2 SUSTAINABLE-AFFORDABLE HOUSING: A FRAMEWORK FOR CONCEPTUALIZATION

2.1 Introduction

This chapter introduces a conceptual framework identifying different aspects of sustainable-affordable* housing for evaluating problems and formulating strategies. Housing problems are multi-dimensional and urge the reconciliation of the interests of different stakeholders. A holistic approach that gives due emphasis to the diverse elements of sustainability is needed to define it from a proper perspective. The proposed framework addresses the problems relating to human settlements and sustainable developments in developing countries based on an integrated approach from the perspective of the households (users) as well as on the concepts of sustainability. Value Focused Thinking is employed in this framework for structuring objectives and criteria.

This chapter is organized in five sections. Section 2.2 explores the concept of sustainable-affordable housing and identifies different objectives. A detailed investigation has been carried out in section 2.3 to identify the various criteria to measure the objectives defined, by covering all sectors of sustainable development. Section 2.4 presents the conceptual framework.

2.2 Sustainable-Affordable Housing

Shelter is one of the basic needs of human beings next only to food and clothing. Besides being a basic necessity, it is also a source of identity that has a considerable effect on the overall psychological well-being of the inhabitants. The perception of housing has undergone some remarkable changes over the years and has more significance in the present day world than it had even two decades ago. Home ownership brings out significant economic security and social status to a household. But for shelter-less persons it can create profound social change in their existence, by endowing them with identity, security and above all creating a feeling of being a part of the society. Housing also acts as a matrix that strengthens family and community ties. The concept of home in that sense is much bigger than that of house. It implies to the provision of food, clothing, and housing with a proper environment that affords protection from the weather, offering security and well-being. It is also a valued place

* Even though the concept of 'sustainability' includes 'affordability'; in order to give special emphasis to the extremely low economic status of poor households, sustainable housing is addressed here as “sustainable-affordable housing” throughout this research.
regarded as a refuge or place of origin where a person is able to develop his social relationships. In other words, a home fulfils physical needs by providing security and shelter from weather and climate. It fulfils psychological needs by providing a sense of personal space and privacy. It fulfils social needs by providing a gathering area and communal space for the human family, the basic unit of society. In many societies, it also fulfils economic needs by functioning as a centre for commercial production and there by generating wealth. The significance of housing in social development should not be neglected in these respects. It is also a crucial component of the built-up environment and an intrinsic element in the economic development of all nations. In this domain, housing and development activities are also related to environmental issues and technological advancements.

The human right to adequate housing is enshrined in international law and can be traced to the Universal Declaration of Human Rights, which was unanimously adopted by the world community in 1948. A focus on the right to adequate housing is thus essential for the promotion of human development.

A habitat normally refers to the area or physical environment where an organism or ecological community lives or occurs. Human habitat and human settlement are synonyms to each other. Housing is a primary component of human settlement. Human activity and economic growth affect the natural environment, and if growth is not achieved in an environmentally sustainable way, its effect on poverty and human well-being will be disastrous. Housing development thus plays an important role in achieving sustainable development. Sustainable development is often defined as development that “meets the needs of the present without compromising the ability of future generations to meet their needs” (WCED, 1987). ‘Meeting the needs of the present’ refers to the development aspects of sustainability, which includes economical, social, cultural and political issues. The second phrase of the definition ‘without compromising the needs of the future’ mostly refers to environmental issues (Ehsen et al., 2000). The Johannesburg Summit of the United Nations proposed the so-called ‘three-pillar’ concept (or Tripple Bottom Line-TBL model) of ‘People, Planet, Prosperity (Profit)’ to reflect the requirement of sustainable development as the balancing of economic and social development with environmental protection. Sustainable development can be considered as maintaining a delicate balance between the human need to improve lifestyles and feeling of well-being on one hand, and preserving natural resources and ecosystems, on which we and future generations depend.

Housing development can be considered as a pioneering step for sustainable development and has got multi-objective and multi-institutional relevance. Human settlements have to function in a sustainable way to achieve this objective of sustainable habitat. Therefore sustainable human settlement should enable to live in a manner that supports the state of sustainability and the principles of sustainable development and
has institutional, social and economic systems that will ensure their continued existence (CIB, 2002). Sustainable habitat could be thus described as a way of developing and maintaining the living environment that support human health (both physical and psychological), satisfying shelter needs along with protecting and preserving the nature for future generations.

