

Department of Environmental Management and Toxicology, UNAAB, Abeokuta

Human Settlement and Development (EMT 506)

lecture notes

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Course Synopsis

- [Human settlements, size and density](#)
- [Factors affecting location, landscape designs, parks and reserves](#)
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What is "human settlements?"

In 1976 in Vancouver, the United Nations held its first conference on the issue of physical and spatial organization of human life on this planet, and on the national and international actions needed to accommodate the growing number of population in urban and rural communities. This conference, called Habitat: United Nations Conference on Human Settlements, established the concept of human settlements to consist of several elements that had been previously considered separately from one another - housing, building, planning and the relationship of these and such other activities as environmental change and national and international development.

In the pre-history period, human settlement in terms of communities could only endure if certain conditions could be satisfied; namely if the clan or community could shelter and defend themselves from attack by human enemies or wild beasts; if they could grow sufficient food to provide not only for daily life but also a reserve to last until the next crop; could practice division of labour such that some members were released from the chores of growing or carrying food in order to specialize on making goods for exchange, especially jars, pots, cutlass, hoes, baskets and other containers for storing foods and drinks; and could organize a system of bartering and keep the trade open and protected. The more efficiently these conditions were met, the higher the standard of community life achieved.

Vancouver Declaration defined human settlements as follows:

Human settlements means the totality of the human community - whether city, town or village - with all the social, material, organizational, spiritual and cultural elements that sustain it. The fabric of human settlements consists of physical elements and services to which these elements provide the material support.

The physical components comprise,

Shelter, i.e. the superstructures of different shapes, size, type and materials erected by mankind for security, privacy and protection from the elements and for his singularity within a community;

Infrastructure, i.e. the complex networks designed to deliver to or remove from the shelter people, goods, energy or information;

Services cover those required by a community for the fulfilment of its functions as a social body, such as education, health, culture, welfare, recreation and nutrition.

Habitat II: The Second United Nations Conference on Human Settlements

Habitat II was held in April 1996 at Istanbul, Turkey. Popularly called the "City Summit" it brought together high-level representatives of national and local governments, private sector, NGOs, research and training institutions and the media. The Conference adopted the Habitat Agenda, a global action plan to realize sustainable human settlements. The Regional Action Plan and the Habitat Agenda has become the major guide for countries of the region to improve the quality of life and promote the sustainable development of human settlements in the Asia and the Pacific region. What is now required is to follow-up the recommendations the Habitat Agenda and the Regional Action Plan in the country or city context with appropriate actions.

It is now contended that human settlements are the spatial dimension as well as the physical expression of economic and social activity. No creative act takes place without being influenced by settlement conditions. In turn, the creation of workable human settlements inevitably becomes an objective of, an indicator of and a prerequisite for social and economic development. Settlements are an objective of development in that places where people can live learn and work in conditions of safety; comfort and efficiency are a fundamental and elementary need. Settlements are also an indicator, in that they are the most visible expression of a society's ability to satisfy some of the fundamental needs of its members: they can mark accomplishments as well as expose destitution, neglect and inequality. Finally, settlements are a prerequisite for social and economic development, in that no social progress for sustainable economic growth can occur without efficient settlements systems and settlement networks.

What is human development?

Human development is the creation of a form of human environment in which certain conditions prevail for human beings. These conditions are safety, sufficiency, satisfaction, and stimulus.

Safety: Society must be generally non-violent so that individuals are protected from victimization by the state or the police or each other.

Sufficiency: There must be enough food, housing, clothing, health, and education in the society. All the material things that will make people realize their full potentials.

Satisfaction: Life must be generally pleasant.

Stimulus: People are kept aware of their intellectual, emotional, social or spiritual potentialities and encouraged to fulfil them.

Settlements, size and density

Settlement is a permanent collection of buildings and inhabitants. They occupy a very small percentage of the earth's surface but exert a far greater influence on the world's economy and culture. Settlements are places to find jobs and to obtain goods and services. Beyond that, though, settlements are both nodes of storage for the world's cultural and economic wealth and point of origin for the diffusion of innovative economic and cultural ideas.

Why are settlements established?

Most contemporary settlements exist primarily to serve economic functions, but earliest settlements probably were established for other reasons. The precise reasons for the formation of the first settlements are shrouded in mystery, as they occurred before recorded history. To understand the possible reasons for the creation of permanent settlements, picture the situation before they existed. Human beings were nomads, migrating in search of food and water. They obtained food by gathering wild berries and roots or killing wild animals.

Why would the nomadic groups require permanent settlements? No one knows the precise sequence of events through which settlements were established, but analysts offer two types of explanations: cultural and economic.

Cultural Reasons:

The earliest settlements may have been established for religious, educational, political, or military reasons.

Religion: The first permanent settlements may have served as places to bury the dead. After all, what could be more permanent than a grave? Nomadic groups may have had rituals honouring the dead, perhaps memorial services on the anniversary of a death. Having established a permanent resting place for the dead, the group might install priests at the site to perform the appropriate rituals. By the time recorded history began, one of the most permanent features of many settlements was the temple. In fact, until the invention of skyscrapers in the late nineteenth century, religious buildings were often the tallest structures in the community.

Home for women and children: The settlements may also have served as a place to house women and children, permitting the men to travel farther and faster in their search for food. Women made household objects, such as pots, tools, and clothing and children were educated in the settlements.

Political and military: The group's political leaders also choose to live permanently in the settlement, which may have been chosen for its strategic location to protect the group's land claims. Elaborate structures were built in the settlement to house the leaders. The settlement probably was also a good base from which the group could defend nearby food sources against competitors, so for protection, soldiers were stationed in the settlements. Walls may be erected to surround the settlement, strong enough to withstand attack. Settlement thus became citadels,

centres of military power. The wall proved an extremely effective defence for thousands of years until the introduction of gunpowder and cannonballs that could destroy them.

Economic Reasons:

The religious, military and political leaders and their dependents needed food, which was supplied by the group through hunting or gathering. There is the need to store surplus food and thus the settlements acquired an economic role, as a warehouse to store an extra supply of food permanently. Settlement then became agrarian centre because the people realized that they can grow the wild vegetable they gathered and nursed them near them. People were able to produce most of the food through deliberate agricultural practices and no longer had to survive by hunting and gathering.

In addition to food, people needed tools, clothing, shelter, and other objects. Settlement therefore became manufacturing centres. Men gathered the materials needed to make a variety of objects, including stones for tools and weapons, grass for containers and matting, animal hair for clothing, and wood for shelter and heat. Not every group had access to the same resources because the vegetation and animals varied across the landscape. The settlement therefore was likely to become a trading centre.

Pre-history settlements

During the aeons of the Stone Ages, primitive man, a nomad, a hunter, ever on the search for meat and edible plants, could seldom stay in one place for long though he might shelter in cave during spells of severe weather. By very slow degrees he learned those things that helped to shape his daily life and environment: to control and use fire, to fashion and use tools, to domesticate animals, to cultivate and store food crops, to build shelter for protection from the elements; and these acquired skills enabled him to remain in one locality for as long as the land remained productive. When the soil in one place had lost its fertility he moved, with his flocks, to another.

The milder, wetter climate that set in after the last glacial period around 6000 B.C., including richer vegetation, great soil fertility and an increased animal population, heralded the Neolithic Age in which mankind grew in numbers and evinced both the desire and ability to live in sizeable communities.

At the dawn of the Bronze Age, *c* 3500 B.C., a typical settlement comprised something between five and fifty families sheltering in round hut dwellings on the site provided by earthworks or with a place of refuge nearby to which women, children and cattle could retire to comparative safety in the event of attack.

Settlements on the scale large enough to be of significance in a study of urban civilization emerged in the so-called 'urban revolution' around 3500 B.C., simultaneously in various regions with a broad belt extending roughly from the Sahara in the west to the Himalayas in the east.

