A SUSTAINABLE LANDSCAPE FOR A LIVEABLE URBAN FABRIC

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ABSTRACT:

Sustainability offers a vision of the ultimate goal; designing for the present while keeping the future in mind. Moreover, through sustainability both health of humans and ecology system improve and continue to exist into the future. On the other hand, landscape addresses both the human and natural systems. The role of landscape elements, specially the soft, in improving the quality of life could not be denied, not only from the ecological aspect but also from the social one.

The paper seeks to understand landscape ethics in order to generate sustainable urban design guide lines for the landscape of open spaces. The question is not only the how of making green, safe and human oriented open spaces but also how to make such places function (sustainable) for both the present and the future. In fulfilling the above, some questions will be tackled, how sustainability is related to the landscape of open spaces? What are the needed landscape-qualities required for a sustainable concept in the design of open spaces in urban fabric? How could a sustainable landscape add to the future of urban life?

In answering the above questions the paper is to synthesise the conceptual origins and definition of the word sustainability. In addition, the role of a sustainable development in achieving a liveable urban fabric will be distinguished. Finally the paper will discuss the integration of landscape elements (soft and hard), and sustainability to create a more holistic design process to achieve livable urban life.

KEY WORDS: Sustainable development, liveability, urban structure, spaces, places, landscape

1. INTRODUCTION:

Today sustainability has become a keyword, according to Wheeler (1998); sustainable development is defined as the development that improves the long-term health of human and ecological systems. It is widely used to describe a world in which both human and natural systems can continue to exist long into the future.

The concept of sustainable development is used to refer to alternatives of traditional patterns of physical, social and economic development that can avoid problems such as exhaustion of natural resources, ecosystem destruction, pollution, overpopulation, growing inequality, and the degradation of human living conditions. Sustainable development can improve a sense of place, lower crime, reduce natural dangers, preserve energy and resources, conserve culture and heritage, improve traffic circulation and decrease waste, thus leading to a livable urban future.

On the other hand, the concept livable is often used at the same level as sustainability, where both promote urban planning that improves lasting community welfare. The former is more oriented to the specific human needs and people's subjective reactions to places, while the latter is more devoted to the physical environment that ensures such needs and relations to be fulfilled and to take place. However, a livable urban fabric is relatively assured through basic aspects which at the same time contribute to sustainability as a healthy environment, safety open spaces, appropriate houses, recreational facilities, etc. the phenomena of unliveable cities is resulted from losing the sense of connection between humans and the natural world.

Problem:

The typical post-war separation of land uses, which necessitates the use of vehicular transportation, has produced an environment which is characterized by various types of pollution, in addition to its overuse of the natural sources for the present with little thought of the future. This lead to various physical and social problems at present and so more attention is required to relate sustainable development to achieve a liveable urban fabric for the present and future.

2. RESEARCH OBJECTIVE:

The next century is more directed to solving the resulted environmental problems in addition to the economical and social problems of the post-war era. The importance of an urban fabric designed with reference to sustainable development stems from not just adding life to the urban form but more in improving the life of residents. The research aims at finding a way to produce a sustainable landscape in a way that achieves a livable urban community, which meets the needs of the present without the collaboration of the ability of future generations to meet their own needs

3. RESEARCH METHOD:

The paper is to use a descriptive survey where an exploration of sustainable landscape and development will take place. This will be achieved through three main steps:

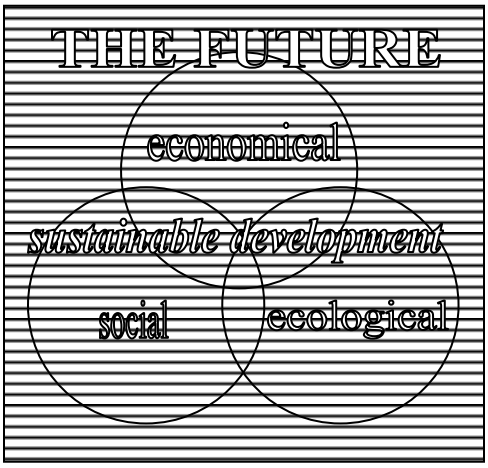
1. exploring the theoretical approach of sustainable development in the urban form
2. distinguishing the role of sustainability within the urban fabric
3. the integrating relation between landscape design and sustainable development

4. DEFINITIONS: ("Exploring sustainable development")

The most common accepted definition of sustainable development is that of the UN. World Commission on Environment and Development (UNCED) 1987 report p. (43): it is development "that meets the needs of the present without compromising the ability of future generations to meet their needs." Emphasis was placed on the need of action today so as to provide for economic and ecological viability tomorrow. Newman and Kenworthy (1999), describe sustainability as the three most powerful needs of our time; the need for economic development to overcome poverty, the need for environmental protection of air, water, soil and biodiversity, upon which humans ultimately depend, and the need for social justice and cultural diversity to enable local communities to express their values in addressing these issues.

