ENVIRONMENTAL MANAGEMENT
FOR
SUSTAINABLE HOUSING DEVELOPMENT

A DISSERTATION SUBMITTED TO THE
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ABSTRACT.

Present day development has become a popular term. Development is a phenomenon that deals with socio-economic and environmental dimensions. Life and built forms sustain in the nature without any conflict. However with the industrial revolution and rapid increase of population growth have been accused of promoting development at the cost of environment and quality of human life.

Sustainable development as the path of progress to meets the needs and aspirations of the present generation without compromising the ability of future generations to meet their needs. Satisfying socio-economic needs and enhanced resource utilization and protection from pollution are the major parameters of sustainable development.

For a housing development, sustainability depend on, how and to what extent the occupants meet their needs and aspirations, their satisfaction of them and how the housing development and the occupants deal with the environment.

Most of the present housing seem are remote from residents' expectations and thereby create problems and conflicts on their life style as well as with the natural environment and also with built environment. This situation directly creates impacts on sustainability of housing. The cause may be the lack of consideration on managing the housing environment.

According to these consequences, the study on importance of housing environment of housing environment and its management aspect would fulfill the awareness gap between the sustainability and unsustainability of housing and help to make awareness among the professionals who are involved in the housing sector.

Under this, the study identifies the notions of housing environment, the importance of them and discuss how to manage them for habitable and environmentally responsible housing development. As a holistic approach this study analytically examines the housing environment with environmental management point of view for a sustainable housing development.

INTRODUCTION

INTRODUCTION.

Sustaining the living condition is one of the major goals in planned housing. But most of the existing housing schemes have not achieved this. The reason may be lack of consideration in socio-economic and environmental aspects in a holistic framework relation to housing. As a result present housing are increasingly getting congested with haphazard developments and poor environmental conditions. This situation has raised the necessity for a suitable system of managing housing development which are aiming the final goal of sustainable housing development. According to the definition for sustainable development, the environment is doing a major contribution to sustainability of housing. Therefore the managed housing environment should be the major solution for the percent and future housing development problems.

When considering the housing environment, it has completely different environmental aspects and it is very difficult to tackle each and every aspect separately. Because these are integrated and interdependent with each other.

Managing of housing environment is not an easy task. It is not an individual responsibility for the architect. For a successful housing environmental management there should be a team effort among the professional decision makers and the occupants.

Lack of identification of architects contribution for environmental management is one of the reasons for poor housing environmental management. Though direct contribution from architects is not visible for some environmental aspects, there would be an indirect contribution which links with the others.

This dissertation will enable the reader to grasp some effective notions and procedures that can be applied, by professionals and their importance for the design

and management of residential environments. Otherwise these professionals will fall short of their goals to create humane dwellings. It is one issue to lament the work of these professionals, but quite a different issue to act in order to change this current state of environmental awareness.

This dissertation endeavors to illustrate the importance of the housing environment to sustainable housing development, at least in part if these professionals widen and deepen their knowledge for application in the architectural design process.

The theoretical and methodological issues addressed in each section in part two of this dissertation illustrate how the application of notions and methods from the socio-economic and the environmental sciences transcends specific design and management tasks, that architects and other professionals and housing managers confront. The main obstacle currently facing these professionals is not only the reluctance of public or private corporations, or the general public, to make the housing development sustainable. But the inadequacy of these professions to redefine and promote their services in terms of a sound framework of knowledge. Aesthetic whims can be replaced by a sound management of residential environments if the issues presented in this dissertation are considered by these professionals in the immediate future.

The study is based on the definitions of sustainability and the sustainable development. On that basis the study would identify the aspects and parameters in relation to sustainable housing development while discussing their significance and contribution for achieve the above said goal.

It is important to note the scope and limitations of this dissertation. First, part one focuses on separate issues related to development, sustainability, housing and the environment. Part two of the dissertation is primarily concerned with the

environmental organization of the housing while analyzing its importance and vitality for sustainable housing development.

Issues are usually discussed with reference to all levels of housing rather than adhere to certain levels of housing. Sometimes the study focuses on issues related to the environment and use of housing for a population, that is not restricted by age, demographic structure or ethnic and economic status. The general examples here in do not imply to housing domestic life for specific group of people.

However it is important to notice that when considering certain housing schemes, housing units their immediate surroundings and residential neighborhoods do not differ merely in size, also in terms of their social composition and their spatial organization. Therefore variables other than those presented in part two of the study would require analysis if the design and the use of housing schemes are to be comprehended.

The housing environment is not a narrow subject. As we discussed earlier it is a wide and complex subject having socio-economic and environmental notions. This situation has raised the necessity for a suitable system of management of housing environment and awareness of it among the professionals and the occupants. Finally if the present generations takes this step forward it would pave the path towards sustainable housing development and sustainability of the world in broader sense.

CHAPTER ONE

SUSTAINABLE DEVELOPMENT.

Present day the notions of sustainable development has become a popular concept all around the world. It has become a more fashion rather than its proper use among the professionals. This is because of the lack of identification and definition of the sustainable development.

1.1. Introduction to Development.

Development is usually defined in terms of economic growth. When countries experience increased growth in economic sectors and expansion of their productive capacities they experience "development".

When we speak about development, development is often confused with growth, growth conveys the idea of physical or quantitative expansion of the economic system. By contrast development is a qualitative concept incorporating notions of improvement and socio-economic as well as environmental dimensions.

The development of human beings could be also considered as the social and economic upward mobility of the society.

When considering development the immediate question which arises is to what extent the development can be measured?. The most familiar indicator of development is the Gross National Product (GNP) of the country. GNP statistics record the productive utilization of resources, whether or not these resources are renewable. Moreover, if productive activity is associated with the costs of economic growth through pollution control, for example, this is also entered under GNP. Deforestation, bringing with it a loss of resources is usually treated, for example as a net contribution to capital growth (Pearce 1986). From an environmental standpoint, then GNP is particularly an inadequate guide to development since it treats sustainable and unsustainable production alike and compounds the error by including

the cost of unsustainable economic activity on the credit side, while largely ignoring processes of recycling and energy conversion which do not lead to the production of goods or marketable services.

In this situation, we have to incorporate the notions of sustainability, when we speak about development.

1.2. Concept of Sustainability

Sustainability is not entirely a new concept. It could be seen in the practices of many traditional societies even today.

Sustainability could be defined as "Meeting the basic needs of all extending to all the opportunities to satisfy their aspirations for better life." (Brundtland 1989) For many people, growing affluence has made luxuries into needs; Yet the least well off are unable to attain basic necessities, let alone satisfying their modest aspirations.

As a goal, the sustainable approach is a concept of enormous persuasiveness as well as of increasingly recognized validity. It seeks to merge and thus to resolve the apparently competing goals of economic growth, socio-cultural continuance and ecological balance. (UNCHS, 1990 : v)

The sustainability of any civilization depends on how the resources are utilized, the sustainability of the environment, this becomes central to both growth and economic development, while business, agriculture and industry have responsibilities to sustain the environment. Consumers also have a responsibility to efficiently utilize resources and conserve the environment for future generations. All actions or omissions of consumers have an impact on the sustainability of the environment.

1.3. Definition for Sustainable Development.

"Sustainable Development" has become a key term during the last few years in many fields both at National and International levels.

"Before that, world redefined open rural development, Integrated Development, Urbanization and Industrialization for progression. But now it is accepted that all these have to be done within the frame work of Sustainable Development." (Chandrasekara,1996:13)

Meaning of sustainable development is elusive because the concept is vague and complex. Its vagueness encourages environmentalists, politicians ,architects among many to claim to be pursuing sustainable goals. Its complexity stimulates a wide range of potential definitions which can be used to support divergent objectives.

According to Brundtland, sustainable development is "Path of human progress which meets the needs and aspirations of the present generation without compromising the ability of future generations to meet their own needs." (Brundtland 1989)

Brundtland (1987) also state that " Sustainable development does not imply a fixed state It is a process of change in which economic and fiscal policies, trade and foreign policies energy, agricultural and industrial policies all aim to induce development path that are economically socially and ecologically sustainable".

For long term sustainability the development proposals should be:

a. Technically feasible
b. Economically viable
c. Socially desirable
d. Politically acceptable , and
e. Environmentally friendly.

In conventional terms, the concept of sustainable development encompasses;

1. Help for the poorest, because they have no option but to destroy their environment.
2. The idea of self-reliant development, within national or local boundaries and within natural resources constraints.
3. The idea of cost-effective development, but often on different, time scales to traditional economic criteria; that is to say development should not degrade environmental quality. How should it reduce productivity in the long run.
4. The great issues of health control, appropriate technologies in food, self-reliance, clean water and shelter for all.
5. The notion that people-centered initiatives are needed; human beings are the resources in the concept.

The call for sustainable development in Agenda 21 is not simply a call for environmental protection. Instead, sustainable development implies a new concept of economic growth - one that provides fairness and opportunity for all the world's people not just the privileged few, without further destroying the world's natural resources and without further compromising the carrying capacity of the globe. Sustainable development is a process by which economic, social environmental, fiscal, trade, agricultural and industrial technological policies designed and are mutually supportive in such a way as to bring about development which is economically, socially and environmentally sustainable. (fig:01) This is the message of Agenda 21 of United Nations and is reflected in its structure and logic.

The Agenda 21 also states that "sustainable development" will not be achieved by accident but must be consciously planned and worked for at all levels from the international to local.

The world Commission on Environment and Development (WCED) has defined sustainable development as "a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development

and institutional change are all in harmony and enhance both current and future potentials to meet human needs and aspirations" (Brad, 1990:33)

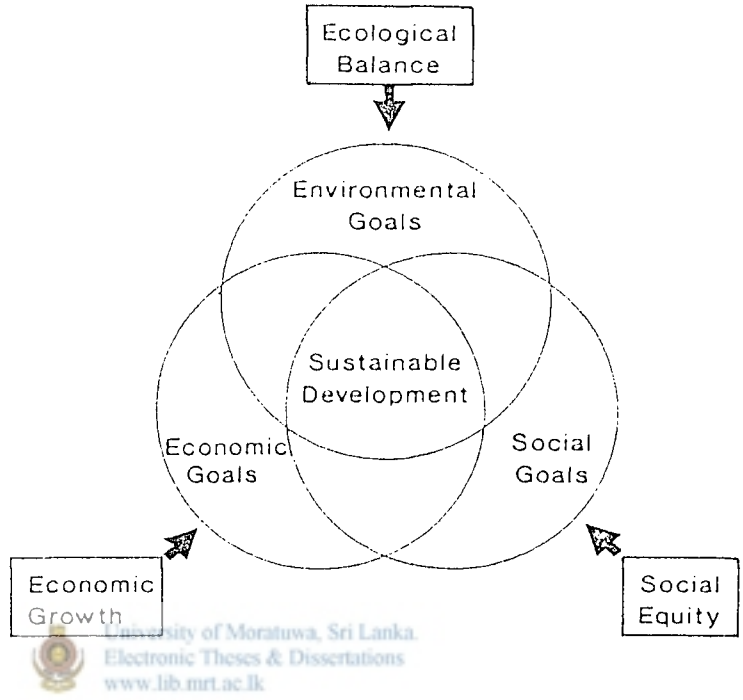

Fig: 01. Sustainable Development Model of Jacob & Sadler

(Source: UNESCO-UNEP. 1992)

Houston (1989:26) further argues that, sustainability calls for wholeness and not fragmentation, and defines it in a formula as,

Wise use of natural resources

+

Equitable and just development Strategies

+

Population and Family Planning

=

Sustainable Development

Further, Blowers (1993;7) argues that " Sustainable development is an integrating concept bridging together local and global, short and long term environment and development. It urges the need for action now to defend the future". He also presents the goals of sustainable development.

a. Resource conservation.
b. Built development
c. Environmental quality
d. Social equality
e. Political participation

Finally we can identify there are two key concepts containing within the definitions for sustainable development.

* The concept of "needs", in particular the essential needs of the world's poor to which overriding priority should be given;
* The idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

1.4. Need for Sustainable Development.

The problem of reconciling the imperatives of economic growth on one hand and safeguarding the ecosystem and socio-cultural system on the other is one of the greatest issues in the present era.

When we consider the development and the environment, they are linked with each other, in other words without conserving the environment you cannot have development, and without development there is no necessity for environmental conservation.

Development also has conflicts, that is if we want to have development, the price to pay would be a loss in environmental quality. Therefore the need for long term development has to be identified, as such the terms "ecodevelopment", "environmentally sound development" and "sustainable development" have come into widespread use.

"Due to the increasing awareness of the adverse repercussions of industrialization biased development and population growth the necessity of evolving a new strategy for development" has been raised by governments and international institutions world over. As a result the notion of sustainable development to combat the degradation of the environment and the depletion of the limited resources available, while sustaining the development has come into the fore" (Ranasinghe, 1996).

"The concept of sustainable development provides a framework for the integration of environment policies, and development strategies. The term 'development' being used here in its broadcast sense. The world is often taken to refer to the processes of economic and social change in the third world. But the integration of environment and development is required in all countries, rich and poor. The pursuit of sustainable development requires changes in the domestic and international policies of every nation" (WCED. 1996 : 40)

Though there is a need, the sustainable development will not be achieved by accident but must be consciously planned and worked for at all levels. Therefore the need for a better foundation has arisen for sustainable development.

1.5. Foundation for Sustainable Development.

The satisfaction of human needs and aspirations is so obviously an objective of productive activity that it may appear redundant to assert its central role in the concept of sustainable development. All too often poverty is such that people cannot satisfy

their needs for survival and well-being even if goods and services are available. At the same time, the demands of those, not in poverty may have major environmental consequences.

Therefore if we could provide some kind of establishment which could satisfy the need and aspirations of the human, it would become the more suitable foundation for sustainable development. Good shelter is the best solution for this situation.

As a example, (Cooper, 1975) established the list of basic human needs. He accounts for both conscious and unconscious human motivations and personality. In brief, this hierarchy of needs confirms to the following schema.

1. Physiological needs — Primary level
   (homeostasis, food consumption, sexual behavior)

---

2. Safety needs — Secondary level
   (security ; stability ; dependency ; protection ; free from fear, anxiety and chaos; need for structure, order, law, limits.....)
3. Belongingness and love needs.
   (stable affectionute relations with people and places, including homes and neighborhoods.....)
4. Esteem Needs.
   (firstly, for strength achievement adequacy, mastery and competence ; for confidence, independence and freedom ; secondly for reputation, prestige, status fame and glory, dominance, recognition, attention, importance, dignity and appreciation)

---

5. Need for self-Actualization — Tertiary level
   (individual differences are significant at this level)
6. Cognitive capacities
   (the desires to know and to understand are the preconditions for the basic need satisfactions)
7. Aesthetic Needs
   (need for order, symmetry, closure, system and structure.)

The above mentioned hierarchy of human needs show us how important a role could be played by housing to satisfy them. Therefore the list of basic human needs could be modified as follows by giving the prominent place for the shelter than others.

1. shelter
2. security
3. comfort
4. socialization and self expression
5. aesthetics

Shelter is a basic need of human beings and most professionals are getting involved in giving solutions for that particular problem, but the complexity of the society and the changing user needs have made it a more complicated problem. And the inter-relationship between the house and the human being may be the most strong one, compared to the other relationships between built environment and user groups, because they spend most part of their lives within the house; Hence the environment of houses and the needs of householders may be more complex when we consider houses and housing schemes, because of the complexity of the users. Therefore, the study of sustainability of environment of housing schemes on user needs may produce much more importance to the sustainable development.

Besides, it is widely believed that housing could also facilitate the realization of other human needs which are of a qualitative nature. As Angel (1986) outlines, housing from a more complex point of view is seen as a product as well as a process of interrelated aspects having physical, psychological, cultural, ecological and economic dimensions.

Eventhough there are qualitative environmental aspects for better living condition, it is apparent that housing today has somewhat deviated from these multi-dimensions towards selected aspects or just the provision of physical entities.

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CHAPTER TWO

SUSTAINABLE HOUSING DEVELOPMENT.

For a sustainable housing development, there should be a clear identification on notions of the housing problems, How important they are and how to deal with them, within the existing housing situation.

2.1. Housing and Housing Crisis

Many professionals such as architects and planners had given interpretations to the housing and housing crisis in relation to their various point of views.

"The concept of housing is more than merely a physical shell. Housing encompasses all the auxiliary services and community facilities which are necessary to human well being" (UN 1976 ; 1)

Turner (1972 ; 151) states that " The word housing can be used as a noun or verb, when used as a noun, housing describes a commodity or activity of housing. While the idea of housing as a collective noun is obviously associated with housing activities." The word itself does not generally indicate this fact.

From a more complex point of view, housing is a product of various interrelated aspects having social, cultural, economic, political and organizational dimensions. (Angle, 1986) Housing as a manifestation of cultural process relates to specific values, attitudes, customs and beliefs of the society. Housing in relation to social process associates with the aspects like human behavior, human settlements, social groupings, social status as well as some symbolic meanings. (Perera, 1989)

In contrast to these recurrent interpretations, Michelson (1980;138) argues "that additional, sometimes crucial, aspects of housing satisfactions revolve around the dynamics of attitude management overtime within the minds and lines of individual persons and families, Moreover one must recognize the diversity of

evaluation criteria potentially mastered, some of which reflect orientations towards the future and which in any case go well beyond the status quo residential environment".

The contradiction between the housing and the human satisfaction on their needs is a complex problem, Michelson (1980;49) argues on that, " As applied to housing with its greater contextual implications, my argument suggests that people are indeed capable of maintaining different and often mutually exclusive wants. They can manage these without dissonance because housing is a product which people typically change several or many times during their life time. A family can look forward to different types of housing, each fulfilling rather different wants, over the course of many years, provided that family economics, the housing market, and other circumstances make this appear feasible". He also gives four specific points under his arguments.

1. Housing choice at any point in time may not necessarily reflect ultimate aspirations. Immediate goals to be served may be long or short term, though less valid, housing which is preferably satisfactory during a brief period of occupancy can be replaced without the need for a "push" by other housing, reflecting quite different short-or long term desires.

2. People's satisfaction with their current housing is in part a function of their expectations for the future, apart from the degree of satisfaction or dissatisfaction engendered by the objective characteristics of present surroundings.

3. The basis on which people judge their housing is therefore a function of conditions that may or not support holding conflicting thoughts applicable to present and future time periods.

4. Human behavior observed in any particular residential setting is not necessarily characteristics of the individual or family doing it, nor the most deeply seated attitudes or values they hold. If reflects the

environmental opportunity available there, and is consistent with the normative criteria people apply to given residential settings while there. In short residential behavior is highly situational, though not necessarily determined by environmental factors".

Within these concerns, the vernacular traditions, cultural continuity and psychological satisfaction are almost absent in present day mass housing.

Before the industrialization, housing did not create much problems. But with the industrialization, population density has increased in urban areas, the demand for housing also increased. But the quality of housing has decreased. Most of the people who migrate from rural to urban environment do not have any capital to invest on housing or even a proper job. They need only lodging to spend the night and to do odd jobs. This situation creates a series of problems in urban areas: the slums and shanties.

Most of the countries worldwide have failed to overcome this situation, therefore haphazard development has taken place. As result the problems such as overcrowding on existing housing, overload on infrastructure facilities unhealthy, unlivable environment, environmental pollution, disasters and social problems have arisen. In relation to this, human values also have lost and every thing is valued on a monetary basis. As such interrelationship within the community also has been destroyed.

"Since the mid-nineteenth century, architects, housing reformers, politicians and the public have become increasingly concerned about problems of physical and moral well-being that were commonly linked to insanitary and over crowded conditions in residential quarters of expanding industrial towns". (Lowrence ; 1987:9)

It is true that housing strategies sometimes take environmental concerns such as neighborhood conditions, infrastructure facilities, environmental services, standards of living, quality of the built-environment etc., into account. But, these strategies do not show any drastic development in housing.

"..... the first point we notice about mass housing is its universal application, so universal indeed that housing generally and mass housing are regarded as almost synonymous concepts. If anyone, therefore puts forward his notion about housing it is automatically assumed that he is speaking about the way in which he wishes to apply mass housing. Any proposal for the solution of the housing problem is expected to mean yet another way of doing the same thing." (Habraken, 1972 ; 6,7)

Therefore housing should reform its notions at the initial stage of the housing policy planning and investment level.

2.2. Housing Policy and Investment on Housing.

The magnitude of the housing problem in developing nations has generated a great deal of interest on the part of governments for a comprehensive set of housing policy guidelines. However, there appears to be no general consensus on the meaning of the term "housing" for that reason.

The improvement of the quality of life is the most important goal of human settlement policies. This goal and its resulting objectives however are common to every sector of economic and social life. As a result human settlements ought to be considered both as an instrument and an object of development designed to facilitate the continuous improvement in the quality of life. An optimum relationship between human settlement policy and economic development policy can lead to increasing satisfaction of human needs and is a necessary means towards raising, the quality of life while contributing to an equitable distribution of benefits among all people.

In the global context housing is a not only political issue, but also related mainly to development planning in the third world countries. Many nations have realized the gravity of their housing problems in order to achieve the targeted goals of development.

The investment for development of new or renovated housing creates economic stimuli to employment, production and savings in a variety of areas, such as; the following,

1. Investment in new housing construction is an important concept of the process of capital formation of a country.

2. In developing nations, the construction of housing is in itself an important economic activity providing substantial and direct employment opportunities which is provide training more than the other employment generating sectors of the economy.

3. A strong housing sector helps to promote the development of an efficient construction industry and commerce, given that in the early stages of industrialization, 50% to 60% of capital investment typically is channeled into construction.

4. Housing construction, even in relatively poor countries, has multiplier effects on industries manufacturing consumer durable goods for the home. Many of these are labour-intensive, and some are produced in small workshops in lower-income neighborhoods.

5. Finally, the desire for a better dwelling. It is clear that housing provides a focus and an incentive for personal saving, in developing countries as well as in industrialized countries. Financial institutions that can mobilize these savings are motivated to expand their operations once they perceive that a potential demand for their service exists. (UN 1978)

Within these concerns, sustainable housing development requires holistic policies incorporating continuance of socio-cultural traditions, generating livelihoods, psychological satisfaction and overall harmony with the ecosystem. This would mean the reconsideration of the key issues which are absent in housing policy formulation today. (Perera, 1996)

2.3. Housing as a part of Human Development.

As a base for providing satisfaction to human needs housing could be considered as a tool for human development.