Three regions in particular show evidence of advanced and extensive town planning and development:

The land between the Tigris-Euphrates rivers (Sumer, Akkad, Mesopotamia);

The Nile Valley

The Indus Valley

In each of these regions seasonal flooding of great rivers spread and renewed rich alluvial soil over wide areas, yielding rewarding harvests. Each area could produce even higher yields if irrigation channels were dug and maintained; and because such formidable tasks of agricultural engineering demanded organized labour on a large scale the need arose, and was met, for organized communities in large urban settlements. The rivers also provided what proved to be indispensable building materials when reinforced with cut straw, namely mud.

The Sumerian civilization, generally acknowledged as the cradle of urban civilization, began to develop around 3500 B.C.; and by about 2500 B.C. several of its cities had grown to considerable size. *Ur* of the *Chaldees* was said to have then attained a population of some 34,000, Lagash 20,000 and Erech probably as many as 70,000. The area of Ur within its walls was some 220 acres (0.89 Sqkm) and Erech some 2 square miles (5.18sqkm). Ur is in Mesopotamia in the present-day Iraq. Ur, which means 'fire', was the most important urban settlement for much of the third millennium B.C.

Land could be held in large blocks by tribes or even by the urban god or goddess. Plots could also be rented by the priests acting as agents of the deity. Urban population comprising craftsmen such as potters, spinners, weavers, carpenters, metal workers, jewellers, and others supported by farmers and farm labourers were administered by a profusion of bureaucrats under the direction of priests and secular rulers.

The scarcity of stone in the region caused Sumerian cities to be constructed mainly of burnt brick and mud. They were strongly fortified with walls and moat, supplied with water by canals and dominated visually by the massive Ziggurat (temple) complex standing in its private enclosure. The buildings do not survive long because they were made of mud bricks. Surrounding the ziggurat (originally a three storey structure with a base of 64 by 46 metres) were residential areas containing a dense network of narrow winding streets and courtyards. The very little evidence exist about the form and density of the dwellings, their forms or street pattern, but evidence from excavations is of orderly disposition of compact buildings along straight footways. House were usually two storeys with narrow rooms surrounding an internal courtyard that gave both privacy and shade.

In the Nile Valley, various tribal groups were united under a long succession of Pharaohs who ruled Egyptians from 3000 B.C. until the territory was annexed by the Persians in 525 B.C. Here,

too, the entire economy depended upon river, which also fed on extensive network of canals, ditches and dams. Collective effort created artificial environment and enabled highly organized communities to be housed and protected in large towns. The society evolved as sharply-defined hierarchy of priests, clerks, soldiers, merchants, craftsmen, labourers, and slaves, each group living in appointed sectors of the town. Imposing examples of the monumental architecture produced by this ancient civilization still abound in modern Egypt; temples, pyramids, obelisks, avenues of sphinxes and statues of colossal size endure because they were built of stone hewn from neighbouring cliffs.

There are evidences of more planning by the Egyptians than the Sumerians as dwellings were arranged on a simple geometrical plan of long parallel streets crossed at right angle by short alleys. Each street had a central drainage channel of stone, and some surfaces were paved. Workmen's dwellings were single-storey structures of three or four rooms arranged in long back-to-back blocks built of crude brick and roofed with reed or straw bound with mud plaster. The town may have housed as many as 10,000 people at as high a density as 500 persons per net acre.

The need to secure increased supplies of raw materials and new markets for manufactured goods spurred rulers and merchants in prosperous Mesopotamia, Akkad, Sumer and Egypt to extend their sphere of influence far beyond national boundaries. New settlements were thus founded and Neolithic fishing villages and trading posts around the Mediterranean seaboard were soon transformed from subsistence economy to an urban economy.

Crete was one of the many places developed in this way by prospectors from Syria and Egypt from 3000 B.C., onwards Together with the Aegean islands it formed an important staging point between those countries in the European mainland and by 2000 B.C. the so-called Minoan civilization had reached maturity there.

Settlements in Classical Period

Bronze-Age civilization ranking that of the Sumerian or Crete made first brief appearance on the Greek mainland in the Achaean fortress settlements of Mycenae and Tiryns shortly after the collapse of the ordered existence in Crete. The destruction of this civilization by the Dorian tribes in 1100 B.C. was the prelude to a long period of strife lasting until the eighth century B.C., when the various Greek tribes had settled down in small isolated independent communities which eventually emerged as 'city states'. Topography imposed isolation and many sites suitable for settlement were few and scattered and separated by mountains or sea islets, many of them overgrew the capacity to feed the population from local produce such as in Athens, Sparta, Corinth, Thebes, Miletus and others. Athens which was the largest city-state in ancient Greece was probably the first city in the history to attain a population of 100,000.

Under the rule of Pericles in the golden fifth century B.C. (444-429), there emerged a culture that was to serve as the fount of education for the Western world throughout the centuries until modern times.

The Roman civilization which had been developing slowly while Greece was at its zenith, gained ascendancy in western Europe first in Italy, subduing Etruscans in the north of the country by the end of the second century B.C., and then the conquest of Macedonia by 168 B.C. and Greece and Carthage by 145 B.C.. Thereafter it dominated the known world for five centuries. In the homeland with topography, unlike that of Greece, imposed few constraints upon intercommunication, the Roman peoples acquired characteristics of nationhood: of conformity rather than individuality, of co-operation rather than competition, of military genius, administrative ability and respect for law and order rather than discursive democracy.

They copied and adapted Greek architectural styles but perfected the arch and the vault. Their techniques of road-making and public health engineering were vastly superior to anything the Greeks had ever envisaged. Ruthless exploitation of slave labour enabled them to embark upon massive projects of engineering and construction of the scale undreamt of by their predecessors: witnessed by their aqueducts, the *Pont du Gard* in southern France with three tiers of arches, a height of 158 feet (48.2 meters) and a length of 902 feet (274 metres). All Roman towns, of whatever size or wherever located, seemed to accord with set specifications, modified as necessary to suit climatic conditions. At the heart of the built-up area, continuing the tradition of the Greek agora, was the *forum*, a formal open space of rectangular shape, colonnaded, decorated with statues and flanked by public buildings including the *basilica* (assembly room or town hall), the *curia* (law courts), temples, municipal offices, tax collector and sometimes, shops.

The city of Rome grew to at least 250,000 inhabitants, although some claimed that the population may have reached as high as 1 million. The city's centrality in the Roman Empire's communication network was reflected in the old saying, "All roads lead to Rome." The fall of the Roman Empire in the fifth century brought a decline in urban settlements. The prosperity of the majority of urban settlements had rested on the ability to conduct trade in a secure environment provided by the empire's armies. With the empire fragmented into control of hundreds of rulers, trade decreased, and the need for urban settlement diminished.

Urban life revived in Europe beginning in the eleventh century. Feudal lords established new urban settlements and gave the residents charter of right to establish the settlements as independent cities. In exchange for the charter of rights, urban residents agreed to fight for the lord. Trade boomed in the urban areas as surplus from the countryside were brought to the city for sale or exchange. The typical medieval European urban settlement was a dense, compact town, frequently surrounded by a wall. Important public buildings, palaces, and churches were arranged around a central market square. The tallest and the most elaborate structure was the church, many of which still dominate the landscape of smaller European towns.

Until the collapse of the Roman Empire until the diffusion of the industrial revolution across Europe during the nineteenth century, most of the world's largest cities were located in Asia rather than Europe. Around A.D. 900, the five most populous cities are thought to have included

Baghdad (in present-day Iraq), Constantinople (present-day Istanbul in Turkey), Kyoto (Japan), and Chang'an (modern Xi'an) and Hangzhou (in China). Beijing, China, competed with Constantinople as the world's most populous city for several hundreds of years, until London claimed the distinction during the early 1800s. Agra (India), Cairo (Egypt), Canton or Guangzhou (China), Isfahan (Iran), and Osaka (Japan) also ranked among the world's most populous cities prior to industrial revolution.