According to Gibson et al. (2005: 56-58), traditional concepts of sustainability are used to be depicted as circles of sustainability with a certain ordering; economy prevailing over society, prevailing over ecology or the other way around (Fig. 2.1). They say that since the idea prevailed that humans play a major role in the character and functioning of many biophysical systems, depictions suggesting uni-directional lines of dependency are insufficient and more often represented as intersecting circles.

![Circles of sustainability: economy immersed in society, society immersed in ecology (source: Gibson et al., 2005)](image)

Many of the approaches on sustainability are actually examples of ‘integrated assessment’, derived from environmental impact assessment (EIA) and strategic environmental assessment (SEA), but which have been extended to incorporate social and economic considerations as well as environmental ones, reflecting the triple bottom line approach to sustainability. These integrated assessment processes typically either seek to minimise ‘unsustainability’, or to achieve TBL objectives. Both aims may or may not result in sustainable practice (Pope et al., 2004).

Sustainable housing can be conceptualized in the same way as sustainable development, to maintain a balance between the present and future housing needs. In order to satisfy the present needs, sustainable housing should be affordable to the users (particularly poor households). Thus, sustainable housing from the perspective of the users can be defined as housing that is accessible and affordable to them, and meets their housing needs. Social and cultural factors influence the primary requirements of housing.
Affordability or the economic capacity of an individual plays a significant role in achieving these requirements. Technology acts as a catalyst to help in realising this, by providing affordable options suiting the individual needs and changing circumstances. In developing countries, where the majority of housing investments are carried out through self-help or mutual help activities, sustainable technological options demand specific consideration in making the houses more affordable and feasible. But technological innovations can either accelerate or decelerate the process of sustainable development as it has got both positive and negative impacts on the environment. Protecting the environment is a fundamental aspect of sustainable development. It includes the improvement of essential ecological processes, biological diversity and the natural resource base (Veron, 2001).

The physical quality of life is very dependant on the environment in which man, who is also part in it, as an individual and as part of a group, can survive and grows physically and culturally. Often housing investments which require high investments are set apart and people have to be satisfied with poor housing conditions. The definition of sustainable-affordable housing for the poor can thus be modified as “housing which is accessible and affordable to satisfy the housing needs of people whose income does not enable them to afford their housing suitable for their needs in the formal housing market”. In this definition, the term ‘accessible’ refers to the feasibility to fulfil those present and future needs. The basic housing need of an individual is often a reflection of his or her socio-cultural needs. In that way sustainable-affordable housing is related to socio-cultural (basic needs) and environmental aspects (present and future needs) of sustainability. The term ‘affordable’ in the definition mainly implies the affordability by the individual in fulfilling these needs. Innovative technological options are necessary for affordable housing solutions. In this sense it is connected to the economic sustainability and affordability of sustainable technological options. Developments in the economy and social changes should be able to sustain ecology and improve potential resources for future generations. In the context of global population growth and the Earth’s finite resources, the way in which human beings are accommodated or sheltered is a major and integral part of the imperative to maintain a global environmental equilibrium. Hence sustainable building processes should be able to give emphasis on environment friendly technologies utilizing locally available waste materials and renewable resources. Therefore this framework assigns equal importance to all these four aspects of sustainability in sustainable housing and accepts their interdependence to each other.

The quadruple (People, Planet, Prosperity, and Project) concept of sustainable buildings put forward by Duijvestein is also based on the principles of sustainable development. It adds one more ‘P’ to the 3P concept of the UN. Hence from the triangle it changes to a tetrahedron as shown in the Fig. 2.2. This fourth ‘P’ for Project refers to design quality, which includes the aspects such as beauty, robustness, biodiversity and the relations
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through the scales (Dorst et al., 2004, http://www.bomdelfl.nl/). According to this concept, the tetrahedron can be used to show the importance of and the relations between the four qualities. The most important quality can be placed on top, but in all cases has to be based on and supported by the three others.