"..... when searching for the essence of an important aspect of our civilization we should not only consider what is being done. But above all who does it, and why, did sense it is, as will appear, much more important to understand how a dwelling comes about than what it looks like, Mass housing takes away a man's act, and presents him with a form; it seeks to provide a comfortable from to be used by people who do not have to lift a finger to influence it. Does this not place mass housing, however skillful it may be, beyond our civilization ? Following this line of thought, it is therefore justified to direct attention to the initiative and activities of the individual. In order to regain control over our housing we must rediscover what has been lost through a long preoccupation with mass housing and regard it with a fresh eye" (Habraken, 1972 ; 11,12)

Good housing however is defined as an essential place among development goals, therefore housing is integrated into the national development planning process.

According to the United Nations "Good housing is essential for human dignity and self fulfillment. It provides "the physical framework in which man's human, social, economic an cultural resources are released, enriched and integrated" (UN; 63:1)

Therefore housing is not providing merely shelter for living. It should be able to sustain the living condition of the occupants.

Even further, good housing creates the social climate necessary for the orderly development of society. This is necessary for socio-economic development. An adequate housing with good sanitary facilities contributes directly to individual health and productivity, which are important for national economic growth and improved standard of living. Therefore to sustain the living condition of the people, housing also should be sustainable.

2.4. Sustainability of Housing.

Sustainability is an ideology which cannot be achieved by 100%, because of restrictions and limitations on every subject. But sustainability can be achieved to a certain extent. As an example in relation to housing, housing should be able to sustain the living condition of the occupants, at the same time housing should have a flexibility for changing needs of the future while responding to all other aspects.

Therefore it is a difficult task to respond to each and every aspect of housing, it can not be done as well. In this case priority should be given to more critical and vital aspects of the particular housing projects, others must be considered as much as possible within the framework of sustainability.

Even, when we consider housing with natural environmental aspects, "shelter of housing is a basic need of all humans and also for some animals, but here we can notice a difference. The structures built by animals are identified as natural, but the structures constructed by humans are not considered as natural. The natural structures are a part of a sustainable system. But most of the human settlements do not positively contribute to a sustainable growth pattern." (Chandrasekara, 1996;13)

Our traditional architecture posed the sustainability of the past. It echoes the environmental harmony with built and unbuilt. Unconsciously our ancestors adhered to sustainable life style. (fig : 02, & 03)

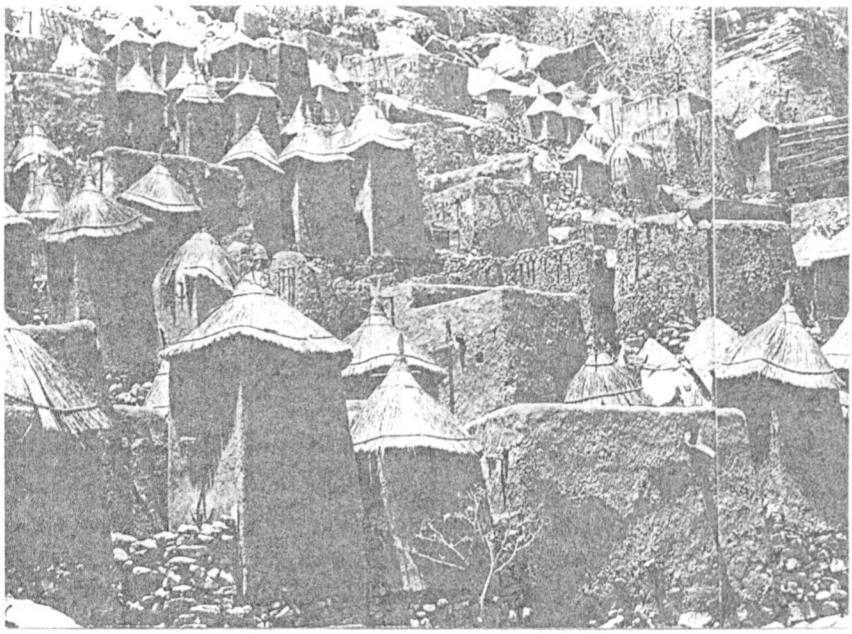


Fig : 02. Indigenous human settlement which close to the nature.

(Source : Pearson, 1991)

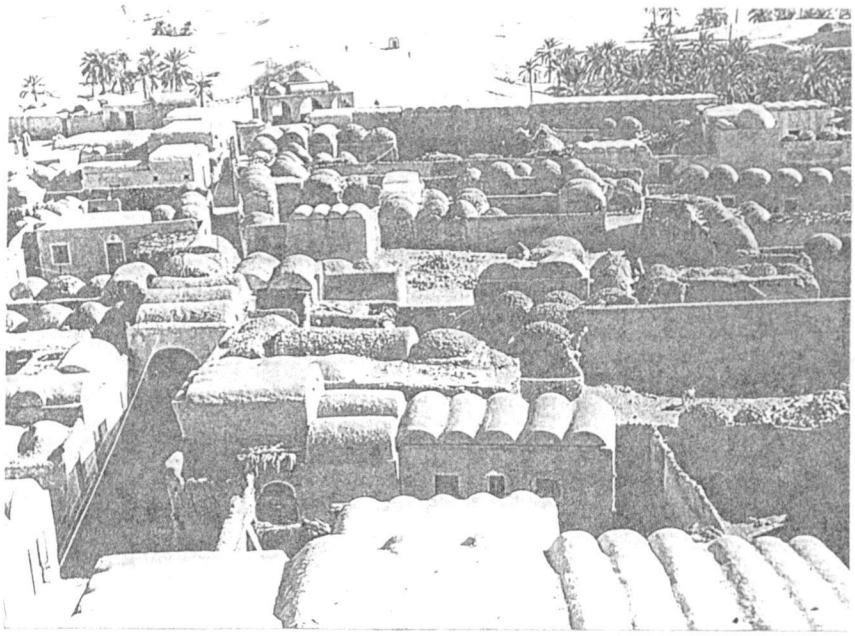


Fig : 03. Architect designed settlement for indigenous people.

(Source : Pearson, 1991)

The implications of sustainable development paradigm on housing development add more concerns to the existing housing policies. In other words, the term sustainable development brings together three strands of thought about housing which are conspicuous by their absence in policy formulation today. i.e., the broader concerns on environment, economic structure and social system. (Perera, 1996;51). (fig : 04)

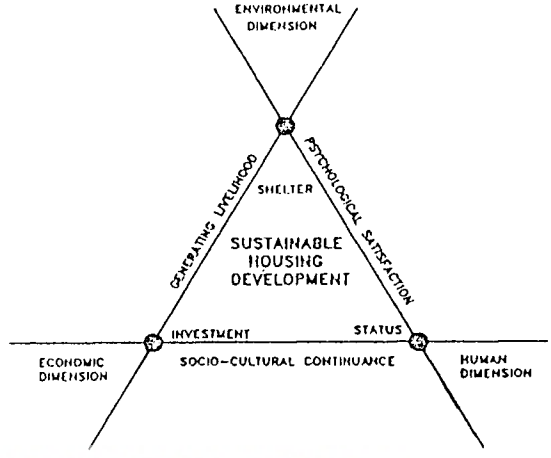


Fig : 04. Concept of sustainable Housing Development
(Source - Perera 1996;51)

Therefore, it is always better to take 'preventive' policy actions, which are difficult to adapt but holistic wherein housing is a potential tool for attaining sustainable development. (Cuncha,1988;16) This would mean the consideration of the key imperatives that are conspicuous by their not so strong presence in policy formulation today. In other words, the sustainable housing development process requires a transformation of the house from a typified physical entity to a total entity which satisfies ;

1. The physical need for shelter ; Protection from the natural elements.

2. The economic need for investment ; Resources utilization within the activity cycle and facilitating a livelihood.

3. The psychological need for personalisation ; Psychological satisfaction in a personalized territory.

4. The social need for cultural continuity ; passing on traditions with vital indigenous additions.

5. The spiritual need for consonance ; harmony and peace with the ecosystem.

(fig : 05).

Satisfying these needs are a prerequisite for a long term sustainable solution to the housing problem that meet the housing needs of the present without compromising the ability of future generations to meet their own housing needs. In other words, satisfying these needs in facility has a long term dimension unlike the short term dimension in schemes such as public built housing or developer built housing. Moreover, such a process enables to make a home out of a house and a residential community out of a group of people living in a group of dwellings. (Perera, 1996 ; 52)

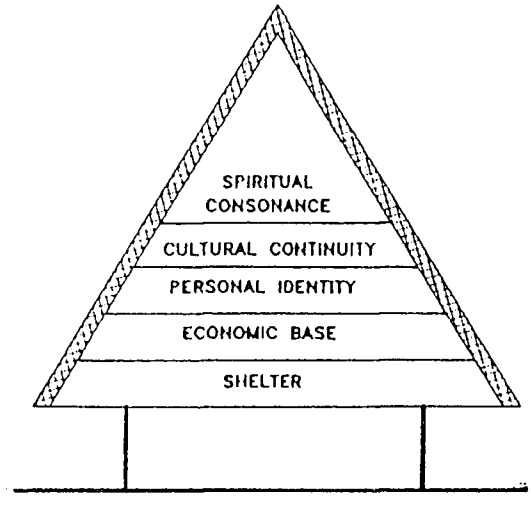


Fig : 05. Holistic framework of Housing (Source - Perera, 1996;12)

Finally the housing development should be able to be more environmentally sound, both socio-economically and physically to achieve sustainability.

CHAPTER THREE

ENVIRONMENTAL MANAGEMENT.

Environmental Management is a synthesis of Design and planning for Sustainable development. The main objectives of environmental management are maintain the environment's carrying capacity to achieve goals of sustainable development and satisfying the needs and aspiration to sustain the living condition of human.

3.1. Housing Environment.

The 'environment' is usually looked upon as located outside ourselves. it is the space that we inhabit. This 'bounded' quality of the environment is seen as its defining characteristics. In this chapter a rather different view is expressed ; the 'environment' is looked upon as process rather than form, as the result of a set of relationships between physical space, natural resources and a constantly changing pattern of social and economic forces.

When we consider housing it is not merely for living; As we discussed early "housing is not 'shelter' or 'household facilities' alone. But it comprises a number of facilities, services and utilities which link the individual and his family to the community, and the community to the region in which it grows and progresses. (UN, 63;1) (fig : 06).

In this situation the housing environment is a vast area. For ease of study further clarification of housing environment has separated in to components as follows. (fig : 07).

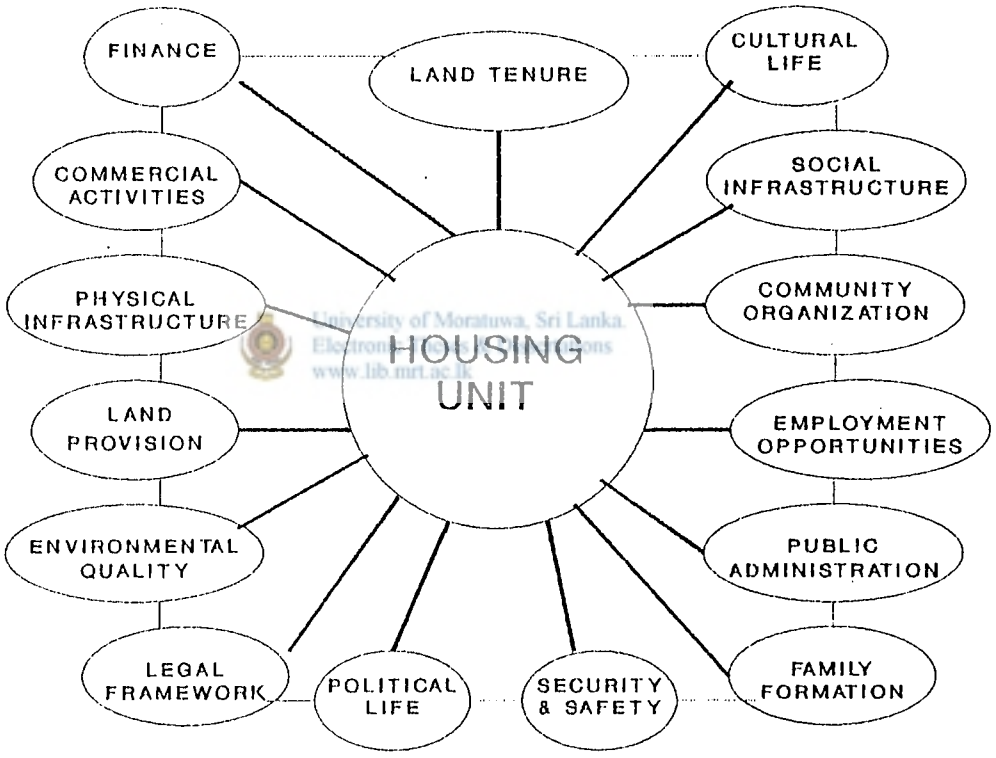


Fig : 06. Housing as a System.

A planner's point of view on housing environment.

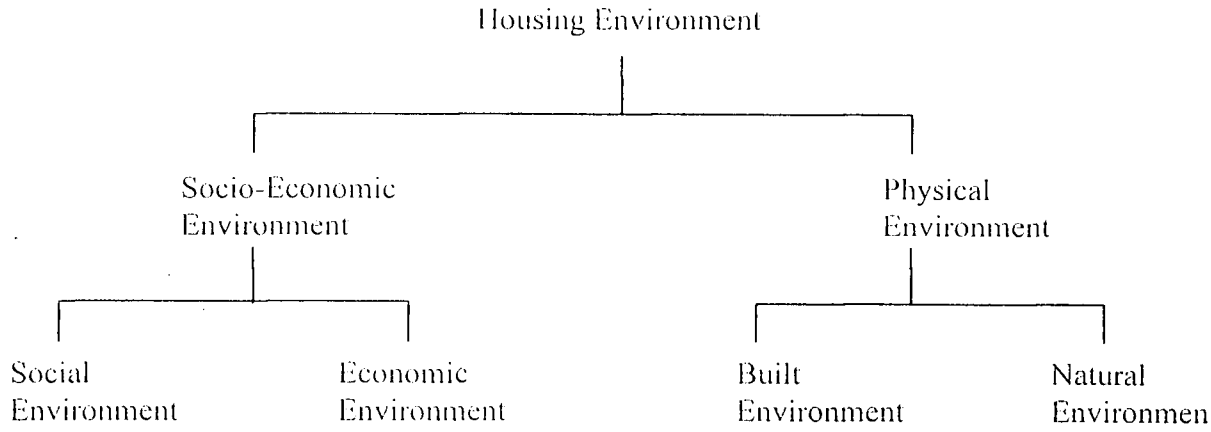


Fig : 07. Components of Housing Environment.

Although these are separate for the purpose of study these components are integrated with each other, therefore it is a very difficult task to analyze a single component in depth without considering others.

3.2. Need of Consideration on Housing Environment.

In today's context, a common situation that can be seen is the ignoring of environmental aspects on development, as sometimes it may be less awareness or deliberate negligence according to prevailing market conditions.

The awareness of the housing environment should be raised even if the professionals' point of view is devalued. Appleyard (1972;272) state that "Professionals see the environment as a physical entity, a functional container, an accumulation of goods or commodities, a setting for social action or programs, a pattern of land-uses, a sensuous experience, or a natural ecosystem, but rarely do they see it as a social or political symbol."

When considering the socio economic environment of housing Pyatok and Weber (1978;203) go into discuss; "Most people's contact with their environment

has been reduced to the experience of a user of a commodity. The existing social relations do not permit people to become makers of the environment, involved in the critical process to bring it into being continuously. For this reason the design and development of residential settlements require that their makers / users reexamine their own internal relations as well as their links to the existing context. They need to identify how these relations constrain and handicap their very ability to conceptualize an alternative. The creation of an alternative process and product, the reexamination of social and political relationships and the formation of a language to accomplish this must all organically evolve together".

Lack of human qualities have failed to satisfy users in mass housing schemes, where people require an emotional bond with the physical structure. (Allsop, 1974 ;38) He further states that failure to provide adequate homes for people and the provision of mere accommodation have severe consequences for the society.

"The built environment and its patterns have a clear and direct relationship to the sustainable growth of any society. It is not possible to imagine a self-sustainable system of built-environment, but a built environment which will contribute to sustainable growth both in material and spiritual terms. In this regard the human settlements or housing play a vital role because it occupies a major portion of habitable land" (Chandrasekara, 1996:13).

According to these consequences we can see housing today has somewhat deviated from its sustainability. Further it can be apparent when examined the following sets of variables (Lawrence 1987;211) on housing environment.

1. The personal characteristics of the respondents(including demographic and socio-economic variables and their residential biography).

2. The physical feature of a sample extant residential environments and the respondents appraisal of the maintenance and cleanliness of collective areas.

3. The resident's images of the residential environment.

4. The appraisal of the residential environment by the occupants.

5. Their degree of satisfaction with that environment, and

6. The reported (rather than the observed) behavior of the respondents.

3.3. Housing Development and Socio-Economic Environment.

Satisfying the needs and aspirations is a prerequisite for a long term sustainable housing solution. Therefore, to achieve the consequences of satisfaction on the occupant, socio-economic environment of housing should have a greater consideration.

In other words, sustaining the socio-economic environment of housing is very important to improve the quality of life. Socio-economic environment of housing for individual person could be considered as his family, neighborhood, community with cultural, religious and demographic background, level of education and health, employment and workplace etc.

How can housing contribute to social development? Decent housing is widely recognized as housing has an important role to play in social development. It relieves overcrowding , create a more sanitary environment and, in the case of housing for sale, fosters a statutory sense of property ownership. Housing, of course also enables its occupants to carry on many activities, such as sleep, entertainment, cooking and the like, which have implications and consequences directly related to an individual's physical, mental and social well-being as housing is only one of many independent variables affecting well-being. However, more must be learned about the causal relations that exist between housing and the many factors which constitute its well-being.

In 1970 an adhoc expert group on social programming of housing, concluded that "In the fulfillment of social needs, housing plays both a direct and indirect role, and both roles are decisive. In its direct role housing serves as the area where the individual becomes capable of experiencing community and privacy, social well-being and shelter and protection against holistic physical forces and disturbances. In its indirect role housing serves as the area where an abundant supply of social relationship and services are accessible, such as places for social intercourse, education, recreation, sports, social welfare and health protecting services, shopping and transportation. (UN Sales No 71;13)

Lawrence (1987;192) has done a literature survey on socio-economic environment of housing and identified eighteen hypothetical variables related to residents' satisfaction as follows.

a. Density / Crowding
b. Safety / Security
c. aesthetics / appearance
d. Site facilities
e. access to friends
f. Site location / access to community
g. maintenance
h. economic cost
i. Sense of community
j. Management policy
k. Personal freedom / privacy
l. resident's perception of surrounding community
m. perception of neighbors
n. personality characteristics of residents
o. demographic characteristics of residents
p. behavior in public spaces
q. Comparison of the current residence to prior residence
u. Future aspirations of the residents

The above variables are simply the needs and aspirations of a normal human being which could satisfy from a sustained living condition.

When we consider housing, from a consumption point of view, much of public housing serves primarily a social overhead function, it has been seen in the preceding section that the construction of housing provides jobs and training in the building industry; moreover, cost benefit analysis has been applied to increased worker productivity improved educational opportunities and reduced health costs, when measured in monetary terms and discounted to find their present value costs to the government of housing. It should also be noted that housing is often an essential component to the development of a new industry or to such activities as land reclamation and irrigation. On the other hand however, there is no doubt that a sustainable and equitable subsidized housing program will play a major role in the redistribution of income in a developing nation. Therefore sustainable socio-economic environment of housing can be considered as a national economic development tool.

But the socio economic environment of housing cannot be developed independently. Other elements of housing also have to be considered with socio economic development.

3.4. Housing Development and Physical Environment.

Physical environment of housing can be broadly classified into two separate components namely natural environment and man made or built environment. This composition of the housing environment of course may vary according to the degree of urbanization and scale of housing development.

The condition of physical environment has direct relationship with the socio-economic environment of housing. As an example the poor physical environmental quality would create unhealthy unlivable situation. Direct impact of this can be seen on occupants' socio-economic lives when they have to spend most of their income for

medical treatments and medicine, and also an increase of birth to death ratio within the settlement.

In other words, development involves a progressive transformation of economy and society. A development path that is sustainable in a physical sense could theoretically be pursued even in a rigid social and political setting. But physical sustainability cannot be secured unless development policies pay attention to such considerations as changes in access to resources and in the distribution of costs and benefits. Even the narrow notions of physical sustainability imply a concern for social equity between generations, a concern that must logically be extended to equity within each generation.

Within the process of housing development more attention should be paid to the natural environment as well as the built environment for sustainability of the development.

Creating the conditions for housing development has often meant interference with the natural environment and in many cases, outright destruction of part of that environment. The construction and expansion of settlement areas has involved innumerable intrusions upon the environment, some of which have been beneficial to nature but many of which have been proved detrimental. The concern should be not how to prevent development from infringing upon the natural environment, but rather how housing can enhance the total environment. There can be environmentally sound development of housing, within which man can live decently and in ways which will enhance the beauty and harmony of the environment. An environmentally sound process must deal not only with pollution, but also with physical and mental health, the conservation of resources including aesthetically interesting and pleasing visions. The transportation of people, the communication of ideas, and a host of other environmental issues.

As we discuss the importance of the housing environment to its development, a considerable amount of attention should be paid to planning and designing of new housing and, update and maintenance of existing housing environmental conditions. Therefore the need of managing the environment arises.

3.5. Environmental Management for Sustainable Housing Development.

The condition of housing environment is very vital for a reasonable living condition as we discussed in the earlier chapter. Therefore actions should be taken to upgrade the housing environmental quality and prevent further deterioration of the environment. The action may be a kind of process or a set of techniques to manage the environment, towards sustainable housing development.

"..... the concept of sustainable development does imply limits-not absolute limits. But limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities. But technology and social organization can be both managed and improved to make way for a new era of economic growth." (WCED, 1996;8)

As we emphasis the need of environmental management for housing the question arises, What about the existing statutory regulations and, are they not enough to give guidance to manage the housing environment in a proper manner? Our experience gained from the past and present realize that only planning regulations are not enough, to achieve the goal. Therefore environmental management has to tackle those aspects to ensure sustainable housing development. The environmental management can be described as " a responsive set of techniques rather than a frame work for implementing policy." (Redclift, 1987;133).