Rural and urban settlements

Geographers distinguish between urban and rural settlements, each with distinctive characteristics.

Definition of rural settlement: Several authors have tended to define and explain a 'rural area' differently. This situation is not surprising as the expression is dynamic in the sense that it has continuously been modified along the lines of the level of development or the evolution of human society. The definition manifested not only in temporal but also spatial variation. However, it is largely accepted that a rural settlement is a compact settlement with a resident population of not more than 20,000 people, characterized by fairly high agricultural labour content of at least 40 percent, and with few basic amenities (usually less than ten) such as roads, communication networks, public utilities like water, electricity, financial institutions, health and education, recreation facilities etc.

Definition of a city: Due to the problem of arriving at a well acceptable definition of a city, scholars often make definition relative to the origin of such cities whether in the ancient or contemporary times. According to Weber's definition which is of a predominance of trade-commercial relations, a city is specific with:

a fortification;

a market;

a court of its own and at least partially autonomous law;

a related form of association; and

at least partially autonomy and autocephaly.

Cities or urban centres can be separated from rural settlements or areas largely by population size, density, settlement size (i.e. the compactness or spaciousness of the place), spatial coherence, social heterogeneity and economic diversity.

Settlement sizes and spacing

Settlements vary in size and functions from a small farmstead to a continuously built-up metropolis or conurbation performing complex socio-economic and administrative functions.

Empirical studies have shown that settlements rarely grow up in random manner, but there is a measurable degree of order in their sizes and spacing in the region. Contemporary cities continue to serve as market centres and in developed countries; geographers observe that market centres are arranged in a regular pattern. The geographic concept of *central place theory* helps to describe the regular distribution of settlements and to explain why the regular distributions exist.

Central Place Theory

Central place theory was first proposed in the 1930s by a German geographer, Walter Christaller, based on his empirical studies of southern Germany. According to the central place theory, a central place is a market centre for the exchange of goods and services by people who are attracted from the surrounding area. The central place as the name implies, is centrally located to maximise accessibility for people from the surrounding region. Central places compete with each other to serve as market for the provision of goods and services. This competition creates a regular pattern of settlement.

Market area of goods and services: The area surrounding a shop from which customers are attracted is known as the market area or hinterland. August Losch a German economist modified the central place theory while trying to explain the location of manufacturing activities in the 1950s. He seeks to relate central places to their hinterlands and defines a central place as a settlement providing services for the population of its hinterland.

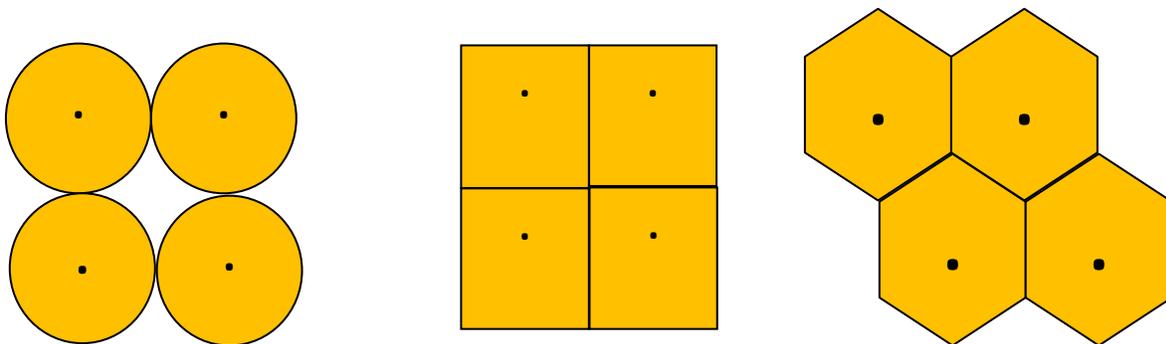


Fig. 1. Geographers use hexagon to depict the market area of a good or service because they offer a compromise between the geometric properties of circle (equidistance from the centre to the edge) and squares (nesting together without gaps).

The territory inside a circle drawn around the shop is the market area. A market area is a nodal area where most activities are intense. Customers located near the centre of the circle purchase goods and services from the local shops. Circles can be drawn to designate areas around

settlement and not just individual shops. This circular trading area is the most efficient in terms of accessibility to the centre and size of the area enclosed. As spatial competition among traders became stiff, the market competition becomes stronger, and market areas become overlap. But the customer being rational beings will choose the nearest retail shop in order to reduce the transportation cost.

If several circles are place next to each other a geometric problem arises. Gaps are created meaning people living in the gaps were outside the market area of any shop. Squares fit together without gaps but do not satisfactorily depict the market area of a good. To represent the market area, the hexagon is the best compromise between square and circle. Like square hexagon do not leave gaps and the variation in distance to the centre varies less than the squares.

Hierarchy of settlements

Small settlements are relatively numerous and close together, while larger settlements are rarer and farther apart from each other. This hierarchical pattern can be illustrated with a series of over-lapping hexagons of different sizes. Small settlements with small market areas are represented by a series of smaller, contiguous hexagons. Larger hexagons, representing the market areas of larger settlements, are overlaid on the smaller hexagons, because customers tend to shop in smaller settlements for goods and services and larger settlements for other things.

In the study, Christaller showed that settlements in southern Germany are arranged according to a regular hierarchy. He identified seven levels (sizes) of settlement or central places comprising of hamlets, township centre (sub-town/village), county seat (towns), district city (major towns), small capital city (major cities), provincial head capital and regional capital cities (metropolitan cities). The average market hamlet in southern Germany, for example had a population of 800 and a market place of 45sqkm. The average distance between market hamlets was 7 kilometres. The figures are higher for average settlement at each level in the hierarchy. Similar hierarchy of settlements was documented for the U.S. Midwest by Brian Berry.

Rank-size rule

Every settlement can be ranked in order from the largest to the smallest population. Geographers observe that in many relatively developed societies the ranking of settlements tend to produce a regular pattern, known as the *rank-size rule*. The rank-size rule originated from Auerbach and Singer in 1839, but popularized by Zipf, G.K (1949). According the rank-size rule, the *n*th largest settlement in the country is $1/n$ the population of the largest settlement (i.e. if all the urban settlements in an area are ranked in descending order of population, the population of the *n*th town will be $1/n$ that the largest town). Thus if the population size of the largest settlement, is 120,000, the second, third and fourth ranking towns should according to the rule, have population of 60,000, 40,000, and 30,000 inhabitants respectively. The rank-size Rule provides a capital framework for allocation of facilities to settlement in a region.

The distribution of settlements closely follows the rank-size rule in the United States and a handful of other countries in Europe. Several of the relatively developed countries in Europe follow the rank-size distribution among the smaller settlements but not among the largest ones. Instead, the largest settlement in these countries follows the primate city rule.

According to the **primate city** rule, the largest settlement has more than twice as many people as the second-ranking settlement. In France, for example, Paris has around 9 million inhabitants, but the second-largest settlement, Marseille, has only around 2 million, instead of 4.5 million that the rank-size rule predicts. The largest settlement in the United Kingdom also has around 9 million, while Birmingham, the second-largest has only around 2 million.

Urban development in Nigeria

The history of urban development in Nigeria is directly related to colonialism. Before colonization the predominant nature of human settlements was entirely scattered and sparsely populated rural settlements with few cities and towns. Colonization brought with it a new socio-political and economic dispensation. The mission of the settler was to take occupation of the land and make it his home, by exploiting all the available resources to best advantage. In trying to achieve this they created an administration system that was foreign to the indigenous people, but naturally supportive of this aim. They set up administrative structures and centres and developed supportive infrastructure such as urban centres, and communication linkages in the form of railway lines, roads and telegram lines.

