CHAPTER 4:
CONCEPTUAL FRAMEWORK
OF SUSTAINABILITY
4.0 INTRODUCTION

There is manifold increase in the deterioration of the earth and its ecological system in recent years. Due to global warming the average annual temperatures are likely to rise by 1.5°C over the next 50 years. The climate of the earth has changed many times during the history of the planet, with periods ranging from ice ages to high warmth.

Human activities have also changed the atmosphere and are influencing the Earth's climate. Since the industrial revolution, the development policies framed did not consider influence on nature which resulted in some undesirable problems such as: air quality, acid rains, ozone depletion, loss of biodiversity, rainforest destruction etc. In other words, the humankind is destroying nature itself. These problems threaten both the living species of the ecosystem and humans themselves. In due course of time these problems shall be getting more worse. In less than a span of 50 years humans have destroyed a third of all virgin habitats in the world. If such an unconscious human behavior continuous with the same pace, it seems that our environment will not survive due to these effects. After the nature's reaction to human in some undesirable ways, it was crucial to find a new solution to the harmful impacts of human to the nature, and the deteriorating situation of the earth. It is now time to describe the nature-human relationship from the start, and make peace with her again. Consequently, the concept of sustainability and sustainable development thinking has now entered as a new paradigm in the present situation.

Sustainability is a word that has become in vogue & fashionable over the last decade. However, now sustainability is not a matter of fashion any more, but survival. The strategy for sustainable development aims to promote harmony among human beings and nature. It is time to comprehend and appreciate being a part of nature and respecting her. Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
The human capacity to consume energy and materials and create waste and subsequently nature’s capacity to recycle the waste and produce new energy sources and materials are on a collision course. There is a capacity of resources that nature can give to humans. She needs time to renew the sources by transforming wastes. Sustainability therefore is the “judicious use of an organism, ecosystem or other renewable resource at a rate within its capacity for renewal”. It emphasizes “improving the quality of human life while living within the carrying capacity of supporting ecosystems”. Similarly, “Manzini” defines sustainability as “a form of organization of human activities whereby, on a planetary and on a regional level, the ecosystem need not be disturbed beyond the threshold of its resilience.” The shift is established on efficient use of anything. For instance, one of its tasks is to find “the most efficient forms of using resources without threatening the survival of nature and people”. In other words, similar to the Van der Rohe’s expression of the shift in modernization ‘less is more’, ‘producing more with less’ seems to be the next magic expression of the sustainable future. Foster expresses this as: Sustainable architecture can be simply defined as doing the most with the least. The Miesian maxim ‘Less is more’ is, in ecological terms, exactly the same as ‘Waste not, want not’.

One of the main issues of environmental sustainability is energy. In today’s world, efforts are being made in saving energy, water, natural resources, ecology, habitat, and natural species. Sustainable development requires more ecologically-adapted lifestyles which are ecologically friendly. Ecology-adapted consumption habits should be developed for the society. In developed countries, owing to the wealth of people, consumption increases day by day. The rich earn more, consume more natural resources, and disturb the ecological system more than consumers in less developed countries. In the light of the sustainability paradigm, consumption habits should be revised. Moreover, over populations can increase the pressure on resources.

4.1 SUSTAINABLE DESIGN

Although the sustainability concept has been used in a more abstract sense since 470-399 BC, it has gained significance in the last 30 years due to huge threats
to nature. This concept is a new ‘paradigm change’ influencing life as well as architecture. Considering that in the industrialized world, buildings and the activities within them consume almost half the energy they generate and are responsible for half the carbon dioxide emissions, it was inevitable to change the architectural approaches of the society.

A sustainable building should address major environmental problems on the global, local and internal levels like climate change, resources, internal environment, external environment and wildlife. In the light of the description of the sustainability, sustainable housing can be defined as “the housing that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Sustainable buildings are high-quality buildings; they last longer, often cost little or no more to build than conventional designs, cost less to operate and maintain, and provide occupant satisfaction. The benefits of sustainable design are measurable in terms of environmental, economic, and social impacts. The economic benefits come from reduced operating costs and improved occupant performance. The social benefits come from the improved health and comfort of the occupants. The environmental benefits derive from the reduced impact of the building’s construction and operations on air, water, landfills, and non-renewable energy resources.