The above is also expressed through defining the meaning of sustainability from the Western Australian Planning Commission: Sustainability is about understanding the connections between and achieving a balance among-social, economic, and environmental aspects that contribute to quality of life. It is not just about the environment. It is concerned with improving the health and welfare of the planet, its people and living organisms into the future (WAPC, 2001:1).

One of the biggest challenges that are related to sustainability is to develop an environment that values the long-term health of human and natural systems in an economical way where the present and the future are taken in consideration. In achieving such aim and with the assistant of the above definitions, reference is often made to the three very interdependent aspects of sustainability; the social, economic, and ecological.



The above contribute to a more durable development with a longer life span and will be mentioned as follows:

4.1 A Sustainable Social Life: aims to making places more liveable by enhancing the sense of ownership, counteracting urban stress and improving quality of life. Although it is clear that sustainability is dependent on communities for its success, developing the social dimension is often an arduous process. Wheeler (1998) stresses on the importance of promoting a healthy and sustainable social ecology referring it as looking for every opportunity to enhance human community, opportunity and empowerment.

4.2 A Sustainable Ecological Environment: is meant to affect the microclimate and creating wildlife habitats. The focus of this approach is more directed to the quality of air, water and the natural system. The dirty unhealthy cities of the industrial revolution and the resulted polluted environment still represent a problem that needs vital actions. Current transportation systems contribute to a complex web of urban problems such as air pollution, ecosystem destruction in addition to social fragmentation.

4.3 A Sustainable Economy: retaining property values because of a perceived better quality of life in addition to the usage of less maintained elements will add to the economy of cities. Less maintained elements leads to less defect to the ecological aspects and add to the economy of the city. The above is clearly expressed through Chief Seattle's poetic words: "We do not inherit the world from our ancestors; we borrow it from our children", (Carmona, (2003), p. 39).

5. LIVEABLE CITIES:

Livable cities promote development not only from the structure level of cities but also are concerned about the aesthetics of the townscape. According to Lynch and Appleyard (1979), liveability is one of six basic elements which one act with competence, free, from dangers and discomforts as noise, pollution, accidents, heat, glare and fatigue. Moreover, livability is also defined by Allan Jacob and Donald Appleyard (1987), as one of seven goals that were essential for the future of a good environment where everyone can live in a relative comfort. The two goals, sustainable development and livable urban cities are mutually supportive, so to achieve a livable future, the urban design of cities should attain the three qualities of sustainable development, (fig. 1).

The main theme of sustainability within the urban context is limiting car dependency, aiming not only to reduce pollution and preserve natural resources but also to facilitate community interaction and connection. Transportation represents an obstacle towards achieving sustainable community not only for its ecological effect on the environment but also as it minimizes the chances of social exchange and for its negative effect on the economy of users and worn out of natural resources.

Achieving a livable urban fabric is accomplished through the main overlapping and interconnecting three levels; the city structure, its urban spaces and local design. They will be related to sustainable development, where more emphasis related to the third level will take place as follows:

5.1 A sustainable city structure
5.2 A sustainable urban space
5.3 A sustainable local place

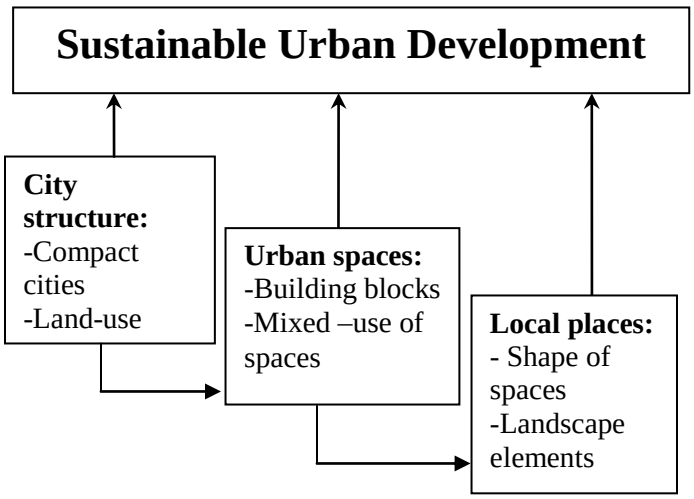


Figure 2, the three levels of sustainable development within the urban context

Figure 1, the interlocking of sustainable development of cities

5.1 A sustainable City Structure ("Roads/areas)

A sustainable city structure is largely affected by land use and whether the city is compact or not.