The country is the most populous nation in Africa. Based on the 1991 census figure of 88.9 million, and an assumed growth rate of 2.8 percent per annum, Nigeria's current population has been estimated at about 120 million. About 30% of the population lives in urban areas, such as Lagos, Ibadan, Warri, Enugu, Onitsha, Owerri, Benin City and Port Harcourt, Kano, Kaduna and Jos. The population exhibits a strong rural to urban migration which has increased since the creation of more states. Nigeria's population exhibits a high ethnic and cultural diversity, composed of more than 250 ethnic groups, with Hausa, Fulani, Yoruba, Igbo, Ijaw, Kanuri, Ibibio, Edo and Tiv as the major ethnic groups.

Nigeria's population has continued to increase by with the rural urban ratio also increasing in line with the global trend of rapid urbanization. The urban population structure is still skewed with major cities such as Lagos, Ibadan, Abuja, Enugu, Kano etc. accounting for about 40 % of the total population. The potential of our towns and cities to play a leading role in the national economic transformation is yet to be realized mainly because they continue to be plagued with major development challenges such as that as high as 30% of the urban population still live below the poverty line, over 65% do not have access to potable water, and vast majority live in deplorable housing conditions or worse still some have no access to shelter. There are even more crucial challenges with the level of environmental degradation and insanitary conditions, which have reflected in increasing health hazards. Some progress has been made in the endeavour to promote sustainable human settlements albeit very insignificantly. Several policies have been put

in place in almost all the requisite areas, and the emergence of the private sector in medium scale shelter delivery has been modest. The population density in the country was put at 96 persons per km² in 1991, although regional differences occur, with the southeastern region having the highest density of 247 persons per km², while the lowest density occurs in the west central with 43 persons per km². In the northwest the density was estimated at 76 persons per km² while that of the southwest was estimated at 194 persons per km². The 1991 census revealed that 64 percent of the population lives in rural areas but the urban population has been growing rapidly at an annual rate of 4.5 percent. Today, about 70 percent of the Nigerian population consists of rural dwellers, an indication of the importance of agriculture in the economy. Furthermore, as much as 1,000 persons per km² density has been attained in a number of LGA's of Abia, Imo, and Akwa Ibom states in the south-eastern part of the country; Lagos and Ibadan in the southwest, and Kano in the north.

A few states and LGAs have experienced improvements in their human resource development and equipment capacities have increased. Despite these marginal improvements, the challenges or constraints are still overwhelming. There are gross imbalances in the distribution of population across the national territory, rural development has still not taken off as desired, and the construction industry remains virtually independent and inefficient to the point where the concept of a low-cost building still remains illusory. There are still flaws in the current institutional arrangements and weaknesses in the enforcement machinery have rendered virtually all legislation ineffective, and there is as yet no settlement that has come to terms with waste management.

There has been a renewed focus on the study of urban systems in the last few years, as urbanization remains a major development challenge exerting awesome pressure on social, economic and environmental sustainability. According to the [United Nations](#) the world's urban population experienced a 15-fold increase from 200 million in 1900 to about 2.9 billion in 2000, and is estimated to increase to about 5 billion by 2030. In developing countries, urbanization is associated with natural population growth, rural-urban migration, convergence in rural and urban lifestyles, and the economic and political processes associated with globalization. Though urban areas currently account for about 3% of the Earth's surface, the ecological footprint associated with urban expansion has important environmental consequences.

Urbanization often occurs on agricultural land and forests, and is generally accompanied by an increase in energy use, and air, water and noise pollution. The increase in impervious surface associated with urban land conversion also leads to a decrease in infiltration and an increase in surface runoff, sedimentation, and eutrophication of wetlands. Uncontrolled urban expansion also leads to the fragmentation of landscapes, destruction of wildlife habitat, and reduction in biodiversity. These impacts make an understanding of the factors driving urban expansion essential to global environmental change research. Africa's urban transition is partially accompanied by economic growth derived mainly from non-agricultural value-added. However, the growth is largely un-sustained, and far below the level required to significantly reduce

poverty levels. As the urban areas sprawl at their peripheries and the core areas break down with the burden from increasing demand for social services by the population, they consequently become homes of the poor, and the sites and sources of environmental pollution. This phenomenon makes the study of urbanization patterns more crucial in the development agenda of African countries.

Nowhere in West Africa is the rate of urbanization in the last few years as unprecedented as Lagos City-State, the economic focal point of Nigeria. Lagos occupies a unique position in the economic processes of the West African sub-region for several reasons. As the economic and financial nerve-centre, it accounts for over 70% of Nigeria's industrial and commercial establishments that account for up to 70% of the country's manufacturing value-added. It has extensive infrastructural facilities—the busiest international airport, seaport, and the most extensive road and telecommunication networks in Nigeria. It is also the host to the most active Stock Exchange in West Africa. These same reasons have made the conurbation of Lagos the hub of intense settlement, and the prime destination of local and international migrants. The remarkable population growth translates to ever increasing pressure on land for housing and business premises with profound environmental implications.

Inadequate housing leading to the emergence of slums, spatial inequity in access to land and infrastructure, haphazard land development, infrastructure decay, incessant flooding, widespread poverty and unemployment are some of the symptoms of unsustainable expansion of the city requiring the intervention of land use planners and managers. In order to prevent grave urban crises, ensure future liveability of the city, and minimize environmental impacts, land use planners require information about the location, spatial extent, rate and driving factors of urban expansion.

The distribution and use of land in Lagos are governed by customary and statutory laws. Under the customary tenure system, control over the use of the land is vested in the traditional ruler who holds the land in trust for community members. He is also responsible for allocating unused land to members of the community and adjudicating in land disputes. The right of usage of land is heritable patrilineally. There is a distinction between community members and strangers/migrants under the customary tenure system that prohibits the latter from acquiring land for building. The statutory land tenure system derives from two sources: the received Law of England and Local Legislations in Nigeria.

The escalating growth in population implies an increasing demand for biological resources. This in turn translates into increasing demand for arable land resulting in deforestation, shortened fallow period, soil deterioration, and increasing application of inorganic fertilizers, pesticides and herbicides for agriculture. Thus, the increasing population growth has become very crucial among the set of factors that degrade the environment and threaten biodiversity.

Cross-sectoral factors have been underlying cause of deforestation and forest land degradation perpetuated by poverty, population growth, pollution, discriminatory trade practices, and unsustainable policies related to sectors such as Agriculture (slash and burn), energy (harvesting of fuel wood), and Mining in forested lands.

Constraints and Obstacles to Human Settlement and Development

Some major constraints and obstacles facing human settlement development generally are:

- ❖ High population growth rate(2.7%) per annum) with due consequences for both human and socioeconomic development, Insufficient access to education, illiteracy and low levels of education inhibiting development, including low level of environmental awareness and poor understanding of the importance and relevance of scientific and technological concepts, difficult in getting people to adapt to and/or adapt informed technologies to rise productivity, reduction of the people access to information, thus preventing them from actively participating in community level policy formulation and implementation
- ❖ Large number of settlements lacking threshold population required for the effective and economical provision of services and facilities,
- ❖ Spatial (rural/urban, north/south) imbalances and inadequate economic and social infrastructure provision which varies considerable between urban and rural areas-in the more remote areas, such infrastructure is virtually non-existent, but even in the main urban centres, many facilities are substandard and unreliable
- ❖ Slow pace of decentralized administration engendering a top-down approach to development and its planning and thus staling efforts at accelerated growth
- ❖ Poor financial resources make it difficult to mobilize resources for long term investment, including financial resources to carry out basic ground demarcation of town plans updating maps for plan making the resolution of conflicts in rapidly expanding towns space etc

FACTORS AFFECTING LOCATION OF SETTLEMENTS

Location of Settlements

Town and cities all over the world have certain advantages of site and location, which have enabled them to grow. The site of a town is its topographical location. For instance, Lagos is sited on a marshy island that is almost surrounded by a lagoon with an outlet to the sea. Its situation is its position in relation to the rest of the region. Lagos is situated (or positioned) at the sea end of a rich agricultural region producing cocoa, palm oil and kernels, groundnuts, cotton and hides and skins. Several factors favoured the location and growth of cities and towns in a particular area. These include:

Fertile alluvial plain: Food and water are basic needs for human existence, hence a fertile alluvial plain traversed rivers is the best for raising food crops and maintaining a secure water supply. A level plain also facilitate the movement of people and goods. It is an ideal situation for the exchange of products and ideas, a centre for communication and administration. Examples include *Alor Star* on the fertile Kedah Plain, drained by the Sungai Kedah, the *Nanking* on the rich *Yang-tze* plain of central China and parts of intensively cultivated Paris basin drained by the River Seine.