![Diagram of the tetrahedron concept]

Since sustainable-affordable housing requires sustainable and accessible technological alternatives, the traditional concept of sustainability (PPP) has to be upgraded in the context of sustainable housing with an additional technology factor. This is also in agreement with the quadruple concept of sustainable buildings put forward by Duijvestein (Fig. 2.2). The fourth ‘P’ for Project is directly or indirectly related to technological sustainability. Sustainable-affordable housing development can thus be conceptualized as a combination of four significant aspects of sustainability, namely socio-cultural, economic, technological and environmental sustainability. This concept is also in agreement with Islam (1996). According to him sustainability in housing may be understood in terms of ecological sustainability, economic sustainability, technological sustainability, cultural sustainability and social sustainability.

As many conceptualizations of sustainability have been around, their common denominator seems to be integration. For instance, the Millennium Ecosystems Assessment (MES, 2005) depicts linkages between ecosystems, services and human well-being, and focuses on the interactions between interrelated categories. As an alternative to the TBL, Gibson (2001) promotes the use of a principles based approach to sustainability assessment, in which sustainability criteria are derived from sustainability principles rather than TBL goals. He argues that a principles-based approach emphasizes interconnections and interdependencies between the pillar areas.
rather than promoting conflicts and trade-offs. Therefore, a principles-based approach could avoid some of the inherent limitations of the TBL approach to sustainability (Pope et al., 2004, 2006; Gibson, 2006). The basic model for sustainable-affordable housing proposed in this research also adopts this principle based approach based on our definition on sustainable-affordable housing for the poor.

Sustainable-affordable housing development can thus be conceptualized as a combination of four significant aspects of sustainability, namely socio-cultural, economic, technological and environmental sustainability (Fig. 2.3). After Pope et al. (2004), we also consider equal significance to the four aspects of sustainability. The interdependence of these four factors and their equality are considered as the pre assumptions of this concept (This pre supposition will be re-visited further and tested in chapter 4 under the context of Kerala).

This basic concept for sustainable-affordable housing can be elaborated further using a methodology resembling that of Value Focused Thinking (VFT). The foundation for any analysis is a set of objectives and a set of alternatives for achieving those objectives. There are desired properties for this collective set of objectives that, when possessed, can greatly enhance the value of any subsequent analysis (Keeney, 1992; Keeney et al., 2005). According to Keeney, values are principles used for evaluation, and we use them to evaluate the actual or potential consequences of action and inaction, of proposed alternatives, and of decisions. To think of these values in a decision process: the decision should be a real problem, it should be of great importance, and it should be complex and have no absolute solution. This approach can be used to uncover hidden objectives, to direct the collection of information, to improve communication, to facilitate collective decision making, and to guide strategic thinking.
Value Focused Thinking (Keeney, 1988) is therefore a methodology that is well suited for handling these kinds of multi-objective problems. It helps in identifying the needs of the households (from the perspective of households and as well as based on the principles of sustainable development) and developing different potential solutions to meet their housing needs. The evolution and nature of housing problems differ from country to country depending on local social, economic and political contexts. This methodology provides a means to reveal and address the multiple objectives considering that all development efforts have resource constraints and facilitate in driving the project in the right direction. The succeeding section explains the significance of the different objectives of sustainable-affordable housing and their interrelations to each other.

2.3 Objectives of sustainable-affordable housing

Since housing is a primary component of habitat, sustainable housing development activities can directly contribute to the development of sustainable habitat. Sustainable habitat can be achieved through promoting housing development by balancing social progress, enhancing economic growth, propagating innovative technology along with conserving and protecting the environment and natural resources for future life and development.

As explained in the previous section, sustainable-affordable housing embraces four objectives of sustainability, namely socio-cultural, economic, technological, and environmental (Fig. 2.4). A list of criteria has been prepared to measure these objectives and assess the present housing situation based on the concepts of sustainable-affordable housing. The ensuing text explains these objectives on the basis of different criteria. It defines and structures fundamental values under each aspect of sustainability, and further guides in integral decision making.

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**Figure 2.4 Objectives of sustainable-affordable housing**
2.3.1 Socio-cultural sustainability

An adequate shelter is not only a human right, but also a base for human dignity and relationships. All human beings are knowingly or unknowingly deeply rooted in their homes, and this has a remarkably high influence in the development of their character and well-being. Proper housing helps in the free development of an individual, and creates a platform for playing an active role in the social and cultural life of the community (Springer, 2000). Social and cultural factors are strongly interdependent. They often interlock and are sometimes indistinguishable (Chiu, 2004). Sustainable housing should respond to the socio-cultural needs and practices of the beneficiary households and communities. It is focused on housing development that promotes social interaction of individuals and cultural enrichment of the community and aimed to reduce the inequality of housing between social classes (Islam, 1996). At the same time it accelerates the improvement in social developments, relations and interactions.