5.1.1. Compact Cities**:**

Compact cities, where the urban form is small enough to be easily walkable, eliminate vehicle dependency. In laying the infrastructure, reducing car journeys and encouraging other sorts of movement between and within separated areas should be taken into account. Compact cities can reduce travel distances; if these are suitably reduced, walking and cycling become possible alternatives to the car, thus helping in reducing air pollution, noise and heat, which improves the environment ecologically. A compact city allows the choice of walking to facilities within a short range even if not everyone actually does (Marshall (2000)). Compact walker-friendly places are people-friendly places, where pedestrians' needs are put first in a more likeable atmosphere where walking as an activity is accompanied by other activities as meeting, playing and interacting, thus enhancing the social environment. More people out and about on foot makes everyone feel safer and discourage crime and anti-social behaviour, (transport 200 Trust/ DfT 2003). [Table, Carmona p. 31?). Moreover, compact cities contribute to the environment economically through reducing the expenses of transportation and reducing the pressure on the natural resources thus preserving nature.

5.1.2 Land Use:

An important key aspect of creating lively, sustainable open spaces is the spatial and temporal concentration of different land uses and activities. A balanced mix of use, within the city boundaries, including opportunities for work, education, shopping, governance, leisure and residential areas should be encouraged from the sustainable point of view, (Breheny (1992), Frey (1999), and URBED (1997) in Carmona et al., (2003) and Moughtin (1996)). Mixed-use developments are more sustainable, they enhance the social development of cities through reducing vandalism, crime, and the need to travel, in addition to providing the city with areas characterized by safety and activities enrichment. Moreover, the mix of use within cities reduce traveling distance, thus lessen pollution which improves the ecological aspect of the environment. Besides, the existence of different uses within one area stimulates the economy of cities.

5.2 A Sustainable Urban Space: (BUILDINGS/STREETS)

Urban spaces are defined by buildings' blocks and movement network; both play a role in the sustainable development of cities. According to Moughtin (1996), "cities with large blocks of single use disrupting the intricate network of public paths; a coarse-grained city dying at night, a fearful place for citizens unprotected by the comforting envelope of a fast-moving car…..While the theory of sustainable development points clearly towards a mix of uses in the city, neither the precise nature nor the degree of intricacy of land-use mix is specified".

5.2.1 Buildings' Blocks:

From the ecological point of view buildings' heights, form and position affect the microclimate of spaces between buildings. Buildings with different heights when located perpendicular to the wind direction provide better air circulation to spaces in between than buildings with similar heights, (figure (3), Carmona, p.187). Moreover, the variation in buildings' heights and breaks in their line affect shadow and solar access to the space in between, (Carmona (2003)).

Form and direction of buildings play a major role in the efficiency of spaces economically, through minimizing the time of using artificial systems within spaces due to the existence of natural lighting and ventilation. Building blocks have the potential to support the process of sustainable development when their form is matching with and promoting public transport. Moreover, the size of blocks should be considered, where small blocks give the pedestrian a choice and variety of routes between any two points and vice versa. Location should be close to the public transport system or sited within walking and cycling distance of vital connected activities. Any other location is unacceptable by the need to reduce to a minimum transport energy cost, a factor which should be a major consideration.

Moreover, the arrangement of buildings is better to facilitate direct pedestrian movement to and from facilities and amenities thus to reduce walking distance and encourage short cuts which will accordingly support social exchange. Besides, location and distances between buildings within the urban fabric should create forms and shapes of spaces appropriate to encourage various activities to take place. **(Orientation and layout of buildings to create a layout which allows sun penetration, reduces wind speeds and enhances microclimate)**

5.2.2. Street Network:

Vitality of movement within streets results from the existence of various activities at all times of the day, which is strongly related to the mix of uses within the building envelope. The priorities of movement between buildings should be: first by foot and cycle then public transportation and finally by car to stimulate a sustainable urban fabric, if this hierarchy is converted the death of the city is expected. Spaces between buildings should be seeking to re-establish anti-car metabolism, thus encouraging walking and public transport as the preferred most economic means of moving. According to Wheeler (1998), inverting the transportation hierarchy means placing the heaviest emphasis on the pedestrian, who represents the most the city energy efficient form of transportation and adds a much needed human presence to cities.