Coastal lowlands: Places where narrow coastal plains are bounded on the landward side by mountains, agriculture, transport and settlement have all to be concentrated on the lower land. Where there is a route through the mountain barrier (a pass), this naturally lead to the growth of a town. Examples include Durban on the coastal plain at the foot of the Drakensberg in South Africa. Another example is Trondheim which lies on the fertile lowland of the Trondheim Fiord, bounded inland by the Scandinavian Mountains.

Sheltered indentations on the coastlines: An indented coastline has calm waters and is sheltered from the waves of the open sea. It is an ideal location for a seaport where off-shore islands offer an added protection. Dakar (Senegal) is located in a sheltered bay, while Freetown (Sierra Leone) is sited in a large estuary sheltered from the sea. These ports are examples of the best natural harbours in West Africa. Other examples of natural harbours include Singapore which is well sheltered in a curved bay. Melbourne is ideally sited on Port Phillip Bay and protected by protruding headlands on both sides of the entrance to form one of the best sheltered natural harbours in the southern hemisphere.

Nodal Towns: By virtue of their geographical location in relation to the region, many towns assume prominence as centres of road, rail, or water communication. People congregate to provide commercial and social services that passing travellers can make use of. Examples of nodal towns Chicago located in the Mid-West U.S.A. Roads and rail routes converge on Chicago from the west, east and south, while water routes on Lake Michigan lead north, and give it an outlet to the Atlantic via the Great Lakes. Kumasi is a rail and road centre in the heart of the cocoa-growing region of Ghana. Ibadan and Kano owe much of their respective central locations in flourishing farming regions with trade routes both by rail and by roads converging on them.

Site for generating hydro-electric power: Waterfalls are natural sites for generating hydro-electricity. Where such sites occur, the availability of cheap power attracts industrial concerns. These require labour and provisions, and a settlement is very likely to grow up. Examples include Buffalo at the top of the Niagara Falls which is an example of the growth of a large city associated with the development of H.E.P. Close to Kainji Dam of Nigeria is New Bussa, a new town built for the resettlement of the former inhabitants of Old Bussa, which is now submerged by the Kainji Lake. New Bussa has attracted new settlers and is growing rapidly. It is also becoming a tourist centre taking the advantage of its Borgu Games Reserve nearby.

By the side of lakes and rivers: Lakes and river provide fish, water and a means of inland transport. Some of the best known tourist centres are located on or near lakes because of the scenic beauty and the recreational facilities. Example is the lakeside town include Como one of the most frequented tourist resort in Europe, located close to Lake Como in Italy. Entebbe is a lakeside town of Lake Victoria, whose importance is further enhanced by its proximity to the Ugandan capital, Kampala. Salt Lake City, situated near the Great Salt Lake of Utah is one of the largest nucleated settlements in the Rocky Mountains. River-borne sites include a number of sites carved out by a river on its course from source to mouth.

a). Where a river passes through a gap. This is the lowest part of the region and it naturally carries many roads and railway routes e.g. Lincoln on the River Witham (U.K.), Toulouse on the River Garonne (France)

b). Where a river bends or meanders. A town may take the advantage of a change in the river's direction of flow e.g. Orleans on the River Loire, or a town may be sited on the inside of a bend, a defensive site almost surrounded by water e.g. Durham, England.

c). Where two rivers meet (confluence town): The volume of the river increases when two streams merge into one. The navigability of the river increased and a town may grow, e.g. St. Louis, at the confluence of the Mississippi and Missouri; Khartoum, at the meeting of the Blue and White Nile; and Lokoja, at the confluence of the Niger and Benue.



d). Where a river enters or leaves a lake on its course: A town may take the advantage of being near the two sources of water and two lines of communication, the river and the lake, e.g. Geneva, where the River Rhine leaves Lake Geneva, Detroit, where the St. Clair River enters Lake Erie.

e). Where a river enters or leaves a gorge: The gorge itself is too steep for any large settlement, but at the point where the river enters or leaves the gorge, the valley widens and there are better sites for settlements. e.g. Bingen, where the Rhine enters the Rhine Gorge, Bonn, where the Rhine leaves the Gorge.

f). The limit of river navigation or the head of ocean navigation: The point where the river becomes too shallow for river steamers to go any further upstream, or the point where big steamers begin sailing downstream towards the ocean, are important points. Oxford on the Thames is a river port at the upper limit of river navigation.

Function of settlements

All settlements perform certain useful functions to justify their existence. Most of them have several functions. London, a city of over nine million people has several functions. It is an administrative centre (being capital of the United Kingdom), likewise Abuja in Nigeria. It is also a port (with highly specialized docks and wharves), a financial centre (the Bank of England is the central bank of the Sterling Area), and industrial centre (highly sophisticated luxury goods are made, a cultural centre (with the University of London, art galleries, museums and theatres). However, most towns have just one function and therefore we can classify towns according to their functions as:

Market Towns: Centre of goods and services. They are the collection centres for local products. e.g. London, Lagos, Accra, Kumasi, Kano, Ibadan, Onitsha

Industrial Towns: Processing of raw materials into finished products. They normally have certain advantages as industrial sites, such as proximity to power, minerals, raw materials, labour or markets, and are well served by a good network of communications. Examples include Leeds (UK) specializing in textiles, Pittsburgh in USA specializing in steel.

Commercial Towns: These are the centres of commerce and finance, where trade is the primary concern. London is the financial headquarter of the Commonwealth, New York, with business concentrated on Wall Street, is the financial centre of USA, Frankfurt (Germany).

Mining Towns: The mining towns can be located in very unusual places provided there are sufficient mineral resources. Some of the more outstanding mining towns are Newcastle (UK) and Enugu (Nigeria) (coal), Johannesburg (South Africa) (gold); Jos (Nigeria) (tin); Lubumbashi (D.R. Congo) (copper).

Administrative Towns: Headquarters of governments and capital cities or centres of local administration. They deal with the organization and administration of the nation or of a division within the country. Examples include Geneva (international capital but not the capital of Switzerland), Washington D.C. (capital of USA), Abuja (capital of Nigeria), Addis Ababa (capital of Ethiopia and OAU).

Cultural and educational Towns: These are towns in which we found world-renowned universities e.g. Oxford, Cambridge and London in UK; Heidelberg in Germany, Lund in Sweden and Leiden in the Netherlands.

Ecclesiastical Towns: These are historical and religious centres and are frequented by pilgrims from other parts of the world. They include Jerusalem (Judaism, Christianity), Mecca and Medina (Islam), Benares (Hinduism). There are smaller ones e.g. Canterbury (U.K.), Lourdes (France).

Royal Towns: These are traditional residences of monarchs, kings and queens, sultan and their consorts. They may have beautiful palaces and are visited by foreign dignitaries e.g. Copenhagen (Denmark), Kuala Lumpur (Malaysia).

Holiday Resorts, hill resorts and health resorts: Located on favourable geographical surroundings. They include coastal resorts for bathing and yachting e.g. Brighton (UK), Miami (USA), Obudu Cattle Ranch (Nigeria).