Balasooriya describes that "The dominant intellectual traditions, which shape urban and suburban policies, are based on instrumental, rational and analytical thinking, obvious systems, like planning sewerage, water utilities, roads and even human values were taken into consideration to create safe, healthy environments, however, science and logical thinking has its limits. Values could be given to these utilities and even healthy environments. But there were no values given to the environmental degradation brought about by human intervention, nor were there criteria for assessment of its sustainable properties, logical, rational and technological

reasoning is a useful tool, but we must now get rid of rigid preconceptions and open ourselves to new thinking and fresh compromises." (Balasooriya, 1996)

Further he states that "with this new constraint, even our approach to creativity would be, to think of the problem afresh, through experimentation, with originality; and by rewriting the accepted rules to the extent of being non-conventional. The implication is that we need to enrich the scientific and quantitative traditions with insight gained from qualitative approaches, but orientated towards a sustainable environment." (Balasooriya, 1996)

Most industrialized countries have learnt from the experience that in order to have long term sustained development it is necessary to have sound environmental management for housing. The developing countries are only gradually coming to accept this view.

According to the definition of sustainable development, A hypothesis could be made, that sustainability of the housing could obtain through the management of housing environment. (fig ; 08).

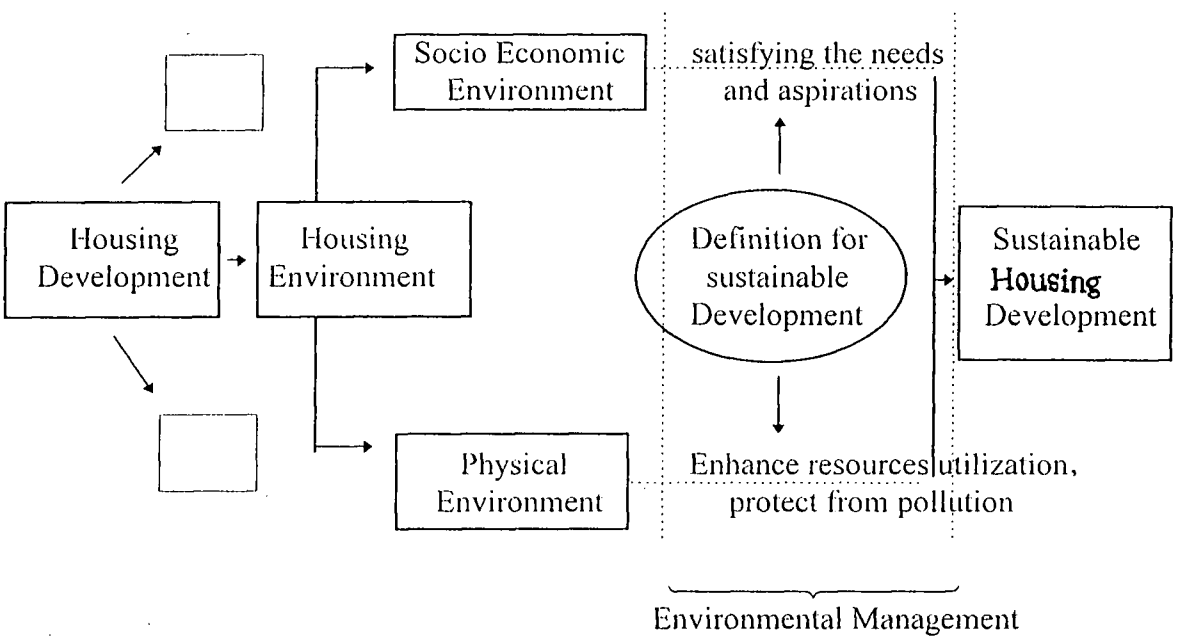


Fig : 08. Environmental Management for Sustainable Housing Development.

United Nations (1976) also set up a structure for improvement of settlements in relation to the environment management of them. (fig : 09).

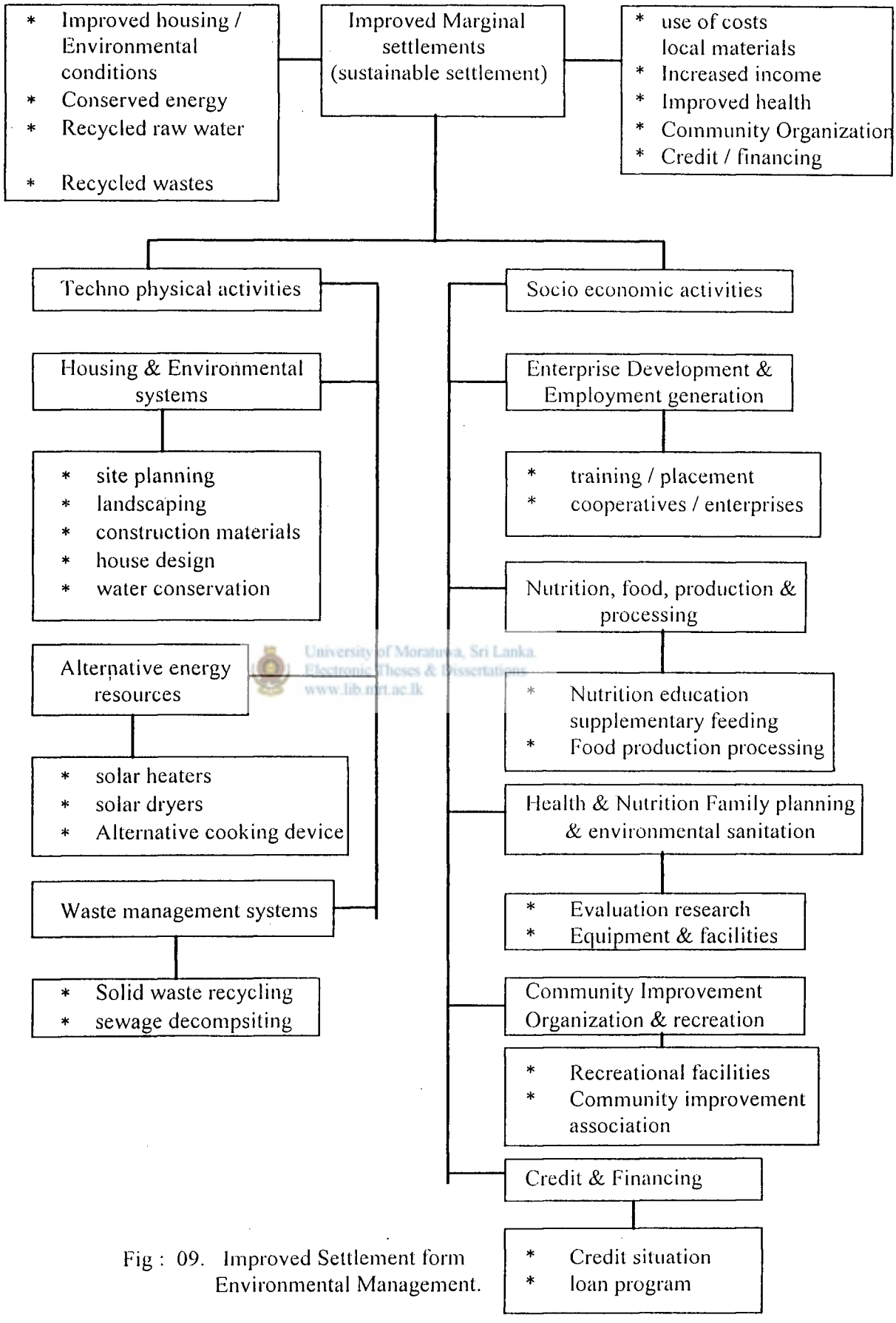


Fig : 09. Improved Settlement form Environmental Management.

(Source : UN;1976)

The above structure describes how to manage the environment under various environmental aspects as well as giving the actions which should be made for manage those.

Although the structure describes the environment under techno physical and socio economic activities it could be considered as same as the physical environment and the socio economic environment which were discussed in this study. But under socio economic activities the above structure does not describe about the psychological concepts of the human which is very important in satisfying the needs and aspirations, though they are represented in the planning and designing of housing and the other environmental aspects.

Although various environmental management strategies are proposed by the professional bodies and the authorities it is very difficult to be implemented by government or the local authorities alone, without peoples participation. Therefore incorporation of people is very important in environmental management.

3.6. People's Participation.

While environmental conditions have severely deteriorated in almost all human settlements, many innovative and non formal approaches to environmental management have been or being undertaken. Community or people's participation is one approach in environmental management.

U.N (1992) describes, people can be involved in environmental management in several ways: ranging from awareness creation about environmental issues and mobilizing "people action" for pollution control, for provision of environmental infrastructure and services. (fig : 10). The success of people's participation depends very much on the specific political, economic, and social conditions in a settlement. However, no matter what the socio-economic conditions are, some form of public participation would prove successful.

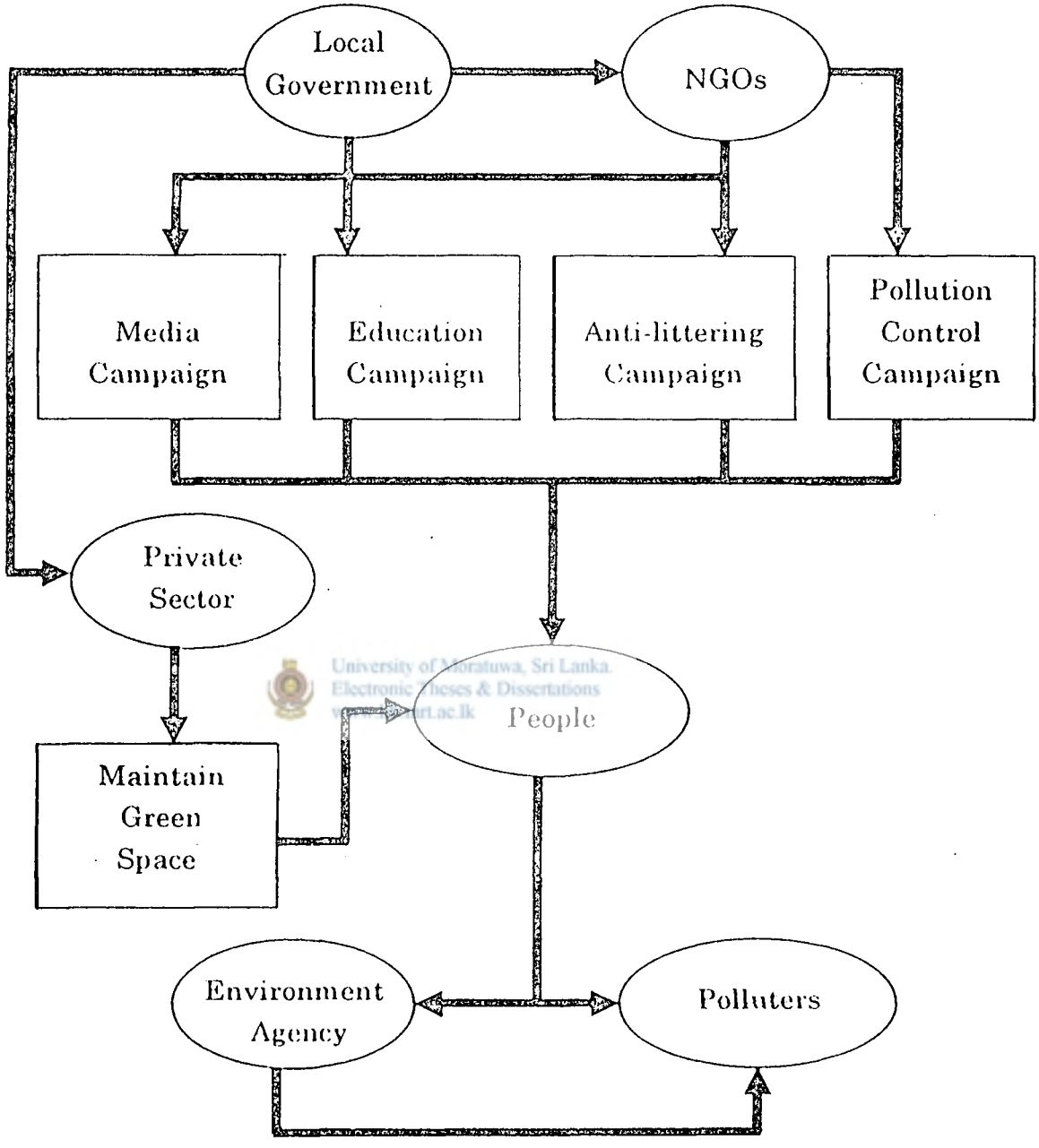


Fig : 10. People's participation in Environmental Management.

(Source : UN , 1992 ; 20)

People's participation means involving people in the process of planning, design and implementation of development or management activities. It involves reliance on the people's resources, both human and monetary, in development and management activities. People's participation strategies imply a change in the role of government from that of provider to that of facilitator. In other words, instead of providing infrastructure and services, the government creates conditions in which people themselves can meet those needs, with their own resources, while the government supports them with technical and managerial assistance and enabling laws and regulations. (fig : 11).

It is being increasingly recognized that local governments cannot tackle housing environmental problems alone. Their human and monetary resources are usually insufficient to undertake such a major task. People's participation offers opportunities to supplement local governmental efforts with the monetary and human resources of the communities and of the private formal and informal sectors.

For local governments to tap the resources of people, it is necessary not only to determine their ability to contribute their human and monetary resources but also to motivate them to willingly contribute towards the costs of the project. Perhaps the most efficient way to ensure the ability and willingness of the people to contribute their resources is to involve them in every stage of planning, design and implementation of an activity. This would ensure that their concerns and ideas would be incorporated, thereby increasing their willingness to pay for the costs of the project. Because of their continuous involvement, the extent of their contributions would also be determined.

Providing some sort of incentives rather than rules and regulations would encourage the people for participation in environmental management.

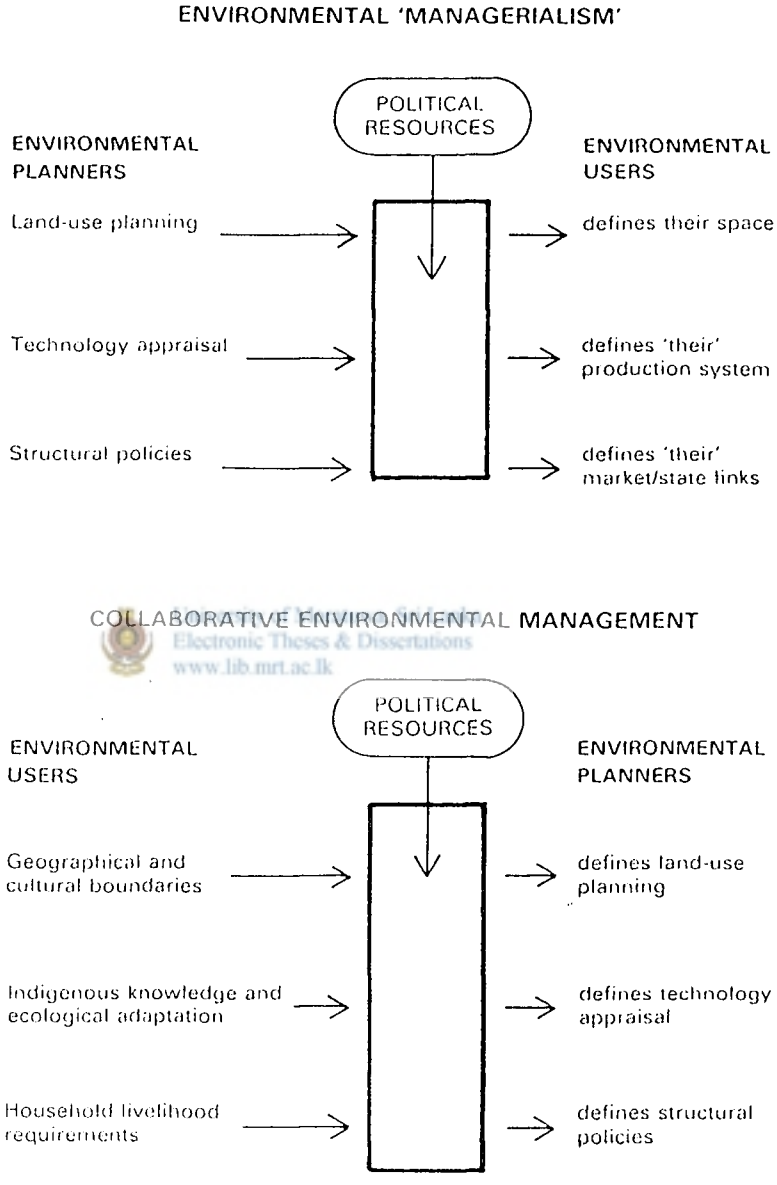


Fig : 11. Collaborative Environmental Management.

Source : Redclift, M. (1987 ; 158).

CHAPTER FOUR

MANAGING THE SOCIO-ECONOMIC ENVIRONMENT OF HOUSING.

Though, the socio-economic environment of housing is a complex subject, the actions should be taken to manage the environment from the initial policy planning level of housing and continuos feed back procedure should be done. For the ease , the socio-economic environment would be discussed in separately as sociological and economic environments.

4.1. Sociological Environment

For an individual, home could be consider as the sociological base. As he spends, most of his life time (this could be change according to the various cultural attitudes) at home. Therefore the environment of housing would be effectively responsible for the social condition of the occupants. The following discussions were made only under the more significant topics which are under control of architects and other professionals involved in the housing sector. The Fundamental basis of environmental management discussed here, is satisfying the sociological needs and aspirations of occupants as much as possible from the housing. (fig : 12).

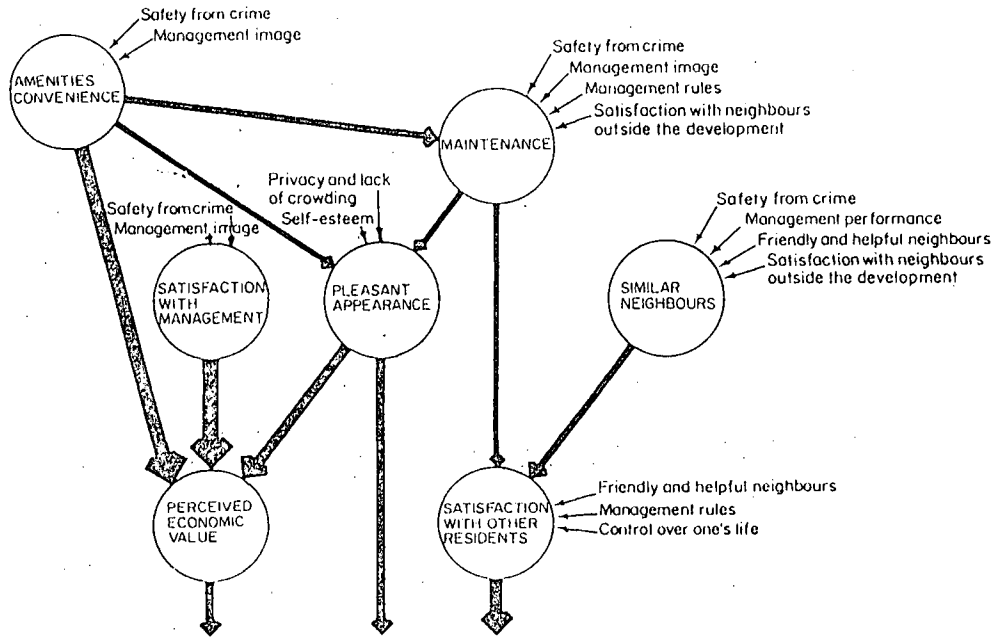


Fig : 12. Resident's Satisfaction on socio economic values.
Diagram of the interrelationships between variables which contribute to a comprehensive understanding of resident's satisfaction.
Source : Davis, S. (1995 ; 195).

4.1.1. Psychological Concepts

When considering an individual person, satisfying the psychological needs is important to sustain his living condition. But the psychological needs are varying from person to person. Therefore it is a very difficult task for architects to design and plan houses and its environment for individually unknown users. Under these circumstances we have to satisfy the psychological needs of the anonymous user in relation to various social levels.

The basic psychological needs of a human, which should satisfy his housing environment could be considered as follows.

* Privacy.
* Personality and Identity.
* Territoriality.

Privacy.

Within a human society privacy is a necessary thing. Altman concludes that "privacy is a universal process which involves 'culturally unique regulatory mechanisms'. Therefore from a very general perspective, privacy can be interpreted as being culturally pervasive, but this perspective is not informative about the kinds of contextually defined mechanisms used to regulate social interaction. A precise understanding of these mechanisms is required to define and regulate privacy in specific contexts at specific points in time.

By contrast Altman(1975) tables six dimension in privacy: first and foremost, privacy is a dialectical process involving changes in the degree of accessibility to and separation from other persons overtime according to variable personal and social parameters. Second, privacy includes a process of controlling social interaction. Third, it is a non-monatomic process which seeks an optional level of interaction with others. Fourth, Altman distinguishes between ideal levels of privacy that are desirable and actual levels of privacy that may engender an imbalance resulting in a lack of autonomy or isolation. Fifth, privacy has a dual direction between an individual and others, such that the reciprocal relations between receiving and transmitting which ought to be considered. Finally, privacy applies to various combinations of individuals and groups.

To enhance the privacy within the housing there are several activities to take at the designing or reforming levels of the housing projects.

* Identifying the reciprocal relations between the household and intrusions from the exterior and then ordering of activities and spaces within and outside the housing units. (fig : 13).
* Enhancing the transition between exterior public spaces and the interior private spaces.
* Enhance the hierarchy of special organization in the transition zone between the public and private domains of housing. (fig : 14).