The various criteria for defining socio-cultural sustainability in housing have been identified as adaptability, equality, integration of amenities and services; self-help housing or beneficiary participation and community involvement (Fig. 2.5).

![Diagram of Socio-Cultural Sustainability](image)

**Figure 2.5 Socio-cultural sustainability**

*Adaptability* - The concept of shelter is much broader than mere housing. It differs from individual to individual depending on household size, culture, tradition, profession and way of living. The house design should be flexible enough to incorporate the changing needs of the individuals (family size, profession etc.). The provisions for future expansions or the flexibility to changing needs is an essential criterion. For instance the housing requirements change when children are born, or grow up, or marry, get children themselves, and so on. Also in the case of professional requirements, the housing needs of a fisherman are quite different from those of a farmer. The flexibility to fulfil these varying needs is defined as the adaptability in housing.
In most communities, the house is treated as part of the identity of the individual labelling their status. People do not want to live in a house, which stigmatizes them as belonging to a low-income class, even if it is all that is affordable to them. The design and the materials used for the house should correspond to the user's way of living and local building traditions (Ebsen et al., 2000).

**Equality** - This objective has to be considered with utmost care as it forms the basis for socio-cultural sustainability. Equality in housing development refers to that, segregation or grouping of a particular group of people based on income, religion or any other criteria should not reflect in their housing and should not prevent them from participating in social activities. Different groups of people within the society should be able to participate equally.

This means that the poor should not be exposed or stigmatized based on a specific type of design or materials and grouping their houses to a particular region. The location and type of houses necessarily reflect social inequalities. This also affects social relationships, day-to-day living, and ultimately the future generations of the inhabitants. Briefly, the mutual relationship between housing and social structure creates a vicious circle perpetuating a lack of social privileges and inherited advantages creating a social problem (Jayaram, 1988).

**Integration of amenities and services** - Sustainable shelter requires the integration of essential culture or local specific amenities (privacy, security, lighting etc.) and public infrastructure facilities. It also refers to location, making the journey to work feasible. At community level, social amenities like schools, libraries, recreation centres, medical facilities, police stations need to be integrated into settlements (UNCHS, 1996).

**Self-help housing and beneficiary participation** - Sustainable housing development can be perceived as a means to improve the livelihood conditions and self-dependence of the inhabitants. The users build houses to suit their needs and hence self-help or participatory approach in housing brings desirable changes that lead to sustainable housing (Eldemery, 2002). Turner's three laws on housing are important in this context (Turner et al., 1972).

**First Law** - When dwellers control the major decisions and are free to make their contribution to the design, construction, or management of their housing, both the process and the environment produced stimulate individual and social well-being. When people have no control over, or responsibility for, key decisions in the housing process the dwelling environment may become a barrier to personal fulfilment and burden on the economy.
Chapter 2

Second Law - Dweller satisfaction is not necessarily related to the imposition of standards.

Third Law - Deficiencies and imperfections in one's housing are infinitely more tolerable if they are his or her responsibility than if somebody else's.

*Community Participation* - Ensuring community participation is an important aspect of sustainable housing. For the lower income population, communal action, whether in the political, social or economic realm, permits a scale of activity impossible as individuals (Jenkins, 1999). Community development is a key to unlocking higher levels of mutual advantage as well as more effectively and equitably accessing state and economic resources. Successful community involvement requires support from the public sector through training, empowerment, financial assistance and guidance. Community participation is also necessary to develop housing clusters to create sustainable residential neighbourhoods. The possibilities are greatly multiplied when governments actively try to foster development simply by bringing people into the process (Eldmery, 2002).

2.3.2 *Economic sustainability or Affordability*

Economic sustainability or affordability in housing should be embedded in an economic development strategy, which strengthens the economic self-reliance of household members. Even though the housing problem arises as a symbol of poverty, mere financial assistance usually does not help the poor in providing housing. Affordability by a household in any part of the world depends on its command over the various resources required for housing. The poor often cannot afford to accept public housing assistance due to the lack of economic sustainability or affordability of the housing programmes.

