. If a community is able to produce/collect food and water for itself, it meets the basic criteria of self-sufficiency. Other parameters include waste management, energy production and transition methods in environmentally sustainable ways. Another important factor for community empowerment is employment and governance.

If there are small scale industries in the community, it provides employment to people in their own locality without depending on outside sources. This ensures their long-term sustainability. Governance is essential because when local people are part of the decision-making bodies for their community, they tend to be more responsible and considerate. These components are described below.

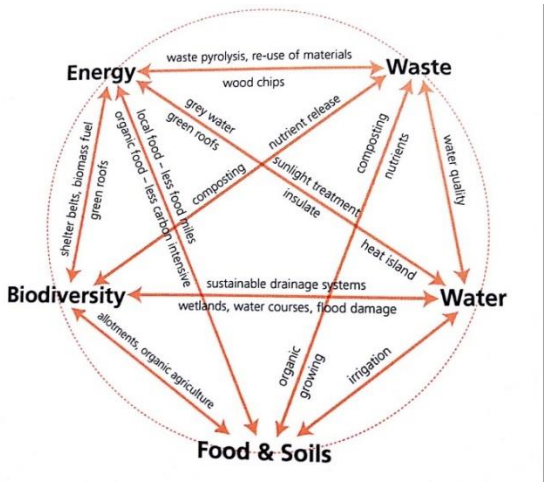

Fig -2: Interrelation between various resources (Source: Barton, Grant, Guise, 2010)

4.1 Food production:

An important aspect of a self-sufficient community is food production. Local food can feed a community and reduce its dependence on outside food sources. Food that is brought from great distances is unsustainable. A recent phenomenon that speaks to sustainability is the concept of "Food miles". Growing food, when integrated with other aspects of community life and sustainability, can solve many other problems. Growing food can become part of buildings by applying thoughtful design. Compost from organic waste can be used to increase soil productivity. Food gardens can become part of community parks where the community as a whole care for them. Through constructed wetland systems, they can be used to purify water.

4.2 Water supply:

The most important resource for meeting basic needs is water. Recently, the renewable water cycle has been disrupted due to many unnatural practices. Covering the soil with non-porous materials will prevent aquifers from being recharged. Contamination of surface water is another problematic issue that occurs as a result of waste disposal in water bodies or excessive use of pesticides. This raises serious concerns about water management and sustainability. With careful management, the water cycle can be smoothly revived. The steps to be taken depend on the main sources of water in the location. Surface runoff must be prevented and rainwater must be collected and stored. The watershed needs to be revitalized so that the water can collect. The soil cover must be porous to allow water to penetrate and replenish the water table. Appropriate measures must be taken to treat gray water so that it can be recycled. Wastewater can be used for composting, which can then be used to produce food.

4.3 Waste management:

The amount of waste we produce every day is growing at an alarming rate. This creates a problem with its disposal, as large amounts are not easily decomposed. The key to this is that waste for one industry can be taken as raw material for another. Most of the inorganic waste we produce can easily be accepted in other cycles and acts as raw material for them. Other waste can be recycled or reused. Environmentalists have long talked about the 3 R's - reduce, recycle, reuse. A fourth R has recently been added – Restore. The construction industry is a significant producer of waste that needs to be processed. The use of recycled or reused materials should be increased in construction. The packaging and embodied energy (e.g. during transport) of the materials used should be analyzed. Buildings that can be easily dismantled produce less waste and most of them are reusable. Organic waste can also be used as biofuel for energy production. Biofuels are best used in community power plants because the waste comes from local production or agriculture. They provide energy through anaerobic digestion or combustion.

4.4 Built-up spaces:

construction techniques and materials Studying the sustainability of building materials is one way to approach sustainability as they are major contributors in determining the same as far as the built habitat is concerned. Although alternative technologies are being developed, construction companies are hesitant to use them, raising direct questions about their durability, economy and capabilities. It follows that it is important to talk about these materials in detail, their specifications, usability, strengths and weaknesses. The development of alternative technologies is also a step to reduce waste from various industries, as it is often used as a raw material for these alternative construction techniques. In order to create communities that can sustain themselves, it is important to know how the energy consumed can be reduced in any way possible. Combining traditional ideas with modern technology is key when designing something sustainable in today's world. Climate is the most important issue here. The location and context determine the material and construction techniques.

4.5 Energy production and transport:

The limited availability of our conventional energy sources and the environmental degradation they cause are serious concerns facing the current generation. Therefore, it is necessary to reduce the energy intensity and increase the use of sustainable energy sources. We use energy in the form of services such as heating, cooling, transportation, lighting, etc. We need to think about how many of these services actually need energy and how much can be replaced by other means. There are various methods by which waste can be converted into energy. Organic waste can be treated by anaerobic digestion, which produces heat and electricity. Combustible waste such as wood scraps and paper can be burned to generate energy. Offices and industry produce a large amount of heat that remains unused. If an efficient way of accumulating this energy is devised, it can be used to meet energy requirements. These methods create "cleaner" energy along with cleaning the environment. This also boosts the local economy and provides more jobs. The user is also responsible for the type and amount of energy they use. Resources and money stay within the community. Accessibility and movement within the community is another factor that is indirectly dependent on energy and resource consumption. In order to reduce the resources that go into transportation, it is important to locate essential equipment of daily use. In other words, the distances for carrying out daily activities for a person should be such that they can be covered on foot or by bicycle. Not only the distances, but also the trail and location must be designed to be more pedestrian-friendly and encourage users to walk. Shaded paths, interactive activities at the edges can encourage people to choose alternative ways to travel through the community.