Port: These are landing places for steamers, and river crafts and usually have deep waters, warehouses and international transport arrangements, including custom offices and banking and insurance services. They include:

Seaports e.g. Southampton, Marseilles, Hong Kong, Yokohama, Honolulu, Lagos, Amsterdam.

Entrepôts (ports that specialize in receiving and redistributing goods to neighbouring countries and to all corners of the world). e.g. Singapore, Colombo, Rotterdam.

River Port e.g. Duisburg (Germany), Port Harcourt, Sapele and Onitsha (Nigeria).

Landscape designs

Landscape design is the process of shaping the natural and built environment to create satisfying places for people to live, work and play and environments for plants and animals to thrive. Landscape has six main compositional elements: Landform, Vertical Structures, Horizontal Structures, Vegetation, Water, Climate. Landscape Design is the art of arranging these elements to make good outdoor space. It implies putting forward proposals for future developments of the landscape. This is done on the basis of understanding, but also of views, ideas and notions that are derived from all sorts of paradigm in this case a design theory. Landscape architects working in landscape design use their spatial design expertise to develop creative solutions to practical and aesthetic challenges relating to the landscape. Using man-made and natural materials, they design and implement solutions that reflect the identity and qualities of place while meeting the current and future needs of stakeholders in a sustainable and aesthetically coherent way.

Typical activities include:

- Producing feasibility studies and site and context appraisals
- Preparing written advice and recommendations
- Coordinating and conducting community engagement and consultation with users/owners/managers other stakeholders
- Developing design solutions and proposals
- Preparing drawings and 3D visualisations to illustrate plans and proposals.
- Preparing detailed designs and working drawings to support tender documentation and site implementation
- Participation in the tendering process, contract administration and site inspections.
- Specifying plants, construction materials and other elements such as street furniture
- Specifying for construction of hard landscapes and the implementation of planting proposals
- Managing projects and contracts
- Providing advice on policy and strategy
- Resource and budget assessment and planning including the preparation of cost estimates
- Contributing to public inquiries and acting as an expert witness

Design activities are concerned with the projection of images of things into the future. Landscape design is primarily a fine art whose important function is to create and preserve beauty in the surrounding of human habitation and in the broader natural scenery. Like architecture, it is also concerned with promoting comfort, convenience and health of the population.

Landscape design is likened to environmental design because it embraces a wide field of activities within the ambit of the outdoor scene embodying those concept not only with the visual

impact of man's immediate physical surrounding and the pattern with which they fit within the broad discussion of the landscape but also their psychological effects. It is an expressive or communicative activity and for it to be acceptable, it must conform with functional, structural and aesthetic satisfaction. Its success is measured by the number or importance of the people who responded to its message and by the continuity of this response overtime.

Generally the art of design is a mental plan. It could be a scheme of attack, something to be achieved or adaptation of means to an end, a preliminary sketch, and delineation of pattern, artistic or literary groundwork or a general idea. In a very much professional approach, landscape design involves the designing, construction and management of space.

Design begins when an individual or team first think about the project. It includes many intangible elements such as institution, imagination and creativity of all of which are essential to research as well. Excellent design is created through the articulation of these elements. Landscape Designers influence Natural Processes, Social Processes and Aesthetic Processes. Their aims and objectives can also be placed in these three groups. Outdoor space which is 'good' from one point of view (e.g. social) may be bad from another point of view (e.g. aesthetic or natural process). A space can also be good for humans but bad for other species (e.g. a swimming pool with treated water).

Planning design creatively mixes together ideas, drawing information and a good many other ingredients to create something where nothing was before. Design can also be seen as an ordered process in which specific activities are loosely organized to make decisions about changing the physical world to achieve identifiable goals. Design includes several analytical distinct elementary activities such as imaging, presenting and testing. Imaging is the ability to go beyond the information given which is often called real creativity. It involves forming a mental picture. Images are often visual, they provider designers a larger framework within which to fit specific pieces of a problem as they are resolved. Comparing a design against a mental image makes visible where the design can be improved and perhaps where the image itself might be modified.

Presenting involves the designers sketch, drawing of plans, building of models and taking photographs. It takes skill not only to present an idea well but to choose the mode of presentation

best suited to a particular time in the design process. Designer present ideas to make them visible so that they themselves or others can use and develop them. Presenting includes both the very important characteristic that for each design, one must choose and organize only some elements from a larger number. Testing involve the process of appraisal, criticisms, judgments, comparism, reflections, review and confrontations. It means comparing tentative presentations against an array of information like the designer's and client's implicit images, explicit information about constraints or objectives, degree of internal design consistency and performance criteria: economic, cultural, technical and sociological. Testing is a feedback and feed-forward process, adjusting the relation between design products as it develops and the many criteria and qualities the product is intended to meet.

Basic considerations in landscape design

In an attempt to enhance the quality of the environment through design, certain important considerations are to be given special attention. Such considerations are taken care of by the designer irrespective of the size, location or the owner of the design. The most fundamental among other are the user's requirements, aesthetics, climate and environmental factors and construction and management cost.

User's requirements

Essentially, all design problems start off with client who has developmental programmes to be resolved through design. In landscape design, the requirements of the client should always be the uppermost in the mind of the designer. It is on this requirement(s) his design should be based and evolved. The client may either be single or group (comprising families, organization etc.), or private type who will use development themselves or public type representing a community or political sub-division of the community. There may however be a need for a compromise between the client requirements and professional ethics of the designer. According to Fairbrother (1974), the role of the designer is to evolve out of all conflicting claims, a landscape that will be pleasant for all users.

Aesthetic consideration

The concept of aestheticity is landscape design consideration has a lot of relationship with design, implementation and maintenance of the landscape. It is very important to evolve a rhythmic balance and unity in every design. The principle is to bring out the aesthetic value of the landscape in any design work. To maintain the aesthetic value of the landscape, well structured maintenance schedule is important.

Climatic and environmental considerations

The impact of climate and other environmental factors such as the vegetation, water, topography, relief, drainage pattern, soil etc. are important in landscape design. They are the forces and processes of the world within which we live and work. While the user's requirements is the starting point of any landscape design, the physical arrangement of the landscape materials should be undertaken as a creative exercise evolving in the first place from the consideration of the interacting complex of climate, geology, vegetation, wildlife and all other elements in the natural scene.

Construction and management costs

This is a function of the first three considerations and it depends much on them. It relates to the total financial involvement of the client in installing, fixing the design on the ground and the cost of the maintenance of the final design. Consideration of construction and management costs is essential, though expensive and increasingly hard to get your hands on. In any landscape scheme, the nature of maintenance in terms of cost and skills should be given top priority because it is a decisive factor in design.

A sustainable landscape is one that conforms to the environment surrounding it, requiring only inputs that are naturally available, with little or no additional support. It is self-sustaining over long periods of time. It embodies the three principles of reduce, reuse, and recycle, and exists in harmony with its local ecosystem. When a resident prepares to design or change an existing landscape, the eventual success of a design will depend upon keeping these principles in mind

Parks and Reserves

A park is an area set aside for the use by people whereas a reserve (nature preserve) although may be used by the people has as its primary purpose the conservation of some resource, typically a biological one. Every park or reserve is an island of one kind of landscape surrounded by different kind of land use. Parks are as old as civilization. The old French word *parc* referred to an enclosed area for keeping wildlife to be hunted. These areas were set aside for nobility, excluding the public. An example is the areas now known as Donana national Park on the southern coast of Spain. Originally a country home of nobles, today it is one of the most important natural areas of Europe, used by 80% of birds migrating between Europe and Africa.