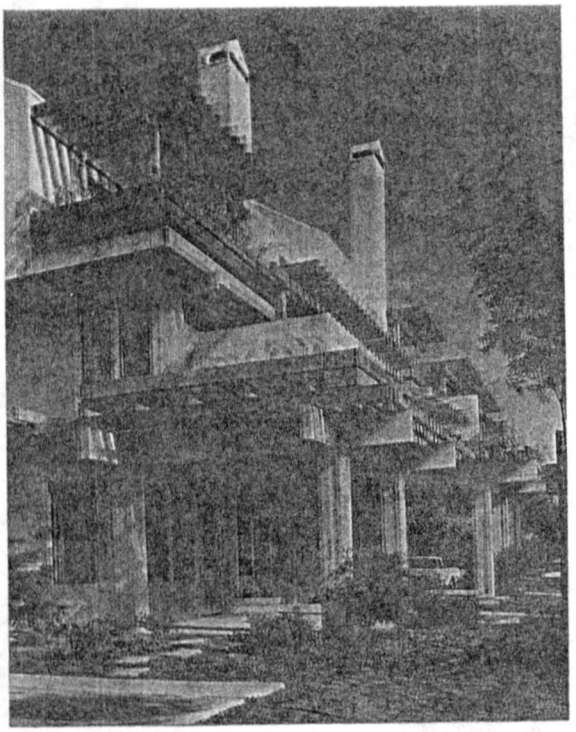


Fig : 13.
Design for Privacy.
(The mixed use of commercial and townhouses.)
Source : Davis (1995).

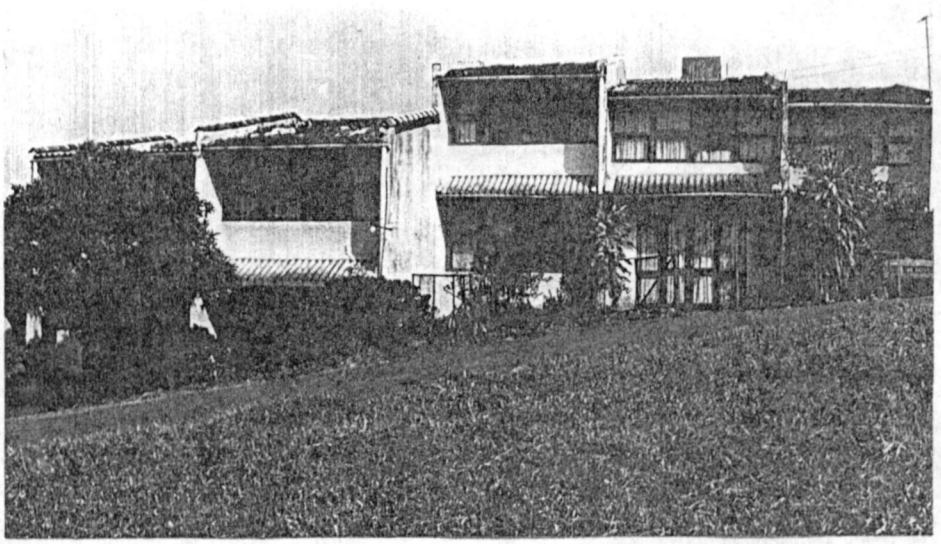


Fig : 14. Conflict Between Public and Private Spaces.
(Hanthane housing scheme, Kandy.)

Personality & Identity.

Houses not only express cultural and social factors, but are also endowed with psychological meanings. It is instructive to interpret the design and use of house intents of consciously pragmatic and unconscious symbolic variables. Many scholars have conducted researches on the relationship between the house form and self-expression of the occupant.

As Ruskin says "..... from a contemporary view point a man's house is the visible evidence of his life style, his family relationship, his income level, his aspirations and his feelings about his fellow man." (Ruskin, 1974;22)

"House forms, interior decoration and personal possession are mediums enabling people to articulate their interpretation of their identity. How they relate to others in the same household and to friends and strangers. They are a means of self-expression of role relationships, and also of the unequal power of individuals to attribute symbolic meanings to domestic space and objects. In order to express both private/personal and public/shared domains...." (Lawrence, 1987;117)

Pandya, 'In search of human habitat' states that, "Housing plan as rows or blocks rather than as groups or clusters lacks on identity, and therefore reduces a sense of belonging among the inhabitants. Moreover, dwelling units are all identical as if 'rubber stamped' over and over again. These layouts offer no flexibility for growth, alteration or personalization. As a result, there occurs a tremendous mismatch between what is desired and what is provided." (Pandya, 1995)

" The house both encloses space (the house interior) and excludes space (every thing outside it). Thus it has two very important and different components, it's interior and it's facade. The house therefore nicely reflects how man sees himself, with both an intimate interior or self as viewed from within and revealed only to the intimates who are invited inside, and a public exterior, the self that we choose to display to others." (Cooper, 1974:131).

The requirement of 'self identify' in housing too has similar manifestation, As Dancun (1981) says, "Identity affirmation is an important need in dynamic societies. Since psychologically it is useful to enhance one's self esteem and confidence in society." He further comments that , "In owning a house, people both provide a means for communicating their identity as autonomous individuals and offer a meaning contributing which represents the practice of the personal life." (Duncun, 1981;83).

According to the consequences which were discussed earlier personality and identity within the society is one of the user needs and aspirations. Therefore satisfying these needs as much as possible within the settlement is a positive point for the final goal of sustainable housing.

In order to above consequences satisfying the needs of personality and identity is a difficult task, but it could be done in a manner. by,

* creating clusters with an identity. (fig : 15).
* using several housing types.
* Allowing the user to change the facade within a limitation decided by the Architect.
* using different colors and textures.
* Introducing landscaping features.
* Allowing to change the interior in a suitable manner.

Fig : 15. A Cluster with an Identity.

Source : Pearson (1991)

Territoriality.

Territories within a settlement could be described as serving a means towards achieving some desired level of privacy for the occupants.

Edney (1976) sees them as serving a stabilizing and regulating the role of individual, group and community levels. This is reasonable when one assumes, as they do fixed and clear boundaries such as walls and fences. However, where no such fixed

and clear boundaries exist, the territory may not serve this stabilizing function and in fact may serve as a source of conflict and tension.

Sebba and Churchman (1983;193) state that, "The desire of some scientists to find in human territorial behavior characteristics similar to those found in animals leads most of them to consider only the negative expressions of such behavior - those which express the forces that separate human beings from one another. Territoriality is described as 'taking possession use and defense of the area' ... or as 'defense of the ..... area by the occupant' .... In quite a number of writings the expression of territorial behavior is almost analogous to aggression and is described as territorial encroachments ..... (concurrently) it is difficult to find a reference to hospitality as a specifically territorial behavior.... Hospitality is expressed by inviting someone into one's own territory and is subject to one's ownership of the territory. One can extend an invitation only to a place under one's own control."

A good sense of territoriality from the meaning of psychologically and physically would satisfy the occupant and that would be done in a proper way incorporating other notions of the housing environment. For an individual the next circle of housing environment after psychological concepts is the family.

4.1.2. Family.

For an individual the most immediate social environment is the family. If the occupant spends most of the time at home the family members are the main interactive persons of his life. Satisfaction of psychological needs from a good family life is a must for the well being of humans.

Therefore the family is a component within the housing environment which should be paid a considerable amount of attention for the availability of reasonable living condition for the people and the sustainability of the housing.

Unplanned and unorganized families are the most affected. As an example some families have so many children, even without a proper income to the parents. This situation causes a series of problems, increase of child deaths, insufficient nutrition food, mentally or physically handicapped younger generation etc. The reason may be the parent's inadequate education and awareness on family planning and poverty.

Extended families also create problems. In Sri Lanka a normal family would have one or two grand parents. This is a positive sign of a sustainable society, rather than neglecting the order generation. But when the extended family which consists of several families the shelter may be insufficient for them. The danger of overcrowding is the increase of prevalence of airborne infections, diseases and the overload on infrastructure.

For managing the conflict the actions should be taken in relation to

* expulsion of poverty
* increase awareness of health and family planning
* controlling overcrowding
* possibility of expansion of the house with the growing family.

After the family environment the next social environmental step is the neighborhood and community of the housing.

4.1.3. Community.

Community living could be described as ways of physical as well as visual interactions between people in their day to day life.

Through the nature of community or the degree of perference for community varies from one special group to another it may consist common constitutes which will be similar to all types of situations, societies or social groups.

When considering a person living in a social 'group' it is apparent that he has to interact with four different communities or sub-cultures. These are,

a) Outsiders (people who are living in the immediate neighborhood of the stated 'group')
b) Community of the group.
c) His immediate neighborhoods within the group.
d) His intimate friends within the 'group' as well as outsiders.

Even though, the community living which we discussed under the social environment, finally the impacts of community living could be seen on the built environment.

Community living is basically based on the human behavior. The relationship between environment and the human behavior is described as "The environment affects behavior by its physical attributes such as heat, light, sound, as well as its special organization such as distance between elements and configuration of patterns" (Molesk, 1977;112).

Chein described that , " The environment has impact on behavior in several ways. Physical settings can act as goal objectives that serve to satisfy needs; as stimuli; that trigger off behavior towards goals; as directors that induce specific patterns of behavior to take place; as support that facilitate activities and as constraints that hinder certain behavior form taking place." (Chein, 1956).

Therefore the 'Community Living' that belongs to a particular kind of behavior pattern could be influenced by the built environment in terms of 'micro' and 'macro' levels.(fig : 16). And this impact of built environment on human behavior can read through the built environment in which they live.

To satisfy the needs and aspirations in relation to community living, Molsek (1977;112) states that , " occupants have two options; the physical environment and

the behavior of people form a transtaction in which they modify the environment to achieve goals and, modify themselves and their need system to fit the environment."

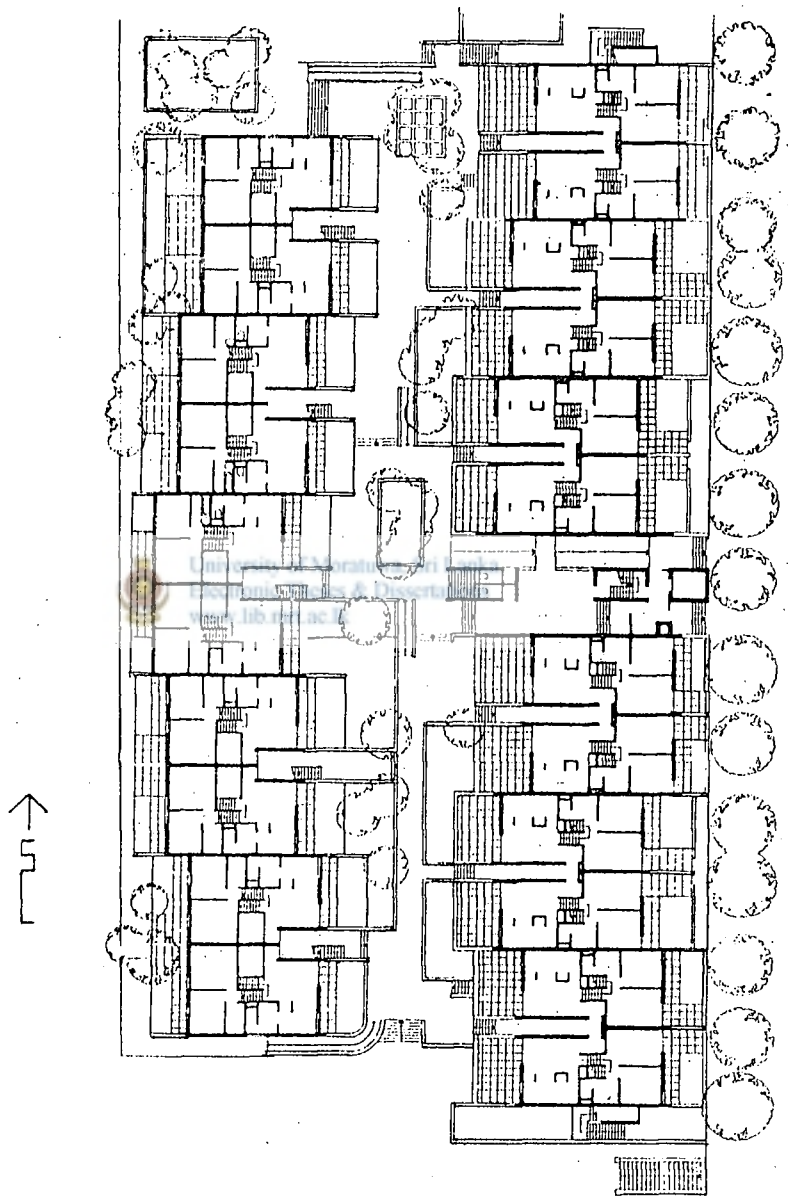


Fig : 16. A Housing Cluster

(Community living in micro level; housing units in Brougham Street , Woolloomooloo.)

Source : Davis (1995;247).

To enhance the community living in housing, following implications can be done.

a) Network of internal pathways.

b) Distribution pattern of plots and houses.

c) Location of community facilities. (fig : 17)

There are three general classes of community facilities involved in planning a community.

1. Public Utilities:- Water, surface drainage, sewage collection and disposal, gas, electricity, access lanes or streets.

2. Community Services:- Schools, hospitals and clinics, health centers, police station, transport, places of worship, social welfare, fire protection, parks, playgrounds, meeting halls, museum and libraries.

3. Common facilities:- (usually not included in public expenditures) markets, stores, repair shops, restaurants, entertainments and establishments.

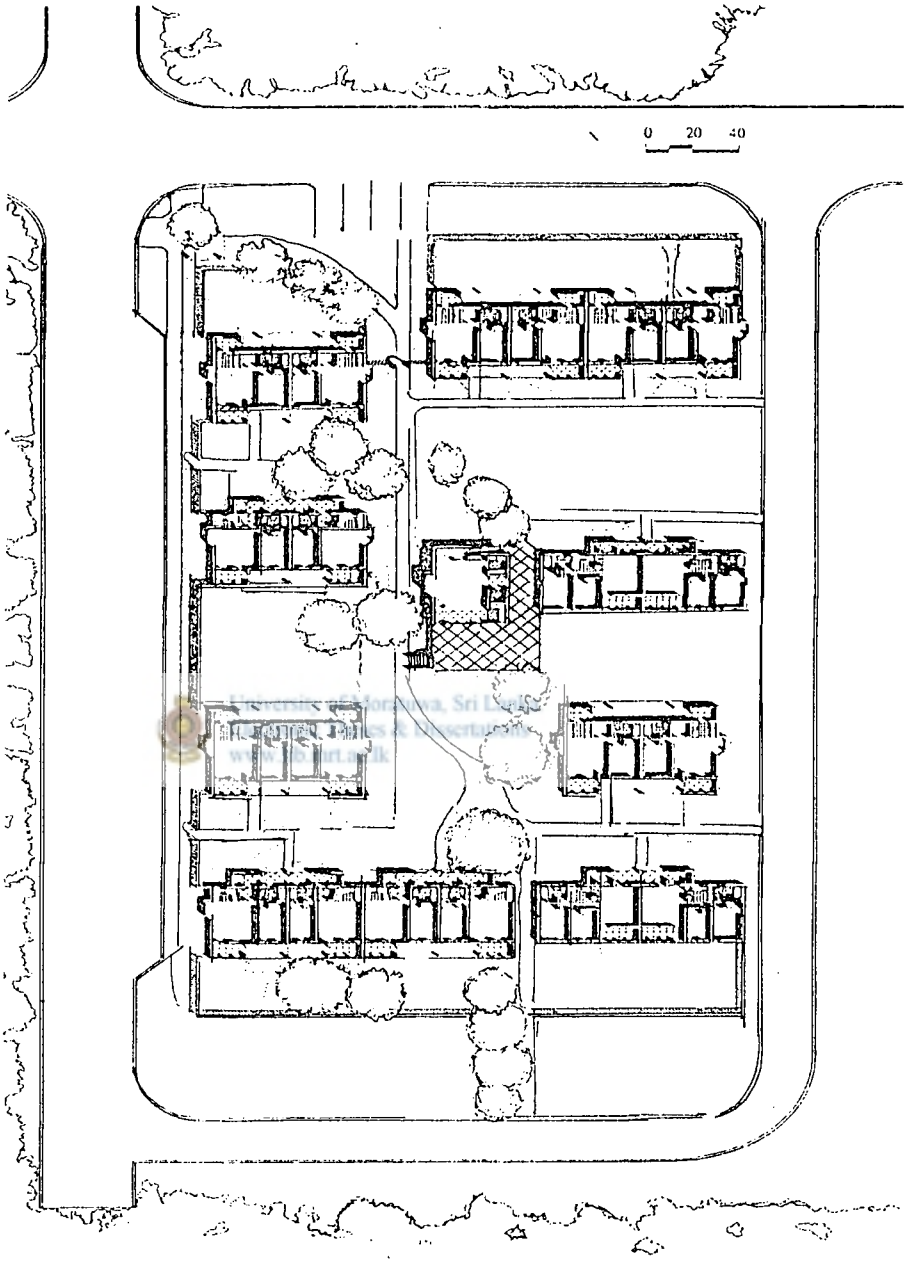


Fig : 17. Accommodating Community Center.

(Rows of units staggered to make a series of courtyards along the walks. At its center is the community building.)

Source : Davis(1995;160)

4.1.4. Social Life.

Social life is the most complex and significant feature of humans than other animals. It has various levels and relationships within the society. The housing is the basic element or tool which helps to reform the social life of the occupants.

" Houses are ordered by the customs and habits of the residents. There are cultural predispositions for the layout and use of rooms. Further more, within cultures there are subcultures and social groups and the design and use of houses commonly reflects this diversity." (Lawrence, 1987;2)

The social life of the occupants is enhanced by the religious and cultural activities. Therefore, the surrounding or the environment should not disturb these values. (fig:18) Chandrasekara (1995-96;15) states that, " The built structures can influence and modify the behavior pattern of people. Hence the architecture of human settlements where people spend most of their time can contribute to strengthen, change or destroy prevailing social orders. In order to achieve sustainable development we have to conserve not only the natural resources, but also the social and cultural practices of the people.

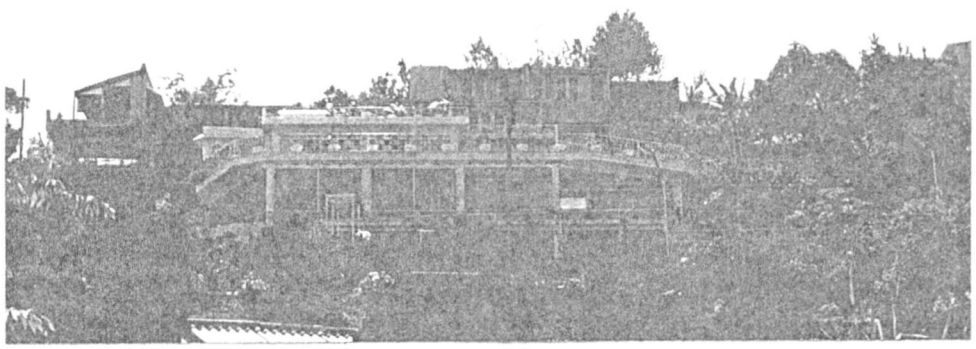


Fig : 18. Social tragedy in Housing.

(Converted housing units to a guest house at Hanthana housing scheme, Kandy.)

He also states that, " The social and cultural patterns are not static. They always change with time, But we should not destroy the natural process of change by using built environment as a tool. In planning human settlements adequate space and provisions should be made for social and cultural activities to happen. Perhaps they might not take place in specially designed spaces. The shade under a tree, walkway, verandah or public water tap could become the ideal place for such activities." (Chandrasekara, 1995-96;15).

According to the above discussion, managing the environment to satisfy the social needs is not a completely new or difficult task for architects. Thus the only need is the pre knowledge of user category, their needs, their social and cultural activities etc. and incorporating them in design and planning in a manner which would enhance them.

4.1.5. Education and Health.

For a reasonable living condition good education and health is a must. At the same time those two aspects also integrated with each other in broader level, as an example the poor education creates unhealthy living conditions.

When considering the education, there is a need of upgrading the education level of the occupants to upgrade the living conditions. But the contribution of housing environment as a supportive base is limited. Therefore the contribution within the limitations can be identified as providing pre-schools within the settlement and giving vocational training and make awareness self employment from the community base organizations, which would be aided by government or NGO's.

Poverty is the most critical aspect affecting the education. Therefore the programs and activities which exploit the poverty within the society needs to be addressed for the enhancement of education.

When considering the health, it is again an integration of so many aspects within the housing environment, Kleevens (1972) states that, " The family is the basic group of society and public health is closely related to the health of individual families. Housewives, infants, preschool chidden and the aged stay at home for a greater part of the day. Approximately one third of a lifetime is spent sleeping in the home. The home is also the place where the families level of physical, biological and social adaptation is reflected and it is therefore a good index of environmental adequacy and adjustment."

Therefore health within the housing environment is very important. Modern thinking on environmental sanitation and housing is not satisfied with a rather limited scope which is practicing now. It is now accepted that housing environmental sanitation can and should be practiced at different levels of health with the combination of environmental management.

* the prevention of premature death
* the prevention of disease illness and injury
* the attainment of efficiency of living
* the provision of comfort.

The following discussions made as a summery shows how the poor housing environmental aspects would contribute to create an unhealthy society and how we could manage the situation to overcome the problem.

* Site:-

When selecting a site for a housing development it should be considered with each and every notion of the housing environment.

* land subjected to flood in rainy season
* swampy areas

} nuisance from mosquitoes

* refuse refilled land		- danger of sagging and hazards from gases of unstabilized refuse
* along highways		- an excess of noise throughout the day.

The site for housing should be dry, free from floods, easy access of sunlight and prevailing wind, far from industrial areas, far from breeding places of insects, not far from place of work and not far from primary facilities.

* Design and construction.

* badly placed windows	-	make the house insufficiently ventilated and dark.
* wrongly placed toilets	-	may spread stench through the kitchen and living room.
* back to back houses	-	difficulty of refuse disposal
* physical condition	-	possibility of accidents
* construction techniques and materials	-	possibility accidents, allergic

The design of housing should be done to minimize domestic accidents and the materials used should be harmless. The construction should be safe, devoid from accident traps including electricity and special safeguards for the aged and the very young must suit the climate, proper drainage of sewage water must be safeguarded against termites and rots.

* Physiological aspects:-

Provisions for adequate ventilation, adequate protection against noise and sufficient provision on natural and artificial lighting.

* Sanitary aspects:-

Sanitary defects of the house are known to be responsible for a high prevalence of diarrhoeal diseases such as shigella infections. Therefore housing should have sufficient, cheap and safe water supply, safe disposal of sewage and refuse.