Moreover, when taking social sustainable development in mind great emphasis should be put on its housing of a mix of activities to ensure safe livable open spaces. The global need is to form pedestrian-dominant environments that recommend a choice of ways of travel and encourage social exchange through the participation of different activities. Compact means of movement is preferable, where the relation between humans and vehicles is moderate, and where the link between vehicle roads and pedestrian streets is attained through suitably located parking areas and transport stops.

Movement and spaces between buildings should create pedestrian-dominant environments, through comfortable micro-climate, suitable and safe pedestrian's movements, appropriate location of parking lots and their relation to various types of movements. Reducing car dependency: Streets and other open spaces should become pedestrian-oriented places that promote social interaction, enhance ecological environment and reserve natural resources.
(Provide local access to public transportation)

5.3 A Sustainable Local Place: (Landscape of Places)

After considering the above, the question that imposes itself is how to make such spaces attractive for human use? Local places are meant to deal with users at the human scale. Places between buildings should have safety and mixed-used characteristics to support a range of uses which socially and economically promote sustainable cities. The sense of place at the local level stems from its ability to support human activities, through shape and landscape elements.

5.3.1. Shape of Places:

Shape of places is defined by space edges, facades. Buildings' facades should offer an active frontage onto places, through adding interests and vitality. It is better for facades' openings to overlook places; the more openings onto places the better for safety, security (Newman), and liveability (Gehl), hence the space is considered socially sustainable. (Amenity and safety of spaces are accomplished through creating a desirable view where buildings' opening overlook to provide good surveillance of the street and the activity within, thus producing a safe space, (Newman)).

Moreover, the existence of activities are more dependant on the shape of the place, e.g. linear spaces sustain activities as walking than social ones, while other geometrical shape places maintain the social more than walking, jogging and running bearing in mind the size of the space. Places between buildings are considered sufficient from the sustainable point of view when their shapes afford different activities in their right form.

Linear spaces, symbolised by streets represent a path and a place, where they should support a range of facilities. A street is considered a path for being a connection between facilities, where walking, strolling and jogging take place. The most direct route between two known fixed points is a straight line. On the other hand streets are places where a variety of activities take place and where pedestrian movement is critical (a photo of traces of use near a route, where vegetation worn when route was not provided). It appears that a variety of land-uses stimulating many activities is a necessity of a lively street, thus stimulating sustainable places socially and economically, (Moughtin (street and squares) (2001)

5.3.2 Landscape within Places:

Landscape plays a vital role in the sustainable urban form of cities, it nourishes the aesthetic sense, improve air, and add human scale to spaces between buildings thus altering spaces to places. Landscape's basic role in the urban form of cities is directed to create physical continuity between buildings with different characteristics, and produce a highly legible space that is easy to understand. A sustainable landscape is one which is ecologically healthy, economically viable and contributes to human cultural and social experiences; it plays a major role in the procedures of reaching a sustainable liveable urban future. Landscape not only holds aesthetic value in the city milieu but also improves that local microclimate, reduces environmental pressures on the city region and affords mental relief and contrast for the urban buildings. Hence, nature and landscape in the city are significant for improving the quality of life of life in urban areas and assist sustainable development in every sense of the word: ecologically, socially and economically through motivating the followings:

I. A liveable social place through landscape:

It is necessary to recognize the interactive relationship between people and landscaped areas and to connect both elements in a way that optimize each. The following will highlight the contribution of landscape in the development of a sustainable urban fabric socially:

a. Encourage people's use of spaces: Landscape design should be achieved where increasing community interaction, hence decreasing social isolation and encouraging various types of interactions.
b. Support different patterns of activities: landscape elements should be designed to be functional thus allowing easy accomplishment of essential activities with different forms and patterns to occur. [Figures of landscape elements limiting and restricting activities to take place in comparison with others facilitating such activities to occur]

c. Improve the visual aspects of space: landscape act as a screen for objectionable undesired views. Trees and vegetation are often important in the perceptual image of spaces. *The trunks and branches create screen.*

d. Enhance legibility: Produce a highly legible space that is easy to understand through landmark, signs and space disposition. Improving the quality and attractiveness of movement routes as well as reinforcing community identity through well designed landscape elements as signage and street furniture.