Affordability by the households, their basic shelter needs, and their pre-requisites or resources for housing development has been identified as the essential criteria for measuring economic sustainability of housing (Fig. 2.6).

![Figure 2.6 Economic sustainability or Affordability](image-url)
Affordability - Affordability by the households must be given right priority before planning any housing development programme. The most important financial resources are the actual and potential savings by the inhabitants out of their income. This probably represents between 10 to 15% of all personal incomes (Turner, 1976). Housing programmes may be linked to some form of programmes like employment generation or income generation activities, enabling the poor to afford their own houses and to maintain them (Bhattacharya, 1994).

Affordability by households can be measured either by their (i) minimum capability to own a house - capability may be in terms of employment, income, assets, skills or any other entitlement for constructing and maintaining the house and (ii) their ability to repay the loan components, if any.

Pre-requisites - Access to land, resources and basic infrastructure is a pre-condition for affordable housing (Bhattacharya, 1994). Houses cannot be built and managed or maintained without resources, infrastructure and land to build on. The economic sustainability of housing is a function of the value of those resources and the costs of the ways in which they are employed (Turner, 1976).

Shelter needs - Affordable housing can said to be sustainable only if it provides basic facilities and amenities essential for the well-being of the inhabitants. According to UNCHS (1990) country-specific modes of adequate shelter are suggested as sustainable solutions since they are environmentally appropriate, economically attainable and therefore realistic. For instance, an affordable type design of a house with minimum essential facilities may sometimes unrealistic, if it cannot fulfil the basic housing needs of the households.

Millions live in poor housing conditions where there are high rates of unemployment coupled with poverty and lack of basic amenities. As the improvements and developments in society are related to economic development, socio-cultural sustainability is closely linked to economic sustainability. Economic growth is a key in providing the means to meet basic needs, to ease poverty, and to generate employment, the factors essential for sustainable development (Veron, 2001). Housing activity is closely linked to the macro-economy. It is capable of producing employment and growth. Investments in this sector not only improve and add to the existing stock of housing units, but also improve the working and living conditions. The housing sector is employment-intensive. It generates employment during the construction period and also during its life for proper maintenance providing employment opportunities for skilled as well as unskilled labour (Glaeser, 1995; Tiwari, 2001).
2.3.3 Technological sustainability

Conventional building materials are beyond the reach of the majority of the world population due to their poor affordability (UNCHS, 1993). Besides the escalation in the cost of building materials, raising environmental concerns due to the extensive exploitation of natural resources connected with general construction and other housing development activities urge the search for alternative technological options. It is now generally agreed that development in the low-income countries must proceed in parallel with a general global application of new technologies, which are both less resource intensive and less environmentally damaging (Spence et al., 1995). In both these respects, technological sustainability is connected to economic and environmental aspects of sustainability. It is also related to socio-cultural sustainability, as technological innovations reflect social demands, and those are in general culture-specific. Sustainable construction can be described as a way of designing and constructing buildings that support human health (physical, psychological, and social) and which is in harmony with nature, both animate and inanimate (Hendriks, 2001).

Feasibility, functionality, strength, durability, reliability and environmental friendliness are identified as the basic necessities for technological sustainability (Fig. 2.7).

![Figure 2.7 Technological sustainability](image)

**Feasibility and Functionality** - The technological innovations should be feasible to the users. Technology which utilizes local resources, unskilled labour, locally available and renewable materials can be said to be sustainable. It should be able to benefit as many people as possible and should be flexible and also functional, i.e. adaptable to the changing needs of the community; at the same time it must be affordable and workable at community level.

**Strength** - The techniques of construction and materials used should be strong enough to meet the basic strength parameters appropriate to the local circumstances.

**Reliability and Durability** - These are closely related to the strength parameters and figure essential criteria for long-term sustainability. Durable refers to the property of a
material, building section or construction that can resist any unacceptable deterioration of relevant functional characteristics through specific chemical, physical and mechanical loads over a certain period of time (Hendriks, 2001).

**Environment friendliness** - Environmental friendliness of technological options in sustainable constructions refers to the minimized usage of renewable and non-renewable resources, extensive utilization of waste materials and as well as minimizing the impact of waste products and pollution.