* Psychological aspects:-

- As the house is primarily the working environment of the housewife, it should have sufficient facilities for good house keeping, adequate facilities for washing and cleaning, the kitchen should be designed in such a way that food preparation can be efficient and that smoke and smells are not allowed to pervade the house; there should also be sufficient storage capacity in the house.
- Sleep requires quietness, thus the noise factor should be made as small as possible, there should be sufficient darkness and bedspace.
- Member of the household should have facilities for privacy if they desire so, and they should also be able to find a place for home work.
- As in many ethnic groups, the meals have significantly a social function and there should be sufficient space for the family to gather around the meal.

* Neighborhood :-

The atmosphere should be free from toxic and noxious gases, odorous, fumes or dusts and free from noise.

4.2. Economic Environment.

Within a monitory base the economic system managing the economic environment of housing is very important to its sustainability. Therefore this study would discuss the significant topics which, could enhance the development and the living condition of the occupants, in relation to housing economic environment.

4.2.1. Employment and Income

Sustainable housing development should provide affordable housing for the people in an equitable manner.

According to the employment and the income level the affordability of occupants would change. Such a housing development should have a housing policy in relation to the occupants affordability level, at the same time it should have provisions for the private sector employees also, rather than only for the government sector employees.

Poverty is the most affecting problem to sustainable housing development. "poverty itself pollutes the environment, creating environmental stress in a different way. Those who are poor and hungry will often destroy their immediate environment in order to survive: They will cut down forests: their livestock will overgraze grasslands: they will overuse marginal land; and in growing numbers they will crowd into congested cities,"(WCED; 1996). Therefore, elimination of poverty is a positive solution for complexity of these problems. Under this situation providing government aids for housing is one of the identified actions. Because it is a basic need for a consolidated economic situation of the people.

When considering middle class housing schemes, most of the existing housing schemes are occupied by the government servants, because the government has directly handed over to them and provided financial facilities such as housing

loans and long term easy payment systems. Then what about the private sector employees, are their housing needs fulfilled?

On the other hand most of the government employees could not afford housing. As an example Rukmalgama housing scheme at Kottawa was expected to sell houses to government employees. But it was not a success. Then the government decided to provide such financial facilities and reconsider the selling price, within several days all the houses were reserved by the people.

But the income level and the job security situation are also important in relation to the affordability for housing. If a person pays most of his income to the housing loan as installments and interests throughout the life time what happens to his other responsibilities and objectives towards himself, the family and the society. Because of this the whole economic life of that person would be a tragedy. The person would not pay any attention towards environment even maintaining his own house and its environment. Poor housing environment would create unsustainable living condition for the occupant.

Consideration of employment has to be done again when selecting people for the occupation, because the selected person may not have a job opportunity within a reasonable distance from the housing scheme. Therefore, the applications of such persons should be rejected though he could afford the house, because problems would arise at his workplace as well as home.

Finally, for a sustainable housing development, the policies and housing environment should be reformed to suit the employment and level of income of the occupant.

4.2.2. Economic Cost/Cost of Living

Increase in cost of living causes reduction of saving. Less saving means a drawback on the development of the country. This phenomena is applicable to the housing environment also. As an example, when considering a housing scheme there, cost of living would be higher than the other residential area. Lack of public transportation, lack of retail shops and higher maintenance cost are the source of this situation. This situation creates unsatisfying housing environment and unsustained living conditions for the occupants.

Therefore, positioning of community based co-operative shops service centers and providing suitable public transportation within the community would be a solution to overcome this problem.

4.2.3. Entrepreneurship.

Providing self-employment within the settlement is a very positive approach towards sustaining the living condition. Because it could earn extra income for the enterprising families that also provide easy access for day to day commodities and services to other occupants within the scheme.

Most of the housing schemes could be seen deserted within the day time, because the occupants were employed outside the scheme. Therefore the old parents and children are only at the home in daytime. Can this happen? Don't they need the security under their family members who could take a responsibility.

Self employment within the settlement is a good strategy to turn the settlement live through out the day. On the other hand way the house owner or both the husband and wife are government employees what will happen when they retire? Is there guarantee for their children to get job opportunities from the government. Actually they too will face the job crisis as other youngsters. But if they have self-employment

opportunities within their own neighborhood, that would be an advantage for both enterprising families and the other occupants within the settlement. Even the government would be released of the burden of providing jobs in what ever scale. (fig:19).

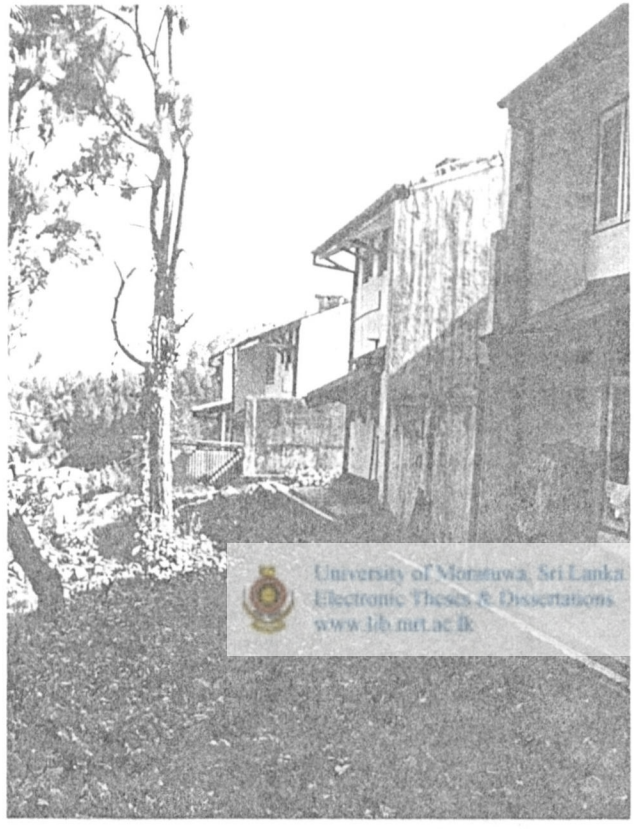


Fig : 19.
An effort for Additional Income.
(Bambarakele housing scheme Nuwara Eliya.)

Then the question arises what kind of self-employment should be allowed. These activities should not disturb the housing environment in any way. In other words there should not be any threat from the self-employment activities to the sustainability of the housing environment.

As an example, Perera (1994) cited example, the shop house type which is indigenous to Asia. The shop house has its workshop or commercial space on the ground floor and living quarters on the upper floors. Further he states that, "This house type is ideally suitable to meet the shelter needs, investment needs and cultural needs." (Perera, 1994; 128)

He also identified following activities which are prevailing and functioning without disturbance to the housing environment.

i. Selling raw and processed food including production and related services.
ii. Selling clothes and accessories including production and related services.
iii. Light engineering work including sales and repair services.

As an example of implementing this phenomena of home oriented enterprise is the one million housing program in Sri Lanka. "The one million housing project has supported and encouraged the economic activities of people living in the low-income settlements which were implemented or upgraded under this program." (Lankathilaka,1989;143). Under this program home oriented enterprises were located at identified plots within the project. Perera (1994;50) has experienced and give comments on this approach "..... As a result, a considerable number of extensions and encroachments into roads and public areas have occurred inside the housing schemes but, they were seen as positive signs of community based economic development." With the time being consolidated HOE's would enhance the social life within the community and establish the economic situation of the occupants.

Therefore the following actions could be taken from the initial stage of housing.

* Identify the ideal locations for entrepreneurs within master plan development of the housing project. (fig : 20,21).
* Identify the viable activities for self employment's to the particular project. (table : 01).
* Design and build the housing which have compatibility for both self employment and occupation. (fig : 22).
* Selecting the families for those positions, those who have experience, monitory ability and with positive attitudes.
* Locate them in such places and give facilities to improve their enterprise.

If we could manage the situation properly in that manner the housing development would be able to sustain the living condition of occupants. But if we attempt to sustain the socio-economic environment alone, it would not be successful, unless the physical environment is also managed.

Fig : 20. Navagampura Location of HOE's.

Source : Perera (1994;47).

Fig : 21. Summitpura Location of HOE's.

Source : Perera (1994;48).

1) Market exchanges		2) Non -market exchanges	3) Domestic production of use values	4) Reproduction
a) Cash from wage labour	a) Petty production of goods domestically	a) Kinship and community networks payments in kind for services	a) Agricultural goods, clothing, shelter	a) Biological reproduction of labour force
b) Goods for cash	b) Domestically manufactured commodities (clothes, baskets, etc.)	b) Exchanges of labour or goods		b) Social reproduction child care, meeting family needs

Table : 01. Household Economy; Women's activities and the environment

Source : U.N. (1980)

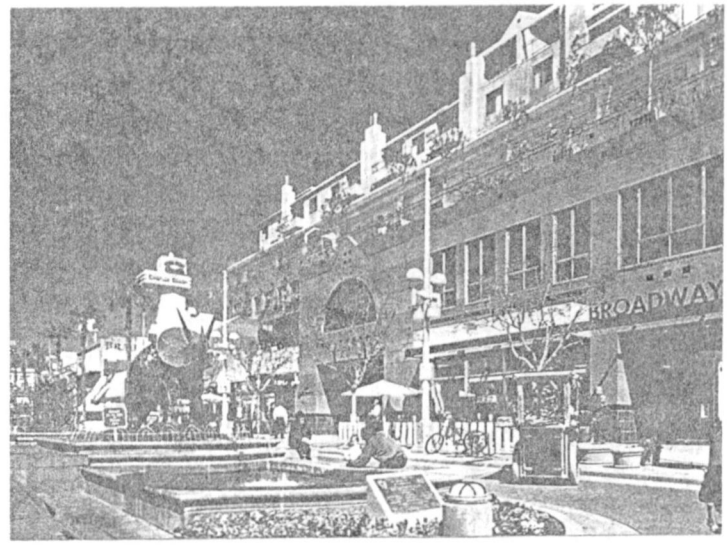


Fig : 22. Accommodating Mixed Program.

(The building containing retail and residential uses.)

Source : Davis (1995).

CHAPTER FIVE

MANAGING THE PHYSICAL ENVIRONMENT OF HOUSING.

According to the former classification, physical environment of housing could be divided in to two, the Natural environment and Built environment. In this chapter also, same as in chapter four the discussions are made under significant physical environmental topics to show importance of them and management strategies for sustainable housing development.

5.1. Natural Environment.

Under the hypothesis made for sustainable housing development, the basis for environmental management to deal with the natural environment could be considered as the enhanced resource utilization and protecting the environment form pollution.

5.1.1. Resources.

Man is both creator and controller of his environment, which gives him physical sustenance and affords him the opportunity for intellectual, moral, social and spiritual development. In the long and tortuous evaluation of the human race on their planet, a stage has been reached. When through the rapid acceleration of science and technology man has acquired the power to transform his environment in countless ways on an unprecedented scale. Both aspects of man's environment, the natural and man made, are essential to his well being and to the enjoyment of basic human rights, even the right to life itself.

In this quest for better living, man has increasingly exploited the natural resources. Although the earth's natural resources are vast, they are not limitless. Due to over exploitation on the part of man at least some of these resources are no more and some others are fast disappearing. One such resource is the oil.

Examples of similar overexploitations which have led or would lead to the extinction of some animals and plants are innumerable. Further, this is not limited solely to biological resources but applicable to every natural resource. Only proper environmental management and timely action could prevent the catastrophe.

The problem is how could it be done. Consuming the natural resources while conserving them is the answer. This would sustain the natural resources according to the definition of sustainable development that '...meet the needs and aspirations of the present generation without compromising the ability of future generations to meet their own needs'.

When we consider this resource depletion in relation to the housing environment the following aspects were identified. Therefore, managing them as much as possible within the housing environment would create sustainable housing as well as sustainable future for the world.

* Soil
* Water
* Energy
* Fauna and flora

* Soil :-

Environmental problems in relation to the soil are,

* erosion/ earth sliding
* contamination
* loss of fertility.

The reasons may be the unplanned and unorganized housing development with such construction technology and material, unsuitable waste disposal from the housing.

* Water :-

Water is a very necessary resource for the household activities, as well as it very easily gets polluted, as well noncontaminated drinking water supply is the most

difficult task with the present environmental condition. It is easy to provide water from wells for the rural housing schemes but the difficulty is within the urban housing schemes. In that situation cost for purification and distributing is very high therefore the users have to pay for their water consumption.

As managing the resource utilization within the housing environment, the remedial actions could be taken as consumption of water without wasting, adequate care on waste, waste water and sewage disposal, correct positioning of wells, leaving adequate space between wells and septic tanks to avoid contamination and between the wells themselves to ensure a proper yield.

* Energy :-

The availability and use of different forms of energy have always influenced the location, structure and development of human settlements and the quality and character of daily life and work within them. In ancient times, networks and structure of human settlements were strongly affected by the limited capacities of natural (water, wood and coal) and biological (human and animal) energy sources. Settlements were characterized by relatively small, uniformly distributed settlement units, concentrated overall structure and close proximity of building's functions, place of work, services and living. Careful attention was being given to natural conditions and resources such as energy. There was a close relationship between the development of settlements and energy existed, because of the necessity of a self-supporting energy system. With the rapid expansion of means of production in the nineteenth century, energy development went beyond the limits of the former, self supporting systems by exploiting new manufacturing and transportation facilities. This led to fundamental changes in settlement patterns and the structure of individual settlements. A characteristics feature of this process was a separation of place of energy extraction and place of energy use. This separation along with new methods of transporting energy, became an important factor in determining the location and structure of human settlements.

Under the present energy crisis, future development crucially depends on its long term availability in increase of sources that are dependable, safe and environmentally sound. At present, no single source or mix of sources is at hand to meet this future need.

Today's primary sources of energy are mainly non-renewable: natural gas, oil, coal, peat and conventional nuclear power. There are also renewable sources, including wood, plants, dung, falling water, geothermal sources and solar, tidal, wind and wave energy as well as human and animal muscle power. Nuclear reactions that produce their own fuel (breeders) and eventually fusion reactors are also in this category. In theory, all the various energy sources can contribute to the future energy mix worldwide, but each has its own economic, health and environmental costs, benefits and risks. Factors that interact strongly with other governmental and global priorities. Choices must be made, but there should be certainty that choosing an energy strategy inevitably means choosing an environmental strategy.

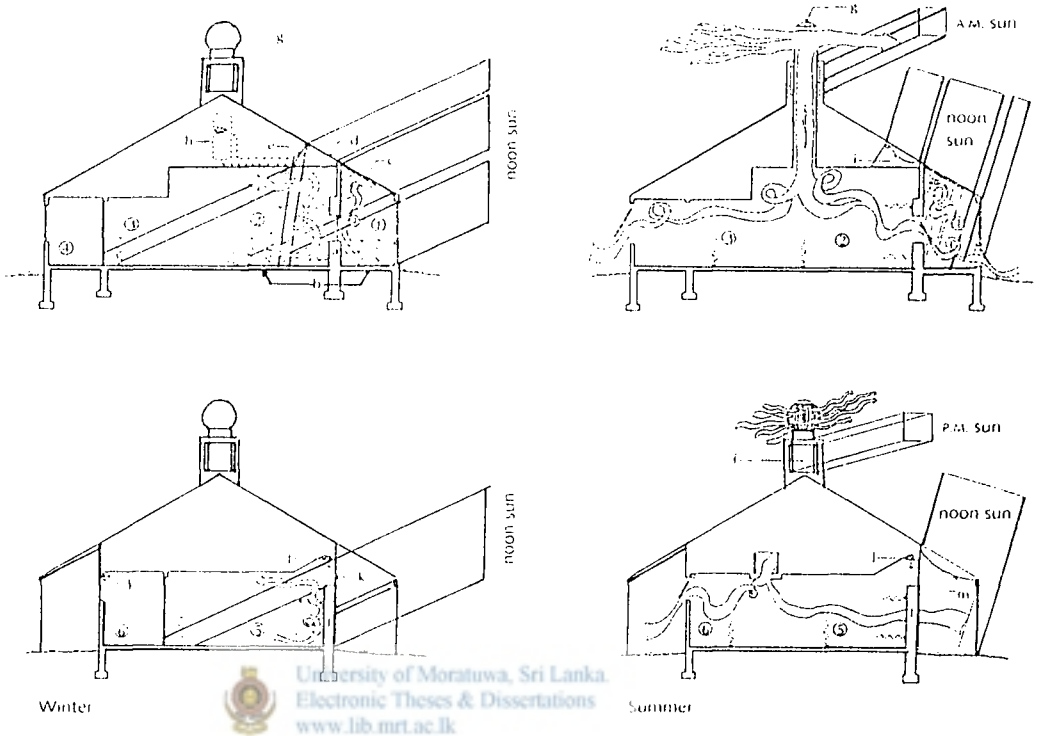
As a consequence of these aspects, present use of renewable energy sources were encouraged. The renewable energy sources are,

* wood
* hydro power
* solar energy
* wind power
* fuel alcohol
* geothermal energy
* bio-gas
* man power

Most renewable energy systems operate best at small and medium scales, ideally suited for rural and suburban applications. They are also generally labour-intensive.

In relation to housing there is a strong need to cut down the energy consumption for their construction works and during occupation. For construction of housing " the human energy could be described as the best renewable source of energy which is found in abundance in this part of the world. The labor intensive construction techniques could easily be adopted in construction of housing. It will not exhaust scarce fuel resources or create any environmental pollution. Now a widely accepted enabling the strategy in housing in global context and Sri Lanka's one million housing program provide successful examples for the use of human energy in place of machine."(Chandrasekara 1996:15)

Incorporating energy saving remedies for design of housing units and using natural light and ventilation for housing interior could be done. As an example the following shows incorporating sun collecting space and natural ventilation in house design at a European country.(fig : 23).



1. Solarium
2. Living/Dining
3. Kitchen
4. Back porch/Air lock
5. Bedroom
6. Bathroom

a: mass wall
b. concrete slab
c: "Big Fin"
d: skylight
e: reflector
f: solar stack
g: rotary ventilator
h: DHW heater/storage tank

i: pull shade
j: Trombe wall
k: clerestory
l: window quilt
m: awning

Fig : 23. Energy Efficient Strategies.

(Include a sun-collecting space and natural ventilation.)

Due to the use of these alternatives and conservation remedies the energy savings per housing unit may be a small amount. But the accumulated total due to the large number of housing units would be a considerable sum at the national level which would enhance the sustainable development.

* Fauna and flora.

Since the settlement of people in the past were basically located in close proximity to a source of water and forest and cultivation land for the direct human consumption. The houses were located in a cluster from to give them social cohesiveness and a sense of security and protection from the wild animals in the surrounding jungle.

Thus a minimum area of forest cover was cleared to allow for the human settlement and the production of food. Disturbance to the ecology was bare minimum. The people were very conscious about the importance of the continuous existence of the flora and fauna in the jungle and the water sources, on which they were depending partially for the erection of their houses.

With the rapid growth of population and the industrialization the natural environment has disturbed by the human settlement along with other development activities.

Clearing of forest area for human settlements and farming has become a major problem at present. Most of these incidents have been done illegally by the squatters. Even the authorities have done the same thing without proper conservation and development vision.

Conserving and protection of fauna and flora, could not relate, directly to the sustainability of housing and it is very difficult in citing examples, but indirectly they make inputs on housing sustainability. According to that, water streams from rainforests, making indigenous medicine from fauna and flora could be considered as examples, which are indirect inputs of fauna and flora on housing sustainability.

The following actions could be made as remedies for the protection,

* Introducing new rules and regulations instead of existing inactive ones.
* Discourage squatting and donate government land for the landlesses.
* Encourage housing development policies which enhance the natural fauna and flora.
* Buffer zones between the protected forests and the human settlements.

5.1.2. Environmental Pollution.

Although pollution is a result of human activities its impact could be seen directly on natural environment, as such environmental pollution is discussed under natural environment.

At present the environmental pollution becomes a major issue on a global scale, a byproduct of the development and maintenance of modern civilization. It now poses a serious threat to human existence on this planet and hence it is the concern of the highest forums of the world today.

The over-all pollution problem is concerned in preserving the biosphere - the life - giving relatively this layer of soil atmosphere and water in which replenishing cycles of living organisms take place.

There are three major aspects which have to be considered under pollution they are the land, water, air. (table : 02). Problems in human settlements in relation to pollution are,

* Health problems
* Problems other than health
* Sanitary problems
* Contaminated drinking water

Under three major aspects following discussions made are of the pollution in housing environment.

SPATIAL LEVEL	MEDIA		
	AIR	WATER	LAND
HOME	Indoor air pollution	Water and Sanitation	Overcrowding
COMMUNITY		Drainage, infrastructure	Housing, Solid waste collection
CITY	Industrial, Vehicular & noise pollution	Water and waste water treatment	solid waste disposal; land-use
SUB-NATIONAL		Water bodies pollution; water resources overuse	deforestation over use of mineral resources

Table : 02. Spatial and Medial Dimensions of Environmental Pollution.

Source : UN (1992;02)

* Land

Contaminated land is, land which poses a hazard to human health or to the environment. Mostly as a direct result of past or present industrial use. The scale of the problem is difficult to assess.

Percent shortage of land forces to use the contaminated land for housing projects and unidentifiation of contaminated land is also a problem. (fig : 24).

Remediation of contaminated soil and ground water is a complex and difficult process. It demands awareness of many technologies, their limitations and applicability. (fig : 25).

A thorough environmental site investigation (ESI) is essential to avoid unnecessary risks to health and safety, costly unplanned remedial work during development or in extreme cases, abandonment of the project.