4.6 Employment and public administration:

The economic stability of the residents also determines the sustainability of the community. If there are enough job opportunities in the community, no one needs to go to work. They produce and consume in their own locality and therefore localize processes. If people work in their own locality, they produce commodities for their own community, thereby reducing its demand for any external supplies. So it goes both ways and residents benefit as both producers and consumers. Governance comes into play because it shapes how the community will be involved in sustainable activities. To increase participation, the community needs motivation, which occurs when people are directly involved in the decision-making process. Instead of an external governing body, a body of local representatives should be established to decide community affairs. This makes local people feel more responsible for their resources and also feel encouraged to take initiative towards their betta

5. Techniques for Eco- village development

Eco-village in Florida is first economic project for Eco village development in which the homes themselves have been designed to combine building science and high-performance products with the ability for homeowners to observe energy consumption. They are designed to reduce overall household energy use, CO2 emissions, indoor water consumption, and reduce associated energy costs. One of the features include a solar system that converts sunshine into electricity and eliminates any electric costs. Others include power-saving appliances, LED lighting and home energy management systems to allow homeowners to better understand home energy use and monitor energy consumption.

5.1 The Principles of an Eco- village

The development of eco-villages or rural sustainable development can be classified in seven topics of sustainable living, sewage management, optimal management of energy resources, environment improvement, optimal water and agriculture management, improving health and cultural, social and spiritual development.

6. Evaluation Criteria

FOLLOWING IS THE LIST OF EVALUATION CRITERIA

6.1 CONSTRUCTION MATERIALS

- Local Sources – This criterion checks what radius the material was obtained in. It is important because it tells about the embodied energy of the material used for construction.

- Low environmental impact – Materials that have a low environmental impact are encouraged. Materials that consume more energy when broken down (e.g. plastics) or use unsustainable raw materials can be considered materials with a high environmental impact.
- Low-energy materials that have low energy consumption from the beginning to the realization on site. This includes raw material acquisition, raw material transportation, raw material processing and on-site implementation. All this is further divided into processes that consume energy.
- Recycled/Reused Materials – Building materials using reused or recycled waste are an attempt to reduce waste produced by another process.

6.2 ENERGY PRODUCTION

- Renewable - communities that produce a portion of their energy needs using renewable methods.
- Efficiency in use (equipment) – if they support the use of efficient equipment in their large and small operations.
- Climate Responsive – if they use climate responsive housing/building methods, which in turn reduces energy demands.

6.3 WATER EFFICIENCY

- Water use efficiency.
- Recycling / reuse / processing
- Water harvesting schemes - schemes used to improve groundwater recharge or surface water harvesting.

6.4 LAND USE

- Renewal / brownfield area
- Density
- Environmental planning
- Land use

6.5 FOOD PRODUCTION

- Local/external production - how much of the community's food requirements are met from local production.
- Production without chemicals
- Healthy (sustainable) farming practices – using techniques that put less stress on the soil and keep it healthy.

6.6 WASTE

- Collection – if the municipality uses the correct waste collection methods. This is the first step to further processing it and keeping the community clean.
- Recycling/reusing/processing
- organic
- inorganic

6.7 ACCESSIBILITY

- Cars - How much of the urban/rural movement is done by cars.
- Suitable for cyclists and pedestrians
- public transport - availability of public transport for local commuter's
- Alternative fuel

6.8 SOCIO-ECONOMIC SITUATION

- Environmental awareness
- Employability/community involvement - what is the economic situation of the residents and what is their level of involvement in community activities.
- Meters and Monitoring
- Health Status

6.9 POLLUTION LEVELS

- Water
- Air
- Soil

3. CONCLUSIONS

The age of modern Western culture as we know it is coming to an end as the world teeters on the precipice of dramatic global climate change and the demise of socio-economic structures. A person's motives and actions are relative to their beliefs and values, and the prevailing collective beliefs and values form a society's culture at its deepest level.

Modern Western culture has a fragmented conception of reality that separates humans from one another, from nature and other species, and narrowly focuses self-interest on individual material gains for prosperity. It is a culture that simply does not recognize the interconnectedness of life and is therefore inherently unsustainable.

If our existence is interconnected, then we must seek values that maintain the integrity and encourage the flourishing of these relationships. Our well-being depends on it. If the world aspires to sustainability, it is important to build a society based on beliefs and values that are grounded in this interconnected reality.

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BIOGRAPHIES (Optional not mandatory)

Prof. Priyanka S. Patil
Assistant Professor, PCM Dept., MITCOM, MIT-ADT University, Pune

Ms. Mrunalini Mahesh Mohite
Second Year student of MBA, PCM Dept., MITCOM, MIT-ADT University, Pune

Mr. Parag Anant Kulkarni
Second Year student of MBA, PCM Dept., MITCOM, MIT-ADT University, Pune