The first major public park of the modern era was Victoria Park in Great Britain, authorized in 1842. The concept of a national park, whose purposes include the protection of nature as well as public access, originated in North America in the nineteenth century. In the twentieth century, the purpose of national park was broadened to emphasize biological conservation, and this idea was applied worldwide. The first designated national park was Yosemite National Park in

California, which was made a park by passage of a bill signed by President Lincoln in 1864. The term *national park*, however, was first used with the establishment of Yellowstone in 1872. In recent years the number of national parks throughout the world has increased rapidly.

One of the important differences between a park and a truly natural wilderness is that a park has definite boundaries. These boundaries are usually arbitrary from an ecological viewpoint and have been established for political, economic, or historical reasons not related to the natural ecosystem. For instance, Lake Manyara National Park in Tanzania, famous for its elephants, was established with boundaries incorrect for elephant habits. When the park was established, farms were laid out along its northern border. These farms crossed the traditional pathways of the elephants creating two negative effects. First, elephants came in direct conflicts with farmers by crashing through farm fences, eating corn and other crops and disrupting the farms. Second, whenever the farmers were successful in preventing the movement of the elephants, the animals were cut off from reaching their feeding grounds near the lake.

Goals of Park Management

The goals of park and nature preserve management can be summarized as follows:

- ❖ Preservation of unique wonders of nature such as Niagara Falls, Obudu Hills, Erin-Ijesha waterfall etc.;
- ❖ Preservation of nature without human interference (preserving wilderness for its own sake);
- ❖ Preservation of nature in a condition thought to be representative of some prior time period (e.g. prior to urban settlement);
- ❖ Wildlife conservation, including conservation of the required habitat and ecosystem of the wildlife;
- ❖ Maintenance of the wildlife for hunting;
- ❖ Maintenance of uniquely or unusually beautiful landscapes for aesthetic reasons;
- ❖ Maintenance of representative natural areas for the entire country;
- ❖ Maintenance of outdoor recreation, including a range of activities from viewing scenery to wilderness recreation (hiking, cross-country skiing, rock climbing), to tourism (car and bus tours, swimming, downhill skiing, camping etc.) and
- ❖ Maintenance of areas set aside for scientific research, both as a basis for park management and for the pursuit of answers to fundamental scientific questions.

Protected Areas (Nature Reserves)

Throughout the tropics, the expansion of agricultural commodity production threatens native habitats and the biological diversity they harbour. In most contexts, formal protected areas remain the optimal mechanism for safeguarding natural habitat. Although national parks face many management challenges, they generally are an effective form of protection against hunting,

logging, grazing, fire, and especially land clearing. Despite ubiquitous shortfalls in park budgets and a daunting array of land use pressures, formal protected areas have proven to be the single most reliable instrument for the prevention of agricultural encroachment on habitat. Therefore, changing the land-use status of an area to habitat protection in perpetuity and then enforcing that status is the most direct way to protect priority areas that lie in the path of expanding agricultural frontiers. However, there are contexts in which establishment of formal protected areas presents legal, political, and financial difficulties, and the process of creating a new national park may take an inordinate amount of time. Given the alarming rate at which commodity production is destroying habitat in some biodiversity hotspots, other means for rapid implementation of direct protection also will be necessary, in some cases as an interim step towards creating permanent protected areas.

The expansion of protected areas, 1980 to 2005

Over the past 25 years, the area of land under legal protection has increased exponentially. As of today, >100,000 protected areas have been established encompassing 17.1 million km², or 11.5% of the planet's terrestrial surface. During the same period, biodiversity, a term once solely considered by scientists, has moved to centre stage of global environmental debates, most recently at the Seventh Meeting of the Conference of the Parties (COP-7) to the Convention on Biological Diversity (CBD) in Kuala Lumpur in February 2004. The 157 representatives to COP-7 agreed to establish and maintain "comprehensive, effectively managed, and ecologically representative systems of protected areas" that, collectively, will significantly reduce the rate of global biodiversity loss.

To understand the forces driving the global expansion of protected areas, it is necessary to trace key events in the development of international environmental policy during the past 25 years. During this period, consensus emerged that protected areas were essential for maintaining biodiversity. There was also agreement that protected areas must address local communities' concerns with development. But considerable debate surfaced regarding the relative weight of social and economic objectives versus biodiversity goals in protected area management.

The campaign to expand protected areas began in earnest at the 1982 World Parks Congress in Bali, where delegates recommended that all nations strive to place 10% of their lands under protection. A decade later, protected areas were promoted again in the landmark Rio Summit—or 1992 United Nations (UN) Conference on Environment and Development. Delegates came from around the world to discuss the meaning and importance of biodiversity and to formally endorse conservation programs. In the end, 167 countries signed on to the CBD and pledged to create systems of protected areas to conserve in situ biodiversity (29, Article 8a).

These high profile events and international conventions helped spur the expansion of protected areas, as did growing public concern over rain-forest destruction. Further driving the expansion was increased funding for protected area management.

Geographic Variation and Gaps in Protected Area Coverage

The expansion of protected areas has been highly variable among world regions. World Conservation Union (IUCN) and the UN Environment Programme's World Conservation Monitoring Centre (WCMC) revealed that the largest areas of land were added to North and South American protected area systems (1,283,914 km² and 1,148,567 km², respectively), whereas the largest percent increases occurred in Middle America (composed of Mexico, Central America, and the Caribbean) and Western/Mediterranean Europe (i.e., western Europe and the European side of the Mediterranean), 10.38% and 10.28%, respectively. Russia, Central and South Asia, and Australia were among the regions lagging behind in protected area coverage.

The unevenness of protected area coverage has a number of possible explanations. Some posit that wealthy countries devote more land to parks because many of their citizens hold post materialist values about protecting nature. Related research highlights the political relationships shaping the geography of biodiversity investments. He suggests that countries more closely aligned with the West (especially the United States) receive more funding for environmental activities and thus set aside more land in protected areas.

Top 20 developing countries by percent territory in protected areas (PAs) (WRI)

Setting aside international variation in protected area coverage, the coverage of biomes varies widely. Tropical rain forests have received a disproportionate emphasis in conservation campaigns owing to their great species richness. One prominent conservation strategy, first promoted in the mid-1980s by British ecologist Norman Myers, focuses on “biodiversity hotspots”—regions with exceptionally high concentrations of endemic species (those found nowhere else) and high habitat loss. An updated Over 34 hotspots have identified worldwide. These regions contain 75% of all threatened mammals, birds, and amphibians within only 2.3% of the Earth’s surface.

The hotspots approach has also been criticized because it excludes areas with lower species richness that nevertheless provide important ecological services (e.g., water capture or carbon

sequestration) or scenic beauty. Human activities have caused plant and animal extinctions to reach rates ~1000 times greater than background rates, perhaps comparable to those experienced during the great mass extinctions of the past.

Some conservationists argue that these extinction rates justify an emphasis on protecting species and their habitats, an approach that also implicitly requires resource transfers from developed to tropical countries. Despite disagreement about geographic priorities, most conservationists agree that more land needs to be protected for several reasons. First, most parks are not large enough to maintain adequate populations of rare or far-ranging species nor to maintain ecosystem-level processes that sustain biodiversity (e.g., natural fire regimes). Most of the world's protected areas are smaller than 10,000 hectare (ha) (approximately 80% of the global protected areas in IUCN categories I–VI)

Small parks have significant local importance, but research suggests that only parks >10,000 ha have the potential to slow long-term species loss. Many sites of high endemism and/or species richness have no legal protection, and pressures to transform land, particularly to agriculture, are increasing. During the 1980s and 1990s, as the number of protected areas multiplied, conventional views on economic development shifted profoundly, with important implications for conservation. Much of the rhetoric on the fringes of mainstream development theory in the late 1970s and early 1980s, such as appropriate and small-scale technologies, local empowerment, popular participation, democratization, and devolution of power, moved to centre stage. These perspectives fit well with the need to internalize development concerns into the conservation debate, and their impact was apparent in formal international plans for protecting biodiversity.