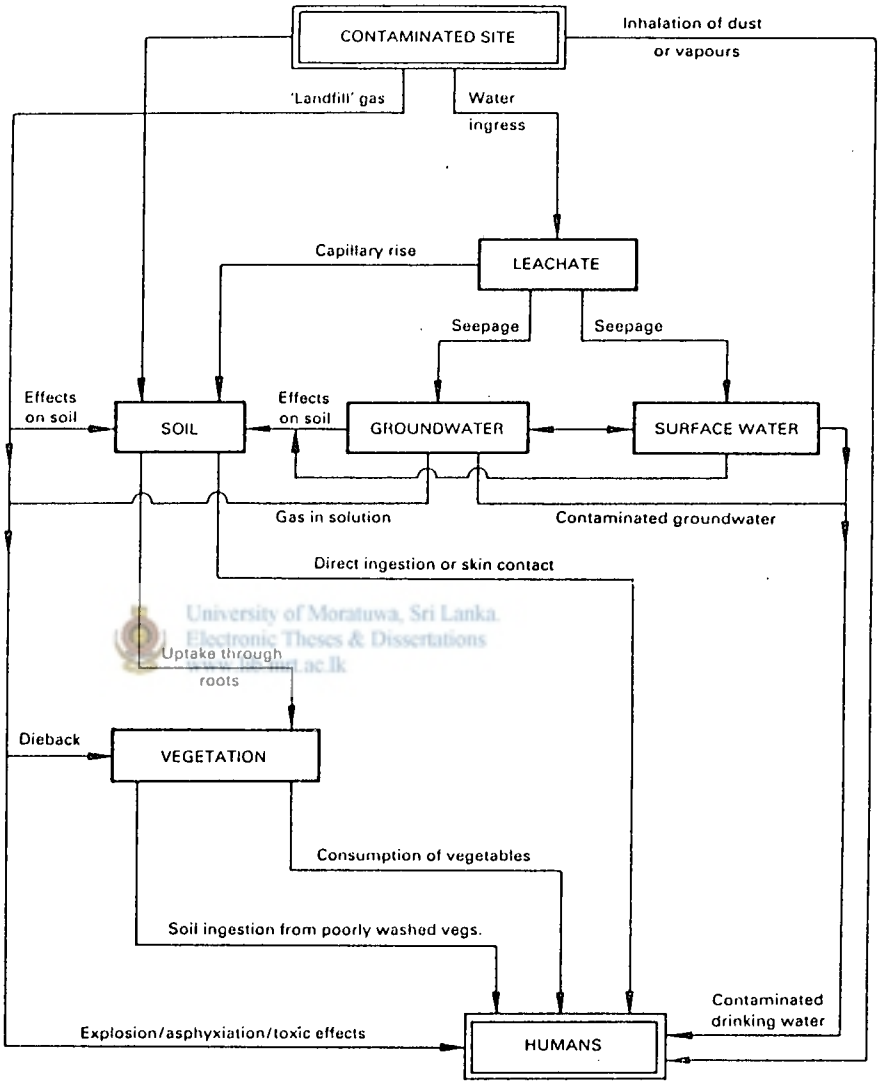


Fig : 24. Contaminated Site and Human.

(Schematic diagram showing contaminant migration pathways from contaminated site to human receptors)

Source : Johnson (1993;24)

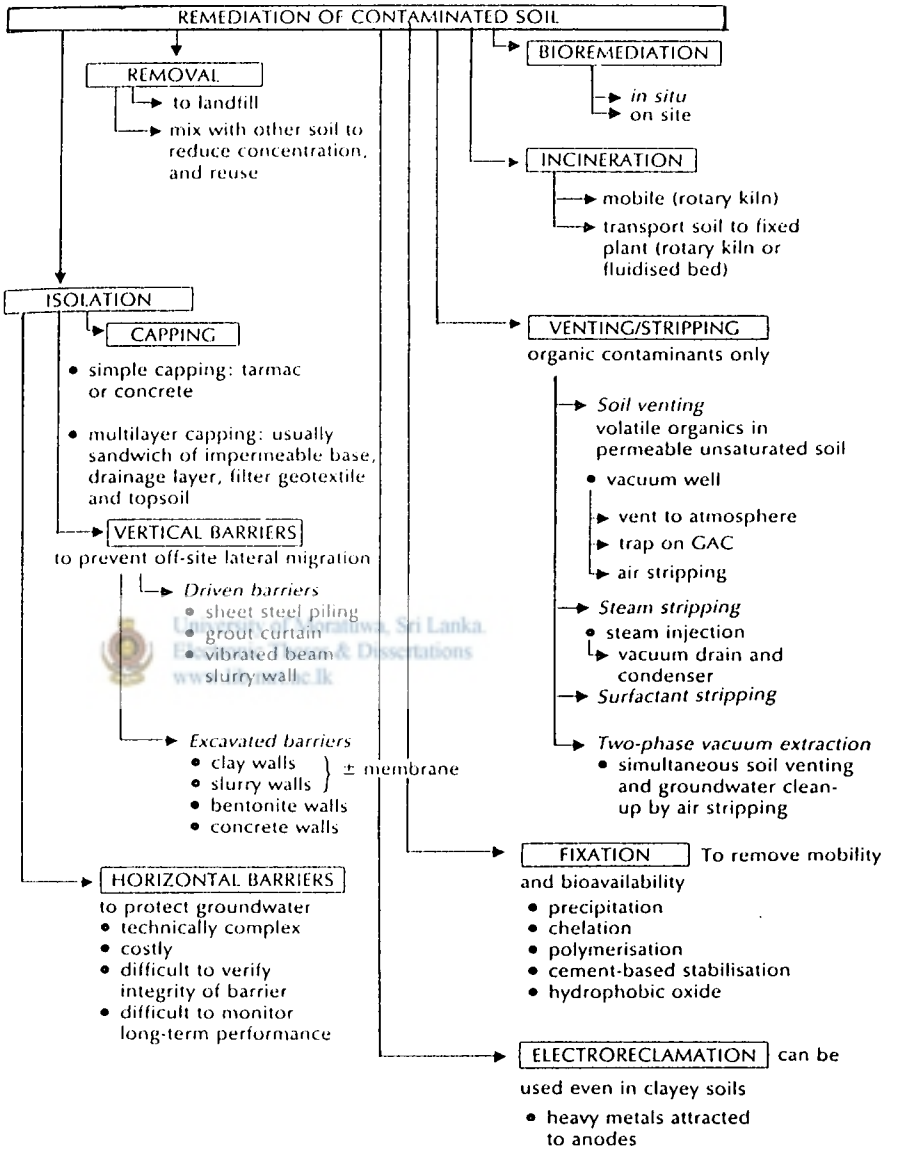


Fig : 25. Remediation of Contaminated Sites.

(Summary of available technologies for remediation of contaminated sites.)

Source : Johnson (1993;27).

* water

Water pollution could happen under following activities.

* Industrial
* Paultry farms
* Poor sewerage waste disposal (fig : 26).
* Agricultural etc.

Polluted water raises problems on human settlements, it directly and indirectly affects to the sustainability of the settlement.

Fig : 26. Environmental Pollution from Solid Waste.

(Bambarakele housing scheme Nuwara Eliya.)

* Air

Air pollution also causes the problems which create impacts directly and indirectly on sustainable living condition. The causes for air pollution in housing environment could be considered as

* Industrial activities
* Paultry farming
* Chemicals in agriculture
* pesticides
* transportation
* Fumes and Dust
* Poor sanitary conditions.

But the impact on housing environment is not only from the surrounding area pollution. The global air pollution also would create cumulative impact with former, wherever the human settlements are located.

Therefore remedial actions should be taken to prevent air pollution in local level as well as global level.

Except these major aspects of pollution, noise pollution and visual pollution could also be considered in relation to housing environment.

When considering noise pollution, noise can be defined as disturbing sound, its disturbing features may result in discordance, loudness, unexpectedness or non-necessity. As an external irritant, noise may play a role in ear diovascular diseases and nervous and mental disorders. Noise of 130 decibels or more is considered the maximum limit man can withstand. At that level it does damage to the auditory system.

When considering visual pollution, the most immediate reasons for it are unplanned unauthorized building constructions and commercial advertisements in housing environment. The orientation of dwellings also should be considered to prevent visual pollution.

Environmental pollution also could happen from magnetic fields. This pollution would not appear directly. But the victims of the pollution could be seen after long periods. As an example, high voltage power supply lines in residential areas, could cause the birth of mentally handicapped children at that area, in years time. (fig : 27).

To eradicate pollution we can not stop the industrial and development activities, but in a managed condition pollution could be minimized. Therefore the environmental authorities and government have imposed terms and conditions to the industries and such activities to control the release of waste and environmental hazardous chemicals to the environment. When considering the problem of waste and byproducts of industrial activities even household activities, recycling comes as the best solution. Therefore using recyclable materials would be an advantage to the environment as well as to the economy. (fig : 28).

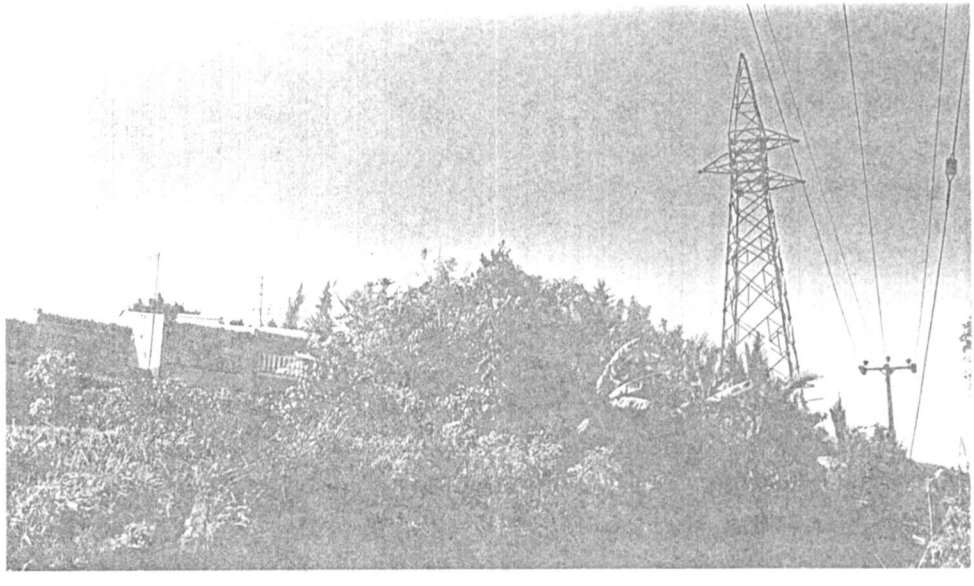


Fig : 27. Pollution form High Tension Power Lines.
(Hanthane housing scheme, Kandy.)

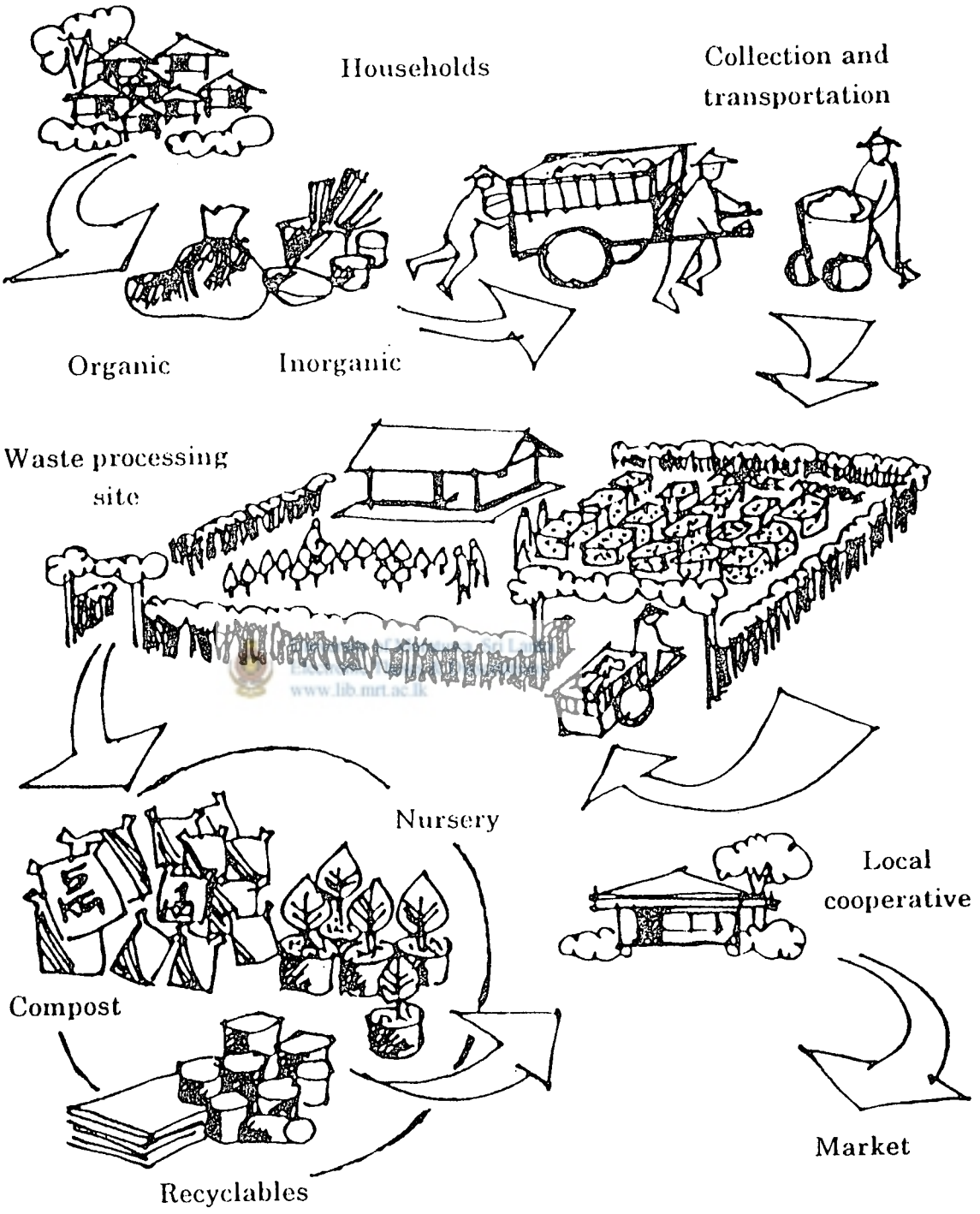


Fig : 28. Recycling of Waste.

Source : UN (1992;40).

5. 1. 3. Natural Disasters.

Natural disasters seriously affect the settlements. It is seldom that only one kind of natural disaster hits a settlement and its population. In the majority of cases a chain of events develops and the final disastrous outcome is a cumulative effect of sequential phenomena and forces. Further when a catastrophe is a combination of various actions of natural forces and elements, often an action in progress may not only "open the door " to what follows, but may make the latter more destructive than when it occurs by itself..

Following, could be considered as natural disasters.

* River flooding (caused by rainfall, melting snow, dam failure, ice jams, mud flows, etc.)
* Tsunami and Coastal flooding (caused respectively by seismic activity and tropical cyclones)
* High winds (caused by tropical cyclones, typhoons, hurricanes and tornadoes)
* Earthquake (of tectonic or volcanic origin)
* Slides, slips, (of land rock or snow)
* Fire and conflagration
* Volcanic eruption
* Drought (UN, 1976;6)

The increase of population involves enlarged movements towards urbanization and agglomeratiotion of buildings and activities. This provides bigger targets for disaster phenomena and an increase in the probability of man-made disaster. The property destruction and loss of life is increased, Therefore the intensity of risk to disaster on a global scale increases even through the capacity to protect communities improves.

In order to prevent or reduce catastrophes, actions could be taken in relation to physical planning of housing environment. The introduction of protective measures

against disasters is important in pre-disaster physical planning. To do so efficiently depends largely upon a thorough understanding of the nature and consequences of all possible catastrophic events, and particularly their impact on the inhabitants.

Direct aims of physical planning as a preventive tool against natural and man-made disasters are;

* decreasing the level of potential risk.
* mitigating the consequences of disastrous action
* mitigating or preventing the development of a chain of disastrous events
* localizing and limiting the scope of catastrophes
* facilitating rescue operations.
* facilitating organization of general habitation during the first post- disaster period.
* facilitating and hastening rehabilitation and reconstruction activities.

(UN, 1976)

5. 2. Built Environment.

Built environment includes each and every change or construction or demolition of the natural environment by human. Unplanned unorganized built environment creates lots of problems such as haphazard development, overcrowding, environmental pollution and unhealthy housing conditions. In this situation architects have a bigger role of managing the built environment of housing.

5. 2. 1. Land Use.

In the present the property developers and public have paid little attention to the landuse patterns in human settlements. The inappropriate use of land for human settlements would destroy the opportunities for a sustainable development. Chandrasekara (1994) states that, " The land use pattern of human settlements has a direct influence over sustainable growth". It directly affects or reduces land for agricultural production and forest cover; two vital factors required for sustainability.

The land use problems in relation to the housing environment are;

* ad-hoc subdivision of land
* suburban residential sprawl
* Indiscriminate land filling (paddy, water catchments)
* clearing of agricultural lands.

Sub division of land happens in two different ways, from generation to generation and subdivision by land sales companies. In the absence of a national land-use policy, there is no controlling mechanism over this. Therefore it has become a lucrative business for the land sales companies. Under this situation so many problems such as insufficient infrastructure facilities, small lot sizes, inadequate facilities for sewerage disposal, contamination of ground water could be seen. (fig:29).

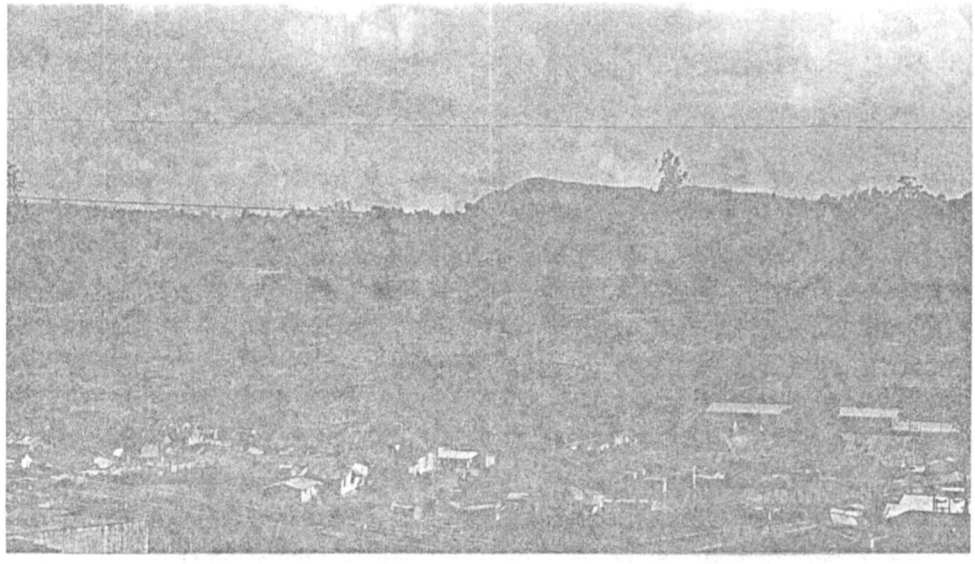


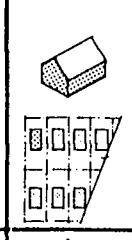
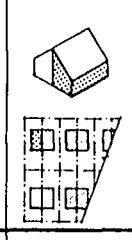
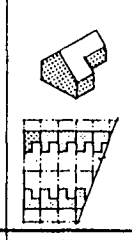
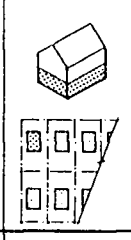
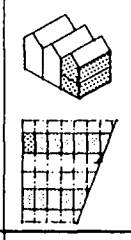
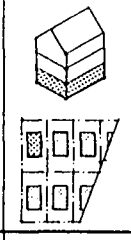
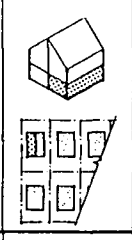
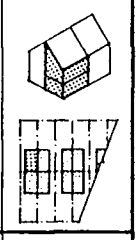
Fig : 29. Fragmentation of Land to Smaller Plots.(Nuwara Eliya.)

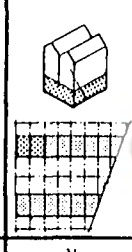
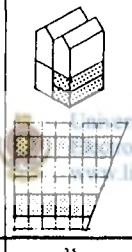
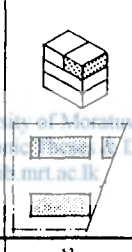
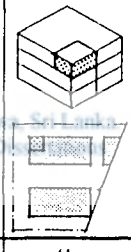
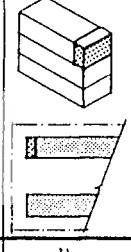
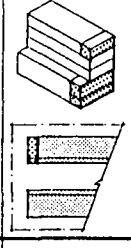
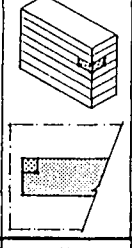
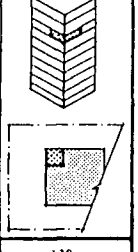
Sub urban residential sprawl also causes to reduce open land, increasing energy for transportation and increase of pollution due to vehicular movement. To stop that the only solution is high density habitable human settlements within the suburban.(fig:30).

Indiscriminate filling of paddy fields and rainwater catchment area for housing development activities cause direct adverse effects on the drainage pattern there by inviting flood hazards for the area.

Moreover the clearing of the agricultural lands (rubber, coconut) has resulted in erosion of soil and silting of water resources and drying up of streams. These are direct negative impacts of the uncontrolled landuse, The indirect impacts also could be seen as decreasing the gross national production, the stimulation of natural disasters and environmental hazards to the settlements.

According to these circumstances the actions should be taken to manage the condition from the government land use policy level. Misuse of public land should be also eliminated. But in the present situation most of them were done by the government authorities while be to preserved. (fig : 31,32).