e. A sense of wellbeing: produce a safe place protected from various types of pollution, landscape elements should be safe for human use. The existence of the soft landscape can help to visually counteract the stress experienced in cities as a result of traffic, pollution and noise.

f. Provision of high quality imaginable places: Landscape plays an important role in improving the image of public transportation through well position, location and designed stops.

g. Enhance human scale: landscape elements influence scale of outdoor spaces through pattern and size.

h. Self belongingness: Landscape elements that enhance the identity of space: London telephone box, Paris bin

II. Landscape and a healthy ecological environment:

The creation of attractive open spaces which encourage pedestrians to abandon vehicle does not only help in the social development of spaces but also adds to the ecological aspects of the environment. Decreasing dependency on the car and promotion of public transport, cycling and walking enhance the ecological natural system. This part is more devoted to the soft landscape than the hard, where the former assists the ecological health of the environment through the following:

a. Reducing pollution: intake of CO2 (over 99 wears, five trees take up as much as is produced by driving one family car for one year (Borcke, C. (2003)), release of oxygen, filtering of toxins and dust (foliage acts as an impingement filter, trapping airborne particles until they are washed away by rain (Borcke, C. (2003)).

b. Enhancing the microclimate: landscape elements absorb noise, raise local humidity by absorbing rainwater and/or delaying it entering the drainage system, make the ambient temperature more temperate by lowering it in summer and raising it in winter, beside moving and modulating light. Moreover they can be screening as a buffer against noise and wind. *Deciduous trees are more often appropriate than evergreens, as the former permit sunlight to reach open spaces in winter.*

c. Conservation of flora and fauna: Consideration of flora and fauna through the use of common plant community models, increases use of native species which are modified to the region. A level of biological diversity of plants appropriate to healthy site-specific ecosystem structure and function should be used.

d. Restoring the natural system: landscape should stem from the original ecosystem of the place thus to restore the natural system. Restoring a natural watercourse provides corridors and habitat for wildlife as well as walkways and open spaces for people.

III. Economical landscape within places:

All forms of landscape should be designed and selected with ease of maintenance in mind. Thus special attention should be directed towards, choice of materials and methods of construction to make landscape management more effective. The followings should be considered in relation to an economically sustainable development:

a. Less maintained materials: A landscape should be functional from the maintenance standpoint aiming for a reduction in labour costs and inputs as fertilizers, pesticides, water, etc. Moreover, sustainable landscaped areas should be selected with care, taking in consideration the choice of less maintained materials. For example the selection of fluorescent light bulbs in street furniture uses about one fifth of electricity of incandescent models similar wattage.

b. The cost effectiveness of elements: The cost effectiveness of elements of the landscape should be considered, a minimum of high-maintenance lawn areas thus lower required maintenance. [Figure of trees grid and safe guards to enhance and protect the tree thus elaborate to its growth]. Preferential use of local materials renewable and recyclable materials and materials with low life-cycle cost. Evergreen or deciduous trees are not only selected according to visual and environmental aspects rather economical views should be taken into consideration. For example an evergreen tree could replace a tent even better. Haussmann: (great streets p. 299): "A gas lamp that is placed too up will project light further but will not give adequate light to the immediate area around it. Obviously, that was not our goal. The higher a lamp, the greater the unlighted area at its base. By reducing the height of street lamps and the distance between them and decreasing the intensity of the flame in each lamp so as to use more gas, we were able to light the city's streets better".

c. Efficiency of resources: Preferential use of renewable and recyclable materials, in addition the ability of recycling trees leaves could add to the efficiency of resources. [Figures of turf areas too narrow to mow, which are not only difficult to maintain but have limited functional value in addition to edging of trees above turf level thus interfering with mowing]

d. Efficiency of maintenance: Location of landscape elements also plays a great role in the efficiency of maintenance, [figures of signs and trees close to streets and walks make application of fertilizers more difficult]

6. IMPLEMENTING A SUSTAINABLE LANDSCAPE:

The paper aims to achieve the maximum social, economic and environmental benefit from the use of landscape elements in urban spaces. Landscape elements should primarily relate in its expression, patterning, levels and visual qualities to the physical characteristics of places, human scale and activities. Landscape is mainly divided to two parts, the soft and the hard. The former indicates to plants while the latter include pavements, enclosures and furniture. In another attempt of division, it could be divided to three; the soft, the hard and the furniture. The latter division will be exploited and related to the three key factors of sustainable development.