### 2.3.4 Environmental sustainability

Environmental sustainability requires the alleviation of poverty if it is to be meaningful (UNCHS, 1996). Many environmental problems often actually originate from lack of development and environmental degradation, in turn leading to poverty. Overall, the concept of sustainable development suggests a potentially positive relationship between socio-economic development and environmental sustainability (Veron, 2001). The positive environmental changes generate economic empowerment, enhance social capital and build institutional capacity. In order to be sustainable, developments in the economy and social changes should be able to sustain ecology and improve potential resources for future generations. We have entered an era in which no country is isolated and secure from the impacts of the environmental conditions of its neighbours. All countries have a stake in each other’s present and future well-being (UNCHS, 1990). Environmental sustainability is the most significant concept of sustainability as it takes care of the demands of future generations along with the present needs.

According to the World Watch Institute, building construction consumes 40% of the raw stone, gravel and sand, 25% of the virgin wood, 40% of energy and 16% of water used annually worldwide (Roodman et al., 1995). The construction industry is involved in activities that adversely affect the environment through the over-exploitation of non-renewable resources. It may result in stripping of top soil, destructing natural topography, resulting in problems like erosion, landslides, and also causing detrimental effects to local hydrology. This also contributes to the loss of fertile soil and to destruction of agricultural land, along with the depletion of natural resources and pollution of the environment by the emission of dust, debris and toxic gases as by products of the building process. Statistics of total energy consumption show that the proportion of energy consuming for building activities in the developing world is 35% of the total annual energy consumption. It utilizes energy for the development or production and transportation of materials and machinery, building and also for the maintenance activities.
Annually more than two million residential buildings are constructed in India apart from the construction of commercial and industrial buildings. Bulk annual consumption of materials like cement (more than 75 million tonnes), steel (more than 10 million tonnes) and bricks (more than 70 billion tonnes) for these construction activities contribute to the emission of greenhouse gases to the atmosphere (Reddy et al., 2001). Good environmental performance is important to mitigate the impact of climate change and depletion of resources to attain a sustainable habitat. The National Measures for Sustainable Building in the Netherlands include measures of six environmental themes: energy, water, materials, indoor environment, surrounding environment and miscellaneous (Hendriks, 2001).

Efficient use of renewable and non-renewable resources, proper land management, provision of healthy surroundings, basic infrastructure facilities and waste management have been identified as the basic criteria for achieving environmental sustainability in housing (Fig. 2.8).

![Environmental Factors](image)

**Figure 2.8** Environmental sustainability

**Renewable and non-renewable resources** - Minimizing or effectively utilizing the resources and promoting the usage of sustainable resources are the main concern in this context. Especially energy and other non-renewable resources in household activities and the building process need specific attention. The overexploitation of natural resources should be restricted. The recycling or reuse of water, rainwater-harvesting systems can be included as essential aspects along with basic infrastructure facilities.

**Land conservation and proper planning** - Modern housing development has a major impact on the environmental system. Damage to sensitive landscapes including scenic, cultural, historical and architectural must also be given due consideration. The unrestricted and unplanned growth of housing development should be prevented.

**Healthy environment** - The habitat as well as the nearby environment should be favourable to the healthy development of inhabitants, both physically and mentally.
Planning of both the indoor and outdoor environment need prime concern with respect to ventilation, thermal comfort and lighting through proper planning and orientation.

**Infrastructure** - Infrastructure can be divided into two components, social infrastructure and physical infrastructure. The social infrastructure refers to educational and health care facilities. The physical infrastructure includes water supply, sanitation, drainage, transportation, solid waste management and land management. The provision of physical infrastructure must be seen as a prerequisite to achieve sustainable human settlements (Choguill, 1996). Infrastructure development is essential to improve the quality of life for human beings as well as the protection of the environment.

**Waste management and material efficiency** - The processes involved in the provision and use of housing have a significant role in the contribution of solid waste. Household activities also supplement to the accumulation of waste further polluting the environment. Construction and demolition debris accounts about 15-30% of solid waste by weight representing a major component of all municipal solid waste (Kartam et al., 2004). Reducing material wastage has several benefits. It reduces global material consumption and in the long term, also the amount of demolition waste. It also reduces construction costs, making houses more affordable. When properly done, recycling waste as building materials is a convenient way to reduce the environmental impact of the construction industry (CIB and UNEP, 2002).