Dwelling Type	1 Single detached	2 Semi detached	3 Joined court	4 Duplex	5 Row house	6 Triplex	7 Quadruplex	8 Back to back Semi detached
Isometric / Plot Plan								
Dwelling units/acre (dwelling units/hectare)	8 (20)	14 (35)	16 (40)	17 (42)	19 (47)	21 (52)	23 (57)	24 (59)
Floor area ratio % open space	0.24 76%	0.38 81%	0.44 56%	0.48 88%	0.56 72%	0.60 80%	0.66 67%	0.66 67%
Unit relationship to grade	on grade	on grade	on grade	50% on grade 50% gr. related	on grade	33% on grade 66% gr.unrelated	50% on grade 50% gr. related	on grade
Access to unit	private on grade	private on grade	private on grade	50% priv. on gr. 50% priv. stair	private on grade	33% priv. on gr. 66% common stair	50% priv. on gr. 50% priv. stair	private on grade
Unit aspect	quadruple	triple	triple	quadruple	double (opposite)	quadruple	triple	double (adjacent)
Private outdoor space	on grade	on grade	on grade	50% on grade 50% gr. related	on grade	33% on grade 66% gr.unrelated	50% on grade 50% gr. related	on grade
Parking	private on grade	private on grade	private on grade	common on grade	private or com. on grade or u/g	common on grade	common un grade	private on grade

Dwelling Type	9 Stacked row house (1½ / bay)	10 Stacked row house (2/bay)	11 Garden apartment	12 3 - storey walkup apartment	13 Medium rise stacked units	14 Combined apartments & row houses	15 Slab block apartment	16 High rise point block apartment
Isometric / Plot Plan								
Dwelling units/acre (dwelling units/hectare)	31 (77)	35 (86)	52 (128)	65 (160)	71 (175)	84 (207)	90 (222)	120 (296)
Floor area ratio % open space	0.86 72%	1.14 72%	1.06 62%	1.36 55%	1.95 68%	1.92 62%	1.78 82%	2.62 87%
Unit relationship to grade	33% on grade 66% gr. related	50% on grade 50% gr.unrelated	33% on grade 66% gr.unrelated	33% on grade 66% gr.unrelated	33% on grade 33% gr. related 33% gr.unrelated	25% on grade 75% gr.unrelated	small % on grade majority ground unrelated	small % on grade majority ground unrelated
Access to unit	33% priv. at gr. 66% priv. stair	50% priv. at gr. 50% com. stair	common stair	common stair	common elevator	25% priv. at gr. 75% com. elev.	common elevator	common elevator
Unit aspect	double (opposite)	double (opposite)	double (opposite)	single	double (opposite)	double (opposite)	single (and double adj.)	single (and double adj.)
Private Outdoor space	33% on grade 66% gr. related	50% on grade 50% gr.unrelated	33% on grade 66% gr.unrelated	33% on grade 66% gr.unrelated	33% on grade 33% gr. related 33% gr.unrelated	25% on grade 75% gr.unrelated	small % on grade majority ground unrelated	small % on grade majority ground unrelated
Parking	common underground	common underground	common underground	common underground	common underground	common underground	common on grade or u/g	common on grade or u/g

Assumptions For Calculations

Dwelling Type	Unit Area in S.F.	No. of Floors per Unit	Lot Size in Ft.
1	1200	1 or 2	50 × 100
2	1200	1 or 2	30 × 100
3	1200	1 or 2	25 × 100
4	1200	1	50 × 100
5	1200	2	21 × 100
6	1200	1	60 × 100
7	1200	1	60 × 100
8	1200	2	30 × 65
9	1200	1 and 2	consolidated
10	1200	2	consolidated
11	800	1	consolidated
12	800	1	consolidated
13	800	2	consolidated
14	800 & 1200	1 and 2	consolidated
15	800	1	consolidated
16	800	1	consolidated

Note: 10% circulation space added for dwelling types 11 through 16.

10

Fig : 30. Unit Types, Densities, and Land Use Efficiency.

Source : Rubenstein (1969;10).

Fig : 31. Negligence ; Children's park used as a store ground.
Hanthane housing scheme, Kandy.

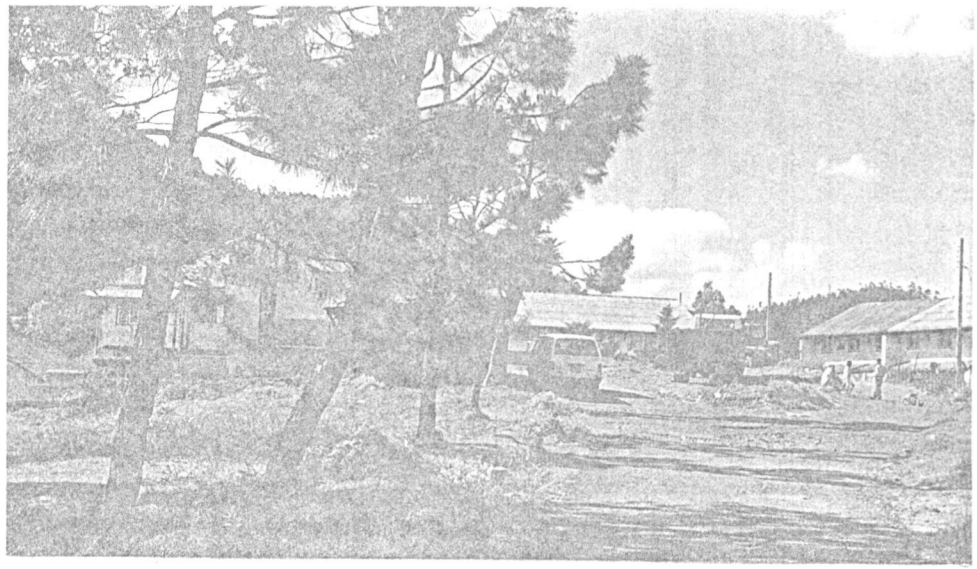


Fig : 32. Unplanned Parking ; Destroys the space for children.
Bambarakele housing scheme, Nuwara Eliya.

5. 2. 2. Environmental Design.

As we designers of the built environment are responsible for creating an environment for human beings that are both extremely habitable and environmentally responsible which is finally called sustainable.

As used here the word 'design' encompasses the group of activities - analytical, conceptual, creative, integrative, evaluative, communicative- by which the physical and subjective attributes of a future building are determined.

" An environmental view of building design is concerned with the spaces given shape by the solids of construction, the quantitative properties of the climate (heat and atmosphere, light and sound) within that space the qualities and character - i.e. the 'atmosphere' (or 'mood' or ambiance') - of the interior, and the degree to which those properties and qualities permit the owner's and user's needs of the building functional, economic, emotional and other - to be served." (Manning, 1995;181).

Incorporating environmental design to housing would be a positive action, which facilitate sustainability of housing rather than traditional design procedures. Further, Manning (1995;181) points out the difference between those two, "Unlike building researches, who traditionally, have found it desirable to study one thing at a time, building designers work with every thing at once, keeping constituent parts fluid while gradually shaping and deciding the whole. this results in a seeming need (which cannot, of course, be met) to decide everything at once and, in the doing, integrate solutions to the complex set of interdependencies that ensues. There is another important difference; when they design building's environments, designers do not seek to provide only the high levels of daylighting or the ideal thermal conditions or the best acoustic qualities that are typical outcomes of single-factor building research. Their objective is not an unrealizable combination of ideals but as much as many be possible of the best achievable daylighting, heating, acoustics and more, all at once." (fig : 33, 34).

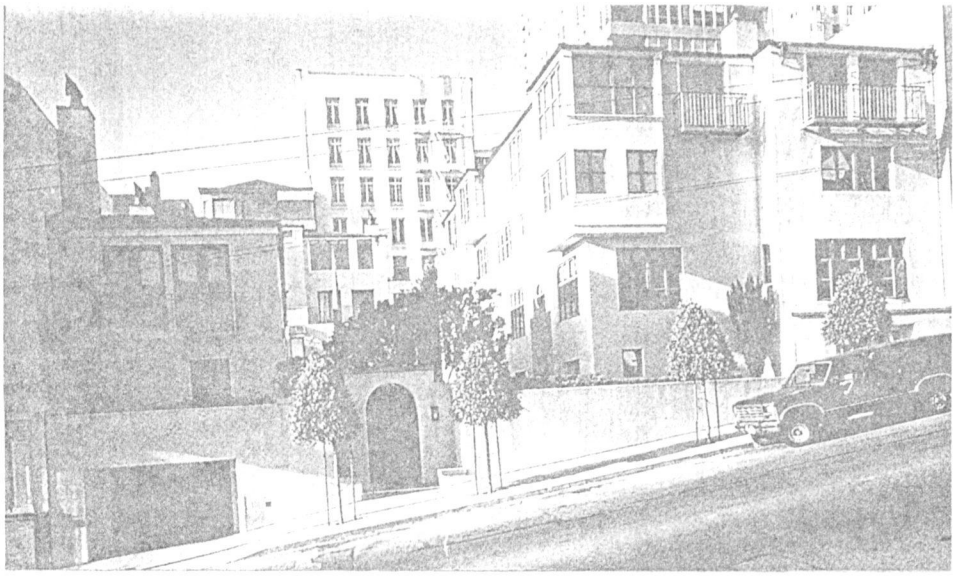


Fig : 33. Urban Housing on Sloping Land.

Source : Pearson(1991)

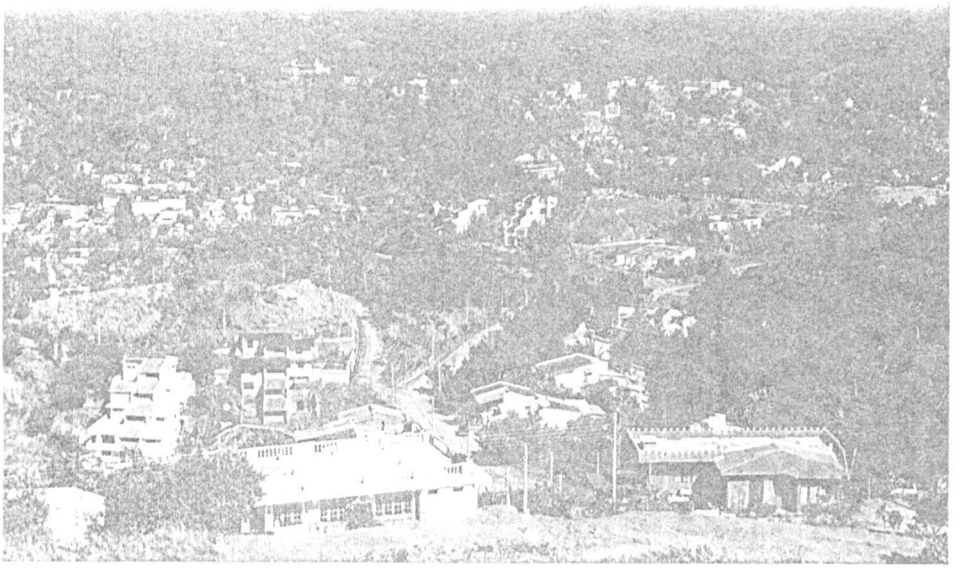


Fig : 34. Housing Design with Natural Environment.

Hanthana Housing scheme, Kandy.

5. 2. 3. Infrastructure Facilities.

A housing environment is complete only when its due facilities are met with. Housing in fact is like poetry. Either it is good, very good or bad and for which every minute item, concerned with it, is responsible.

"Human settlements depend not only on the individual houses that shelter families living within a community but on the essential infrastructure like roads, railways, domestic and other water supplies and energy required by the community and the other services like health , education, transport, that enhance the quality of life". (UN, 1980; 38)

Under the built environment management within housing the infrastructure also should be manage to prevent from;

* overloading
* unable to future expansions
* resource wastage
* accidents
* pollution
* increasing cost of living
* disasters etc.

When managing the infrastructure and services the community involvement is very important. Incorporating the people to design while giving priorities to their goals would help to self sustained development within the community. Also the self financed and self managed projects of infrastructure and services by the occupants increase the sustainability of the development. (fig : 35).

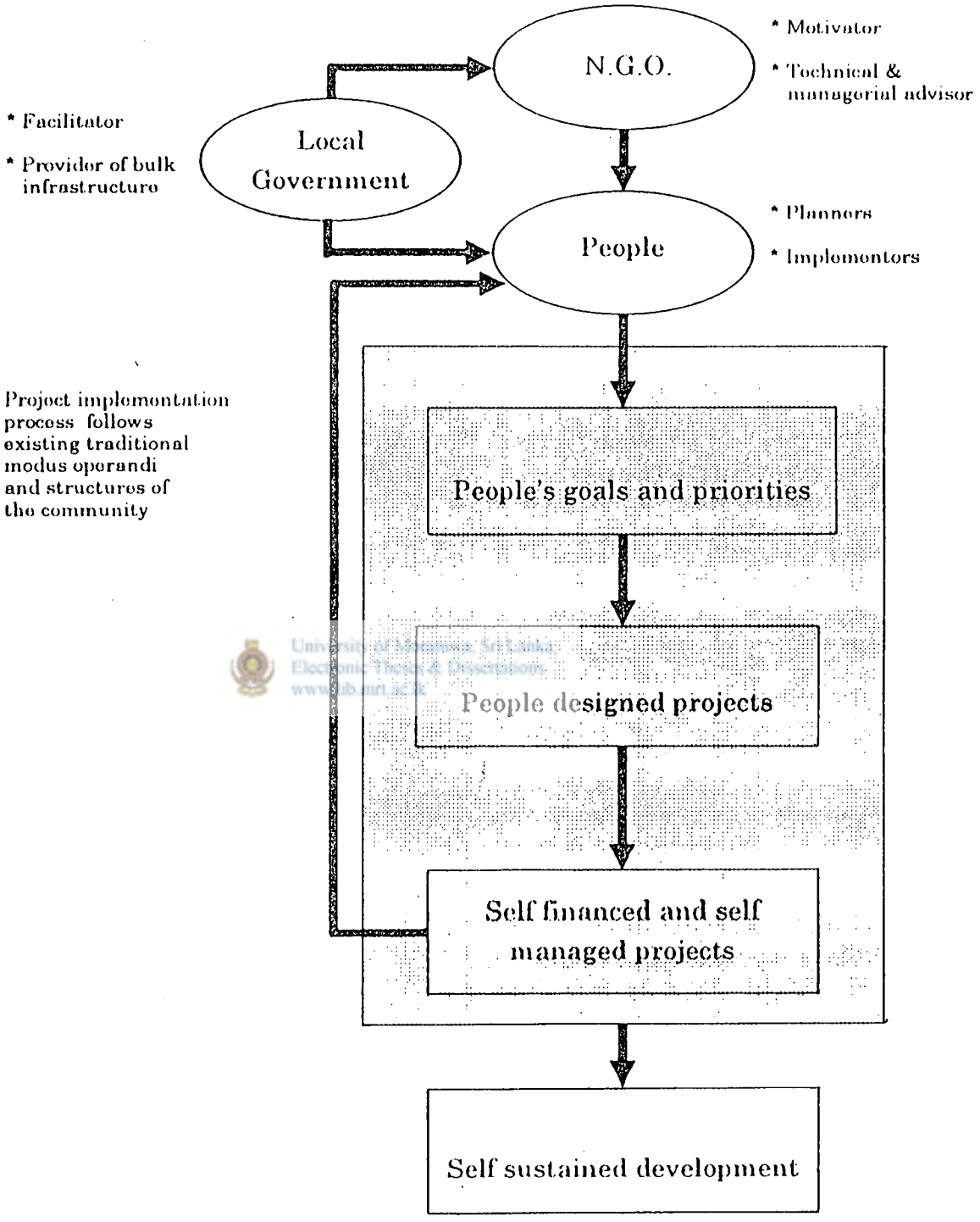


Fig : 35. Process of community involvement in Infrastructure and Services.

Source : UN (1992;17).

5. 2. 4. Building Materials And Construction Technology.

The selection of appropriate building materials for construction work could be described as important factor in achieving a sustainable development in the housing .

Use of building materials which have following properties will significantly contribute to the sustainability.

1. It should be possible to convert the finished building materials back to its original form with less amount of energy.
2. The materials should be able to regenerate with natural eco-systems in a short period of time or else they should be able to be produced by less energy consuming and pollution free manufacturing process. (fig : 36).

" For example, when an unburned clay wall is compared with a burnt brick wall, we could see, clay wall needs less energy for production and it recycles back to its original form. On the other hand, the bricks require a fare amount of energy for production and it cannot be converted to its original form easily. Similarly, it can be shown that lime is a better choice when compared to cement." (Chandrasekara, 1995;14)

" Further research works on building materials are essential to develop an approach for sustainable design. Indices should be established for all building materials considering factors such as the production process, time and energy requirement for production, ability to recycle, impact on the environment etc. For example, mud will have a low index and cement a higher index figure. Multiplying the quantity of materials used for a structure by their respective index numbers, we would be able to get an idea of their environment friendliness and contribution to sustainable growth. " (Chandrasekara, 1995;14)

Use of alternative construction techniques other than inefficient; energy wasting methods also for housing construction would be a positive action towards sustainabilty. As an example use of human energy (refer; 5.1.1.) could be given.

Using appropriate technology which incorporates available building materials, energy and labourforce, rather than more sophisticated high technology such as industrialized houses, would improve the socio-economic and environmental conditions for sustainability.

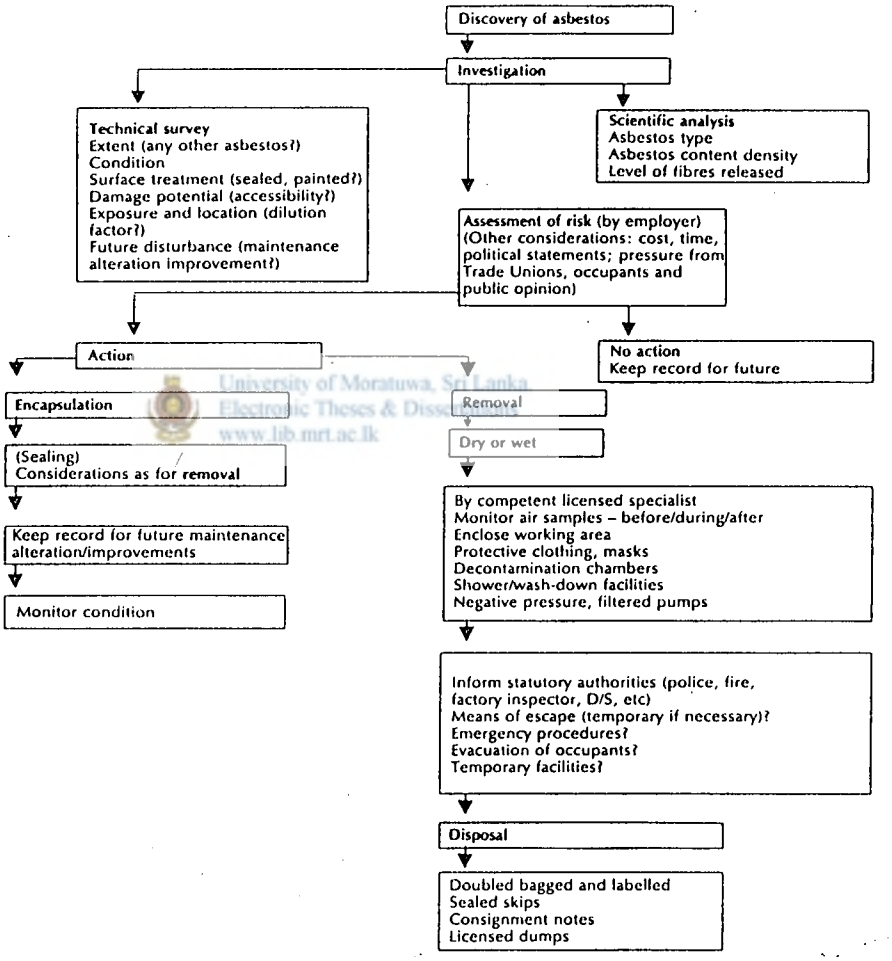


Fig : 36. Outline of the Procedure to be Followed on Discovery of Asbestos.

Source : Johnson (1993;95).

5. 2. 5. Landscaping.

Landscaping in housing environment is not merely for the pleasing environment. It should incorporate the notions of security, safety, leisure and recreation, children's play, infrastructure services even the parking of vehicles. (fig : 37,38).

Further landscaping would satisfy the psychological and physical needs of occupants. As an example the following values and benefits related to architectural design on housing environment could be seen.

* aesthetic
* space definition and articulation
* screening undesirable views
* complementing or softening architecture
* Creating sense of unity among inharmonious buildings.
* providing textural and pattern variety
* buffering incompatible land uses
* attracting wildlife etc.

Landscaping normally is divided into two as hard landscaping and soft landscaping. The trees, which include in soft landscaping affects an area's microclimate by moderating the effects of sun, wind, temperature and precipitation, such climatological values and benefits includes these;

* intercepting, filtering, or blocking unwanted solar radiation.
* blocking undesirable wind by obstruction
* directing wind flow by deflection
* reducing wind velocities by filtration
* moderating temperature changes (although this is more directly function of solar radiation interception)

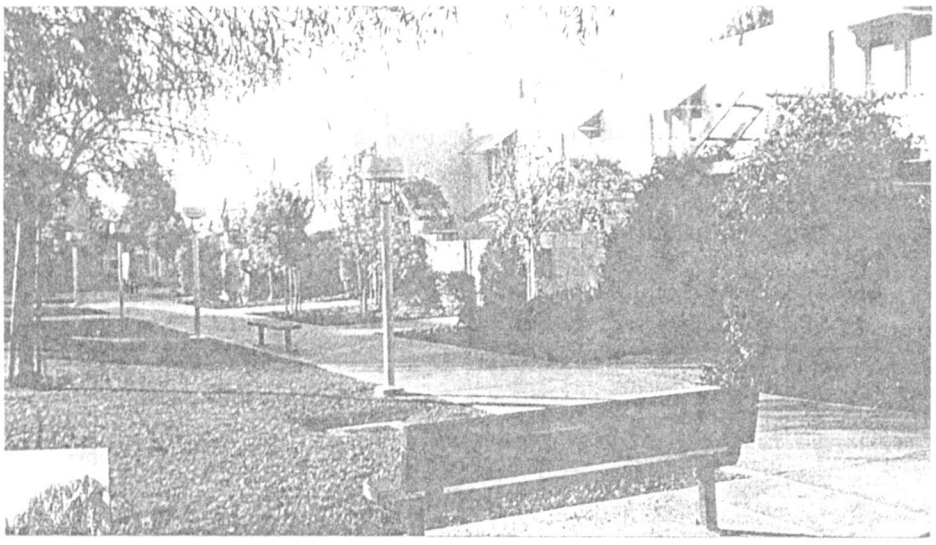


Fig : 37. Well Lit and Generously Landscaped Housing Scheme.

Source : Pearson (1991)

Fig : 38. Incorporating Children's play activities; to the Commongarden Landscaping.

Source : Pearson (1991)

The values and benefits of landscaping relative to environmental protection and conservation are equally as important. These include the following ;

* decreasing storm water runoff directly through interception of rainfall and indirectly through water uptake from root systems.
* stabilization of soil
* protection against erosion
* reducing the glare and reflection characteristically generated by the combination of buildings and / or road ways and natural and / or artificial light.
* acting as noise attenuators
* interacting with the particular matters and gases. known to cause air pollution to reduce significantly the concentrations of those pollutants.
* adding extra oxygen to the atmosphere.