Table 1, the implementation of a sustainable landscape

Landscape elements	**Factors for a sustainable development**		
	Social	**Ecological**	**Economical**
Soft: •Trees and Shrubs	• Location and spaces between trees should assist various types of activities to take place • Enhance spaces though screening of undesired views and supporting human scale • Better planted within streets and car parks	• Type should be selected from native species or cultivars of indigenous species to restore the natural system •Evergreen: reduce wind speed and dust and create shadow all year round • Withdraw CO_2 , produce O_2 and improve	• Evergreen: no falling leaves thus more economic • Deciduous: falling leaves could be recycled

	where pollution exists	the soil • Prevent overshadowing	
•Green Cover	• Imply spatial edges • As a colour it is a psychologically restful agreeable one	• Green cover helps conserve moisture • Provides the most effective initial protection against erosion • alter the local climate thus increasing the dispersion of pollution	• Turf areas too narrow to mow, are not only difficult to maintain but have limited functional value • As a ground cover needs regular maintenance
Hard: •Pavement	• Pattern depend on type of activity (change of pavement in street and sidewalk is used to indicate a hazard) • Assist walking through providing direction, and suggesting rate and rhythm of movement • Influence human and space scale	•Not ecologically friendly to the environment, depending on colour, and prosperity of material • May need drainage system	• Materials: robust finishes to surfaces and boundaries • Durability and load bearing depend on material
Furniture*: •Seats	• Form, size and material should be comfortable, and stable • Location to assist individual and group use	• Materials: heat absorption, rain run off efficiency	• Materials: durable, low maintained and robust against vandalism
• Tree Guards and Grids	• Dimension: pavement size, and continuity should be considered	•Dimension: tree grid should not exceed 1m² to allow sufficient aeration of the soil, while tree guard should stand 1.3-1.6 so not to interfere with the branching of trees	•Materials: durable long-lasting materials, e.g. cast iron. Flexibility of replacement through tree growth • should be coordinated when occurring together in terms of fixing and detail
•Planters	• Dimension, materials and location: selected with relation to activities (act as seating) and other elements	• Good conductor material and large planters are preferable to minimize danger of soil dehydration	•Should be maintenance-free on a long term basis, robust and resist vandalism
•Shelters	• Provide refuge and protection from weather • Create a sense of place • Dimension and position depend on orientation of	• Materials: resistant to different temperature	• Materials: resistant to fire, rust, rubbing, roughness and waterproof

	wind and sun • Location: depending on participated activities		
•Lightings**	• Level and type related to function (amenity or decorative)	• Materials: resistant to different temperature	• Fixing could be adaptable, mounted, clustered and combined with structure and signage
•Signage**	• Low signs are less obtrusive and feel more in human scale • Should combine aesthetics and function	• Materials: resistant to different temperature • Wind loading should be considered	• Height not too low for the risk of vandalism
•Litter Bins**	• Should be immediately obvious related to commonly participated activities (walk and sit) •Height should suit different ages	• Materials: resistant to different temperature • Lids help to reduce smells and minimize insect attraction	• Should be durable, maintenance-free and have adequate drainage • Robustness against vandalism
•Water Features	• Location: in the sun for sparkling while in the shade for reflection • Safety: avoid deepness and margins should be well define	• Cooling effect in hot hard paved areas, • Noise absorption (moving water)	• Minimize vandalism through integrating fountain components.
•Bollards	• Protecting pedestrian movement from traffic (safety) • Provide informal seating • Accommodate low level lighting •Define space	• Materials: resistant to different temperature	• Fixed bollards require little maintenance
* materials and colour of most street furniture should be coordinated ** elements which could be fixed together			

7. CONCLUSION:

To achieve a livable future, the urban design of cities should attain the three qualities of utility, durability and ability to bring to the user a sense of well-being and emotional satisfaction. Support should be given to create public places that are friendly to a variety of users. Providing footpaths, cycle-ways, street parking and attractive streetscapes encourages opportunities for spontaneous community interaction. Planners should take in mind to change roads to streets whenever possible, as roads do not have the social qualities of streets and tend to slice up and divide urban areas. It is general agreement that building blocks of mixed uses result in a more interesting city. The theory of a sustainable development for a liveable urban fabric points clearly towards a mix of uses in the city and the need to reduce automobile dependency. The following

two questions are part of the debate in sustainable development; to what degree should land/activity uses be mixed in the city? And to what degree should human/vehicle movement be integrated? It is very important that the next generation are encouraged to get used to cycling and walking as leisure activities as well as means of transport]
The conversion of mode of transportation mean a change of life style where humans no longer depend upon a car, this demands a major cultural change.

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