The aim of sustainable housing is to improve both the quality of life and the environment. The intention of it is not only to save resources but to reorder them to serve the people better. One should think rationally about a combination of issues including sustainability, durability, longevity, appropriate materials, and sense of place. A building exists both in terms of its physical being form, structure and its functional aspects, i.e. the systems and operations that sustain it during its useful life. Both aspects involve the built structure in relationships with the natural environment which take place over time. The built acts like a living organism; in place of food, it uses energy and materials, and also produces outputs into its environment. Sustainability is not only environmentally-friendly, but also economically, culturally, socially, aesthetically and health-friendly.
Recently, when any principle of sustainable design is applied for a housing project, the project is evaluated as an example of sustainable housing project. For instance, if a building employs technology to reach low energy, water or material consumption, it can be called as sustainable. Similarly, using renewable resources, green technologies, climate, healthy and recycled materials or even just using passive design principles can mark a building as sustainable.

Sustainability requires us to think holistically regarding the location and function of a building; its flexibility and life span; its orientation, form and structure; its heating and ventilation systems and the materials used; together impact upon the amount of energy required to build, maintain and use it, and travel to and from it. To be a real sustainable building project, it includes a design problem concerning ecological, social, spiritual, aesthetic, and economic conditions of the case area. For instance, besides ecological design, a regional approach to design is also essential. Climatic and topographic features of the site cannot be ignored in the design period. On the other hand, cultural and regional character of the region should be tried to be sustained as well. Moreover, the spiritual and aesthetic requirements of the people who live in the region should be provided by design. This means that a holistic approach is unavoidable to reach sustainable buildings, environment, cities and community. According to Foster, only by finding new solutions to the existing problems will it be possible to create sustainable forms of buildings for the future. One of the main mistaken ideas about sustainability in the architectural practice is that it is seen just as the energy performance of the building against global warming. Sustainable architecture is not just energy-efficient architecture, indeed, as Foster declares, “the optimum design solution integrates social, technological, aesthetic, economic and environmental concerns.” Braungart radically criticizes the consideration of sustainable design as just energy efficiency: Design is the complete opposite of sustainability. We would still live on trees if we were sustainable. He mentions that sustainable design should not only be energy efficient, but also be a real part of nature. For instance, after 50 years time, the building materials can transform themselves to nutrients for the living creatures of the ecological system.
There should be holistic approach for sustainable design & the concept is applied as a whole for the regions and the countries. Sustainability will not be achieved if it is appreciated only by several blocks. Several perfectly sustainable houses cannot cause the concept to succeed. The concept should be applied, not just at the scale of individual buildings, but beyond that at the scale of communities and regions, as a matter of survival.

4.2 ECO HOME DESIGN

Eco design is a methodology in design taking into consideration all the ecological aspects throughout its entire lifecycle. The life cycle of an item is normally partitioned into acquirement, fabrication, utilization and transfer. Eco design is basically an obligation and understanding of our biological foot shaped impression on the planet. Green mindfulness, over populace, industrialization and an expanded natural populace have prompted the addressing of these principles. It is basic for building having results that are ecologically well disposed and lead to a decrease in the utilization of materials and vitality. Ecological viewpoints which should be investigated for each phase of the life cycle are:

(i) Consumption of resources (energy, materials, water or land area)
(ii) Emissions to air, water, and the ground (our Earth) as being relevant for the environment and human health
(iii) Miscellaneous (e.g. noise and vibration)

4.3 DIFFERENT FACETS OF SUSTAINABILITY

Generally, sustainable architecture issues consist of natural, cultural and technological facets of sustainable design. In other words, they are the environmental, social and economical facets of the paradigm. These three images have been implicitly presented as corners of a triangle.

The sustainability of all three – environmental, socio-cultural and economic systems – is sometimes called the ‘triple bottom line’ by which the viability and success of design and development should be assessed. In the environmental sustainability of architecture, the key to architectural sustainability is to work with, not against, nature; to understand, sensitively exploit and simultaneously avoid
damaging natural systems. According to Williams, the principles of ecological sustainability involve:

a) the rates of use of renewable resources not exceeding the rate of regeneration;

b) the depletion rates of non-renewable resources not exceeding the rate at which renewable substitutes are invented and invested;

c) rates of pollution not exceeding the assimilative capacity of the environment;

d) waste emission not exceeding the assimilative capacity of the local environment.

Environmentally sensitive buildings can be described as living species that will harvest all their own water and energy needs on site. In economical sustainability of architecture, the key to architectural sustainability is economy and an economic development model. It influences not only the inhabitants, but also the country. The primary constraint hampering the achievement of economic sustainability is the need to balance economic benefits generated by an activity with the economic costs. The costs of inputs, extraction and/or processing are crucial. The availability of inputs and the demand for the product are also important for sustaining economic activities. Moreover, environmental costs (e.g. the damage to the ecological system due to the use of natural resources or the reduction in the stock of renewable resources as consumption exceeds the speed of replenishment) theoretically need to be accounted as production costs, though this may prove difficult, if long term sustainability and equity are to be sought as mandated by the advocacy of sustainable development. Considering that, in developing countries, like India, economy is a major parameter for architectural design, it will be seen that this issue has a wider potential to influence the people in terms of sustainable architectural design in India.