Environmental sustainability of sustainable housing development should consider the following objectives as basic requirements for sustainable housing developments. It should be able to ensure -

**Basic infrastructure by**

- Provision of drinking water
- Provision of drainage and sanitation
- Waste disposal
- Provision of electricity

**Energy efficiency by**

- Minimizing the use non-renewable energy in daily household activities
- Utilizing alternative solutions for renewable energy

**Water efficiency by**

- Reuse of water
- Protecting water quality
- Rainwater harvesting methods should be integrated with housing projects
Land management

- Conservation of agricultural land
- Proper regulatory measures should be taken against uncontrolled land reclamation for clay mining, housing and other development

Indoor environment

- Improving air quality
- Improving thermal comfort

Surrounding environment

- Improving biodiversity

Waste management

- Proper disposal and recycling of household waste

Based on the above discussions on different aspects of sustainable-affordable housing, Fig. 2.9 presents an objectives hierarchy model for sustainable-affordable housing. This framework can be used for evaluating the present housing issues or formulating the guidelines for new housing projects for achieving sustainable housing development.
Figure 2.9 Objectives hierarchy model for sustainable-affordable housing (CF₁)
2.4 The conceptual framework for sustainable-affordable housing

The macroeconomic performance sets the overall resource framework for human settlements in all countries. Although there is a clear correlation between economic growth, the level of urbanization, the quality of shelter and basic services provided, and social indicators, there are many exceptions to this rule: policy can make a difference, even when resources are scarce (UNCHS, 1988). This advocates the need for a strong supportive institutional (policy) framework, including a wide range of inputs and expertise to deal with all different aspects, the actors involved and their actions at various levels, to accelerate and integrate the process of development in a sustainable manner.

The existence of inappropriate regulations and inefficient planning systems can also cause havoc with housing supply for the poor majority. Thus housing policy for people living in poverty has multi-objective and multi-institutional relevance (UNCHS, 1990). At the strategic level, sustainable development principles and approaches should be integrated into policy strategies and into the planning process. A hard-core policy framework is thus inevitable for the efficient working of implementation systems, which can optimize the limited resources and integrate the various actors. It is also essential to create a 'pull' from the side of beneficiaries rather than being a 'push' from the authorities in achieving the development of sustainable housing.

The proposed conceptual framework for sustainable-affordable housing (Fig. 2.10) is thus a combination of objectives (CF₁, Fig. 2.9) and strategies (CF₂) for sustainable-affordable housing. CF₁, Objectives for sustainable-affordable housing enlist the criteria for sustainable housing development, and helps in analysing the housing issues. CF₂, strategies for sustainable-affordable housing, is intended to assist in formulating policy recommendations supporting sustainable-affordable housing utilising the criteria set out in the first phase as guidelines.

![Figure 2.10 Conceptual framework for sustainable-affordable housing](image-url)
Policy reforms in the housing sector require a country-specific approach of applying the appropriate instruments to the conditions, challenges, and constraints in each country (World Bank, 1993). Since housing is a region-specific activity, these strategies can be formulated only after the evaluation of housing situation using CF_1. In this framework CF_2 can be considered as a mechanism for achieving the objectives as derived from the analysis using CF_1.

2.5 Conclusion

The basic conceptual model for sustainable-affordable housing shows the interdependence of the four factors of sustainability and as well as their equality. These are the pre-assumptions of this model and will be tested under the context of Kerala.

The conceptual framework developed in this chapter can be used as a general tool for analyzing the housing problems and as well as formulating improved policies for housing the rural poor in any of the developing economies. However, this framework needs some modifications for applying to the housing problems of developed countries as it has peculiar differences in the needs, requirements and specifically in the concept of shelter from that of less developed economies.

The Objectives hierarchy model (CF_1) analyzes the needs and requirements of the beneficiaries from their own viewpoints and enlist them under the heads of different objectives of sustainable development. Based on the analysis of CF_1, strategies have to be formulated according to the requirements of sustainable-affordable housing. CF_2 brings up integrated strategies for addressing the housing problem as defined by CF_1, considering the regional requirements.

This conceptual framework will be applied and tested in this thesis in analyzing the housing situation of the poor in Kerala and formulating strategies for sustainable housing development.