5. 2. 6. Man Made Disasters.

The activities of man could become a disaster for himself and the whole occupants of the settlement. Even, sometimes he encourages natural disasters by his activities. Man made disasters are;

* Fire (fig : 39).
* Explosions
* Mining catastrophes and damage
* Contamination of air, water and soil
* Large scale traffic accidents
* Radiation

To prevent this, there is the need for active rules and regulations, safety precautions and increase of public awareness on the consequences can be given. Further the physical planning for prevention is discussed in chapter 5.1.3. under natural disasters. For the illustrations relation to physical planning for disaster prevention in housing please refer annexure.

Fig : 39. Man Made Fire Hazard.
Hanthana Housing scheme, Kandy.

CONCLUSION

CONCLUSION.

Housing development is a more complex and vast subject. It concerns itself with problem solving and decision making. It provides designers with enormous gratification to watch a concept more from the first exploitative lines on a sheet of paper through different stages of development to an exact working prototype of the end product. But the problems facing designers and developers are becoming increasingly complex, especially when ecological, social, financial and political consequences are considered.

Life has become a mere struggle for the modern man even without his knowledge, as he is making desperate attempts to search for new ways and means of fulfilling his ever increasing needs and aspirations, of course modern science and technology have been a great help for him in this respect and his achievements are vast and unimaginable. He has conquered the earth, the sea, the sky he is in the process of conquering the unknown worlds far and above.

The world is a limited entity an most vulnerable property. All its resources are static. They will never recover at the same pace of his consumption with over exploitation and it is fast becoming an unsuitable place for his habitat. Development and environment cannot be separated in the creation of a conducive habitat for mankind. Nevertheless the basic physiological and economic needs of man must be fulfilled and on the other hand there is a need to balance, harmonize and integrate the development with ecological, social, financial aspects etc., and development with above factors are now being brought to sharper the focus arising from recent movement towards sustainable development.

Environmental management in housing is a physical, psychological, social, economic and environmental experience having the potential of making sustainable development surpassing the many limitations which direct man towards achieving this end step by step. It is this ultimate purpose that the environmental management must serve more than any other at present.

This study resists it self on the argument which is made according to the definitions of sustainabilty and sustainable development. At the sametime the environmental management is a holistic approach which makes housing development complex and comprehensive.

Its the role of the designer to amalgamate the components in the process of creating sustainable products. At the first step its important to study the past for better alternatives to modern methods and to examine how other people solve the same problem. All good housing designs are not merely sustainable. Any product of housing should be sustainable to the task if performs, the people that use it, and the materials from which it is made, It must also be appropriate to the ideas and behavior that will produce it should be in accordance with ethics and to the life style of its occupants.

The main focus of the study is to establish the concept of environmental management for sustainabilty of housing, and examination of its attributes and contribution towards sustainable housing development.

This initial study would be a guideline for architects, and other professionals in designing future housing needs. It is hoped that the approach presented in its dissertation has shown by example not only the relationship between housing environment and the sustainable housing development, but also hopefully the importance of the managing the environment to achieve the final goal, Hence forth it is possible not only to interpret, but also to implement in a complementary way.

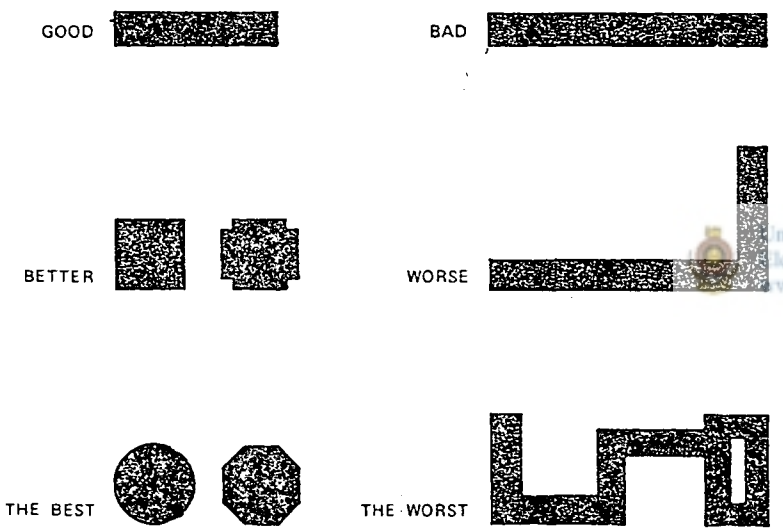
This dissertation has shown how this can be achieved by presenting a synthesis of different interpretations and notions that can enrich current knowledge of the wide range of principles related to housing development. Moreover at a more general level it has been illustrated not only how housing research and architectural practice can become uniquely pluridisiplinary, but also what issues can be examined in order to answer 'what makes housing sustainable?'. Given the complex range of

environmental factor and the reciprocal relations between them, that need to be examined in order to respond to this question.

Hopefully this dissertation has established a solid foundation for continuing theoretical and empirical research and housing environment management practices in the immediate and in the distant future.

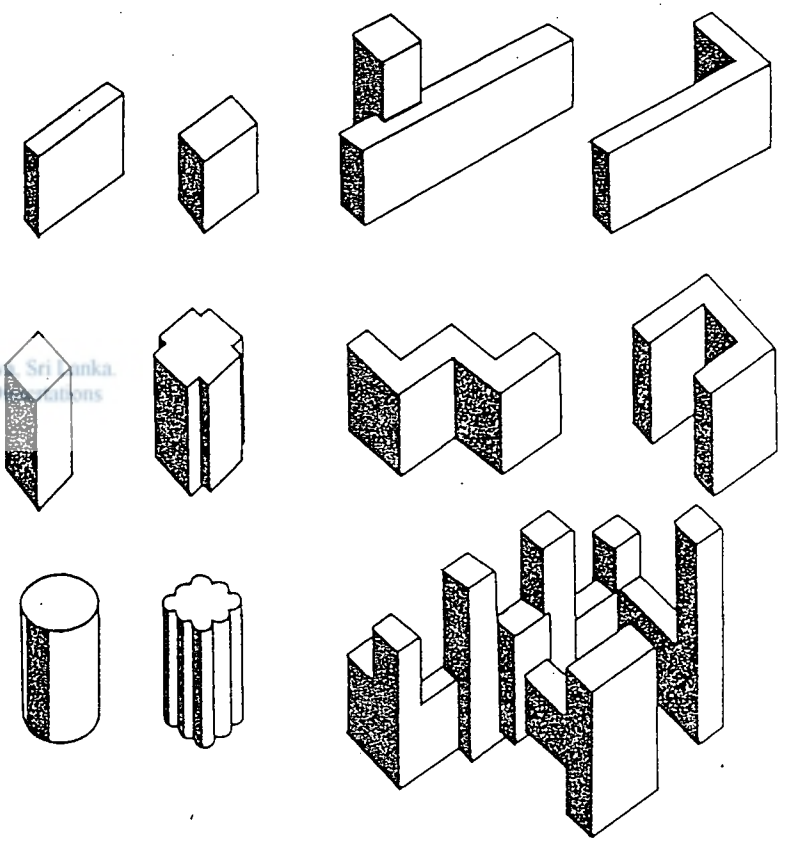
ANNEXURE

Shapes of buildings ①



GOOD **WRONG**

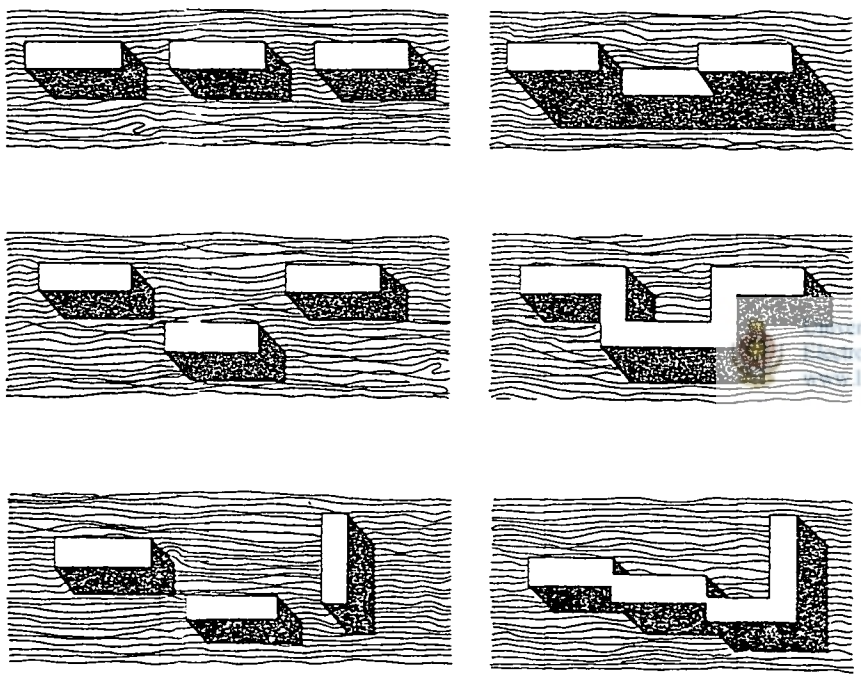
Shapes of buildings ②



GOOD **WRONG**

Setting of buildings

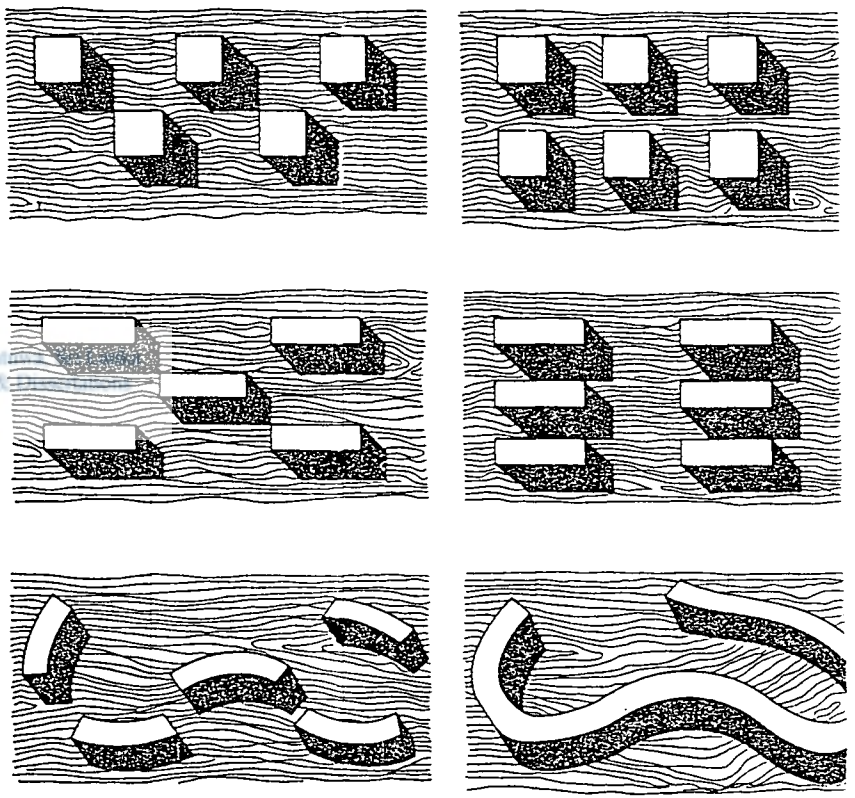
③



GOOD WRONG

Setting of buildings

④

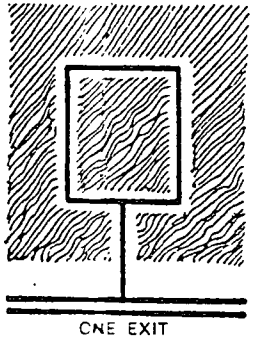


GOOD WRONG

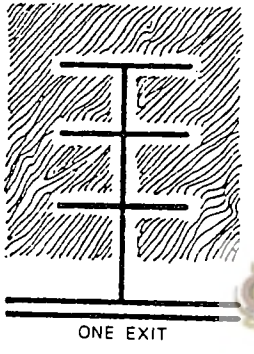
Exits from housing units

5

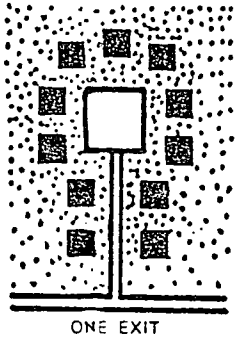
Never one exit!



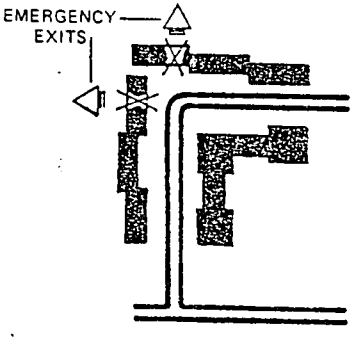
No dead end streets!



No dead end streets!



No buildings on street corners!

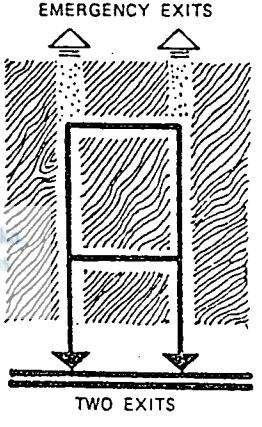


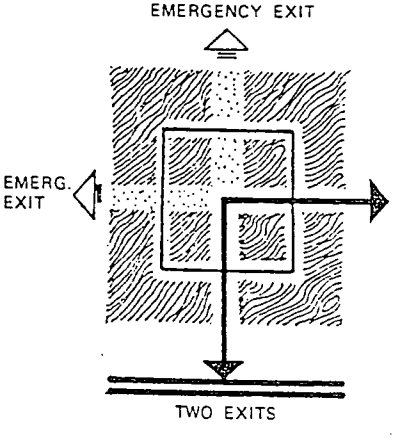
WRONG

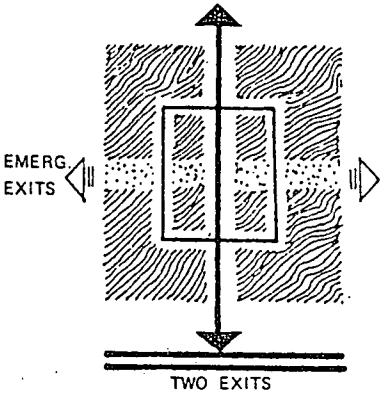
Exits from housing units

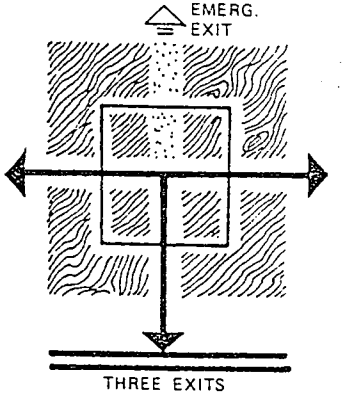
6

Always more than one exit!
+Emergency exits / Green belts /



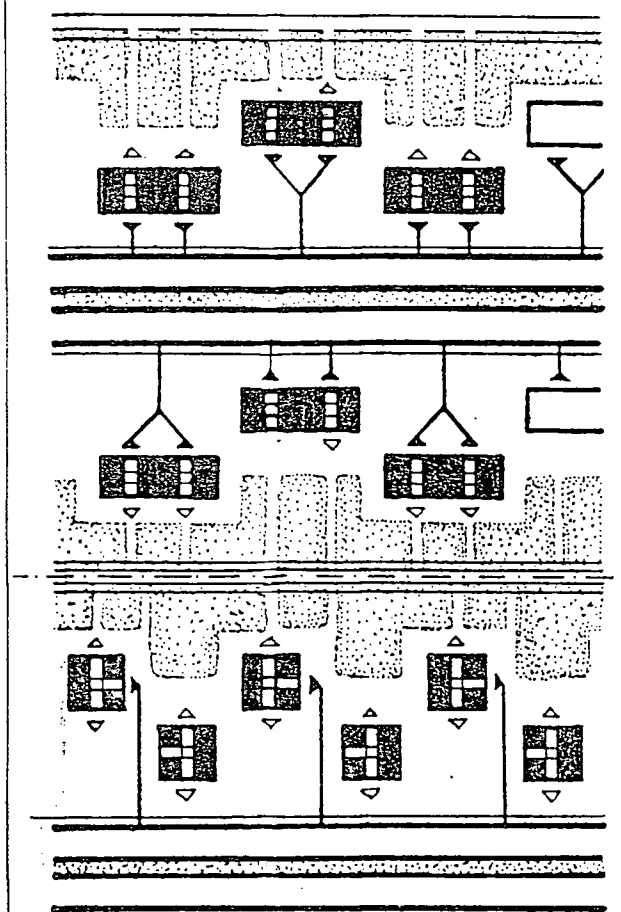




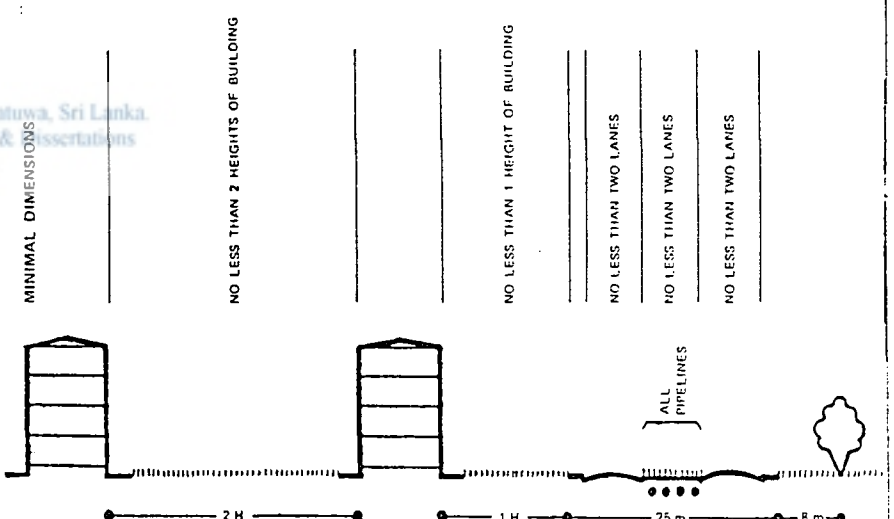


Exits from buildings evacuation system (7)

Always more than one exit from one staircase!

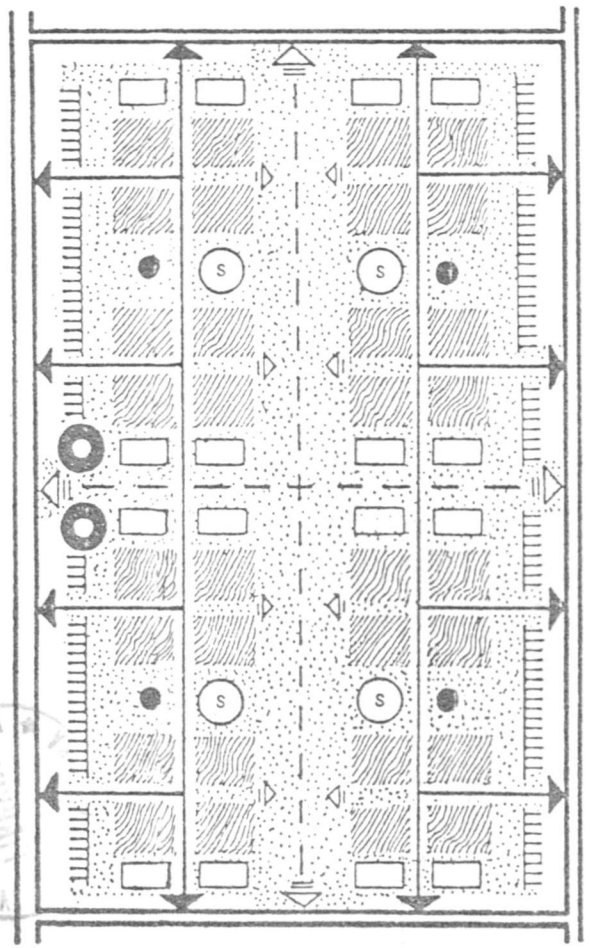


Street crossection (8)



Organization of space & Exits in residential area

9



HOUSING UNIT

EXITS FROM UNIT

EMERGENCY EXITS

GREEN SPACE EMERGENCY AREA

SCHOOLS

SERVICES

CIVIC CENTRE

SHOPPING CENTRE

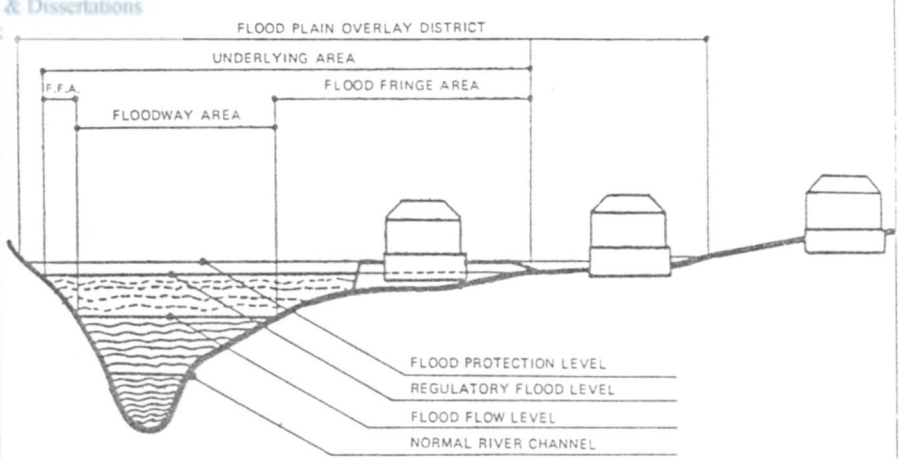
PARKING AREAS

EMERGENCY THOROUGHFARE

Flood protection

10

AS 5	NO STRUCTURES AND FILL	NO RESTRICTIONS
AS 4	AGRICULTURE PARKS RECREATION PARKING	
4	STRUCTURES ON FILL ONLY ABOVE REGULAT. FLOOD LEVEL BASEMENT FLOODPROOFED BACKWATER VALVES EVACUATION FACILITIES	
5	FLOOD BASEMENT AREA BASEMENT FLOODPROOFED BACKWATER VALVES	



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