The social sustainability of architecture is a people-oriented interpretation. It refers to maintaining or improving the well-being of people for the present and future generations. The emphases are social cohesion and integrity, social stability and improvement in the quality of life. Thus, there needs to be equitable distribution
and consumption of resources, harmonious social relations and acceptable quality of life to be sustainable.

As is seen, the sustainability level of a building is a very complex issue to measure and evaluate. Building assessment programs have been employed mostly by northern countries to attain international standards needed for labeling buildings as sustainable. By using indicators to model or monitor performance, the full complexity of sustainable development could be reduced to measurable parts. It will become design or management tool to point in the right direction.

The sustainable development is complex and many types of solutions are possible depending upon the priorities or conditions of a particular site. Building assessment tools are mostly used to evaluate sustainable buildings in the world. However, it can be mentioned that even they are not enough to measure all the facets of sustainable design. Innovative building assessment programs need be developed according to the regions concerning all the facets of sustainable design such as environmental, social and economical.

Arranging a universal rating system does not seem to be the most beneficial solution to the framework and utilization of sustainable design. According to Williams, “each society must define its needs in its own way.” In other words, each society’s priorities differentiate depending on the regions. Thus, each society or country should create their own sustainable design rating systems.

### 4.4 SUSTAINABLE HOUSING

It is possible to define sustainable housing as ‘housing that meets the perceived and real needs of the present in a resource efficient fashion whilst providing attractive, safe and ecologically rich neighborhoods.”

According to Lock, housing has a greater impact upon global and social harmony than any other building type. Housing needs to support family life, community cohesion, and ecological well-being. Besides its specific features such as supporting family life, housing also has to be healthy, comfortable and cheap to run. Housing has invisible crucial tasks in terms of sustainability. For instance, no
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society is balanced and sustainable unless housing addresses difficult issues such as social exclusion, crime, employment opportunities as well as the usual priorities of energy and environmental performance. Along with job security and education, housing is central to the public’s perception of quality of life.

Green housing is not easy to achieve, especially within the constraints of typical housing budgets, but when over a quarter of all CO2 emissions are the result of how we heat, light and ventilate dwellings, there is no alternative approach to housing design. There is an extra capital cost of a sustainable housing complex. It varies according to the design and specification but is usually 5-15% greater than the norm. Just adding about 8% to construction costs with a payback period of about six to ten years will maintain a potential sustainable house. The customer benefits are the low energy bills while the government benefits are the lower national CO2 emission levels. According to the “Edwards”, five conditions for sustainable housing are as follows:

- **Low resource use**: energy, water, other resources (land, minerals etc.)
- **Safe**: security through design
- **Healthy**: physical health, mental health (stress)
- **Productive**: socially, economically
- **Beautiful**: aesthetically, spiritually, ecologically

Housing by nature is multi-faceted. It consumes natural resources and produces impact on the natural environment. It constitutes a major economic activity and impacts on the general economy. It is an important component of social development and quality of life. It is often used by governments to achieve political and economic ends. It is also a cultural attribute, manifesting the aesthetic value and the way of life of man in his particular setting. A holistic perspective is therefore needed if we wish to chart the future of housing development. The sustainable development paradigm offers such a possibility.

Sustainable housing should not be merely about meeting basic needs, but should also improve livability. Improved livability does not only mean larger space and more facilities, but also healthy, safe, affordable and secure living within a
neighborhood with provision for water, sanitation, drainage, transport, health care, education and child development. Moreover, a home protected from environmental hazards, including chemical pollution. It is also significant to meet the needs related to people’s choice and control, including homes and neighbors which they value and where their social and cultural priorities are met. There is a little genuine social progress without good quality housing. Housing is at the root of cultural and economic vitality because it is the agent that cements communities. Therefore, sustainable architecture influences housing which is the cement of it.

4.5 NEED FOR SUSTAINABLE BUILDINGS

- Global warming leading to rise in temperatures and extreme weather effects.
- Land for building is scarce & Greenfield areas are being depleted to make buildings.
- The Buildings being made are both energy intensive in construction and usage.
- Environment around buildings and air is polluted, fresh water is scarce and many water sources are polluted. There is also an Increase in energy usage to compensate for the above.
- Deteriorating health of occupants due to sick building syndrome arising from non-natural and toxic materials.
- Increasing energy use for other utilities like transportation due to sprawling cities & towns.
- Large scale depletion of non-renewable energy resources