Conservationists worldwide were thus faced with the challenging task of rapidly assembling a global protected area system where none existed, among disparate socio-political conditions and institutional settings from one region to the next. In recognition that different types of protected areas are better suited to different settings and that not all of these areas emphasize biodiversity conservation, the World Commission on Protected Areas developed six different management categories with two subcategories: (*a*) areas managed primarily for biodiversity conservation (categories I and II) and (*b*) areas managed mainly for the sustainable use of resources (categories III–VI).

There are five categories of protected areas recognized in Nigeria, namely:

National Parks

These are ecologically and culturally important areas where human habitation is largely disallowed and tourism is encouraged. There are currently eight national parks in different biogeographic zones of the country. Hunting and other human activities that affect biodiversity are completely forbidden in all the parks. Together the national parks cover about 22,592 km², about 2.5% of the country. National Parks are assets of the Federal Government and the agency responsible for their management is the National Parks Service, an agency of the Federal Ministry of Environment.

Game Reserves

These are areas set aside by state governments for the protection of wildlife. Included here are Wildlife Parks and Wildlife Sanctuaries. Poaching is often widespread despite state edicts prohibiting illegal offtakes from the reserves. Game Reserves are often very poorly managed because of inadequate staffing, poor funding, and lack of equipment and poor remuneration of staff. Many states in the south, where human population densities are high, do not have game reserves. State Ministries of Agriculture and Natural Resources often manage game Reserves. Well-managed Game Reserves may be considered for upgrading to national park status. There are presently about 14 Game Reserves in the country.

Forest Reserves

These are areas set aside by state governments for the protection of timber, fuelwood and other forest resources in their domains. Some Forest Reserves in the northern parts of the country double as livestock grazing areas. Natural vegetation has been replaced in some reserves with monocultures of exotic tree species. Harvesting of resources is usually allowed under permit or as special concessions to local people. Poor management often results, however, in a lack of control of resource utilization and conflicts among resource users. Only a few Forest Reserves, located in remote, difficult to access or sparsely populated areas, are still in a good undisturbed condition. Each of the 36 states has at least one forest reserve, managed by state Ministry of Agriculture and Natural Resources.

Biosphere Reserves and SNR

Are specially designated areas within forest reserve for scientific and educational purposes? And all human activities including hunting and fuelling include fuelwood gathering are prohibited.

Special Ecosystems and Habitats

These include sacred groves, streams and lakes or other sites that are revered by local communities for their spiritual, recreational and other socioeconomic values. The commonest of these unique sites are sacred groves; small forest blocks, usually no more than a few hectares, set aside by some rural communities, mostly 43 in the south, as homes of local deities, e.g., the Oshogbo Shrine in Osun State. With increasing urbanization and the spread of modern religions, sacred forests and other distinctive habitats are fast disappearing. Conservation of the biological

resources of these in these small ecological islands is usually through traditional belief systems of superstitions and taboos

A major shortcoming in Nigeria's protected area system is the non-inclusion of any part of the country's coastal area into the protected area system. Portions of some key ecosystems such as the Niger Delta are also not part of the country's protected area network. These need to be urgently addressed. Another problem of Nigeria's conservation areas is the absence of buffer zones between the core conservation areas and human settlements. This has made it difficult for the lands surrounding the conservation areas to be managed in a manner that is compatible with key objective of biodiversity conservation in the protected areas. A need to create these buffer zones therefore exists.

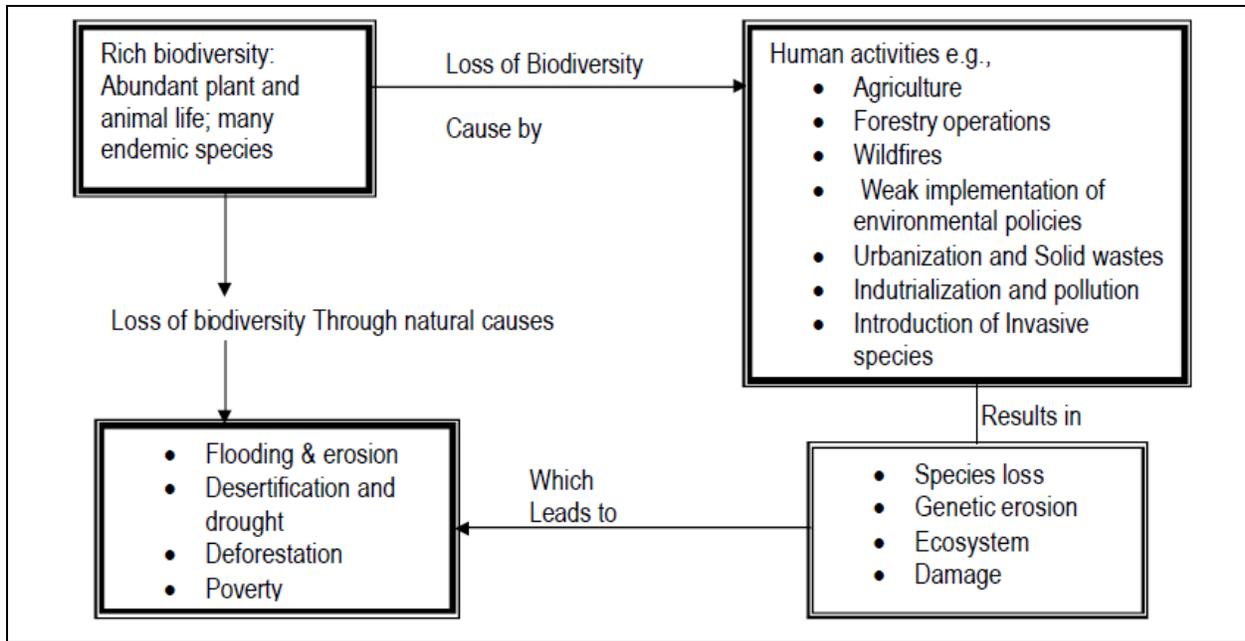
Ex-situ Conservation

Many rare and threatened species in Nigeria that require ex situ conservation are receiving very little attention. For example none of our zoological gardens is engaged in a breeding programme for any of our endangered animals. [Major conservation areas](#) in Nigeria are listed in the table below.

Major Conservation Areas in Nigeria

Protected Area	State	Legal Status		Area (km ²)	Location	
Game Reserves						
Alawa	Niger	Gazetted	1971	296.2	10o20'N	06o30'E
Dagida	Niger	Gazetted	1971	294.2	09o20'N	50o31'E
Gilli-Gilli	Edo	Gazetted	1960	363	06o05'N	05o20'E
Kwiambana	Sokoto	Gazetted	1970	2,614	10o50'N	06o00'E
Opara	Oyo	Gazetted	1971	2,486	08o09'N	02o50'E
Orle River	Edo	Gazetted	1960	1,100	06o49'N	06o50'E
Pai River	Plateau	Gazetted	1971	2,486	08o09'N	02o50'E
Pandam Wildlife Park	Plateau	Gazetted	1972	224	08o31'N	09o00'E
Wase Rock Sanctuary	"	Gazetted	1972	2,800	09o40'N	10o00'E
Falgore	Kano	Gazetted	1969	920	11o00'N	08o45'E
Lame Burra	Bauchi	Gazetted	1972	2,058	10o27'N	09o15'E
Sambisa	Borno	Gazetted	1978	686	11o00'N	14o30'E
Hadejia-Baturiya Wet- and/Game Reserve	Jigawa	Gazetted	1976	297	12o27'N	10o13'E
Biosphere Reserve						
Omo	Ogun	Forest Reserve		1,350.5	06o30'N	4o15'E
National Parks						
Kainji Lake	Niger	NP Decree	1975	5,309	09o40'N	03o30'E
Yankari	Bauchi	NP Decree	1993	2,240	09o30'N	10o00'E
Old Oyo	Oyo	Gazetted	1991	2,529	08o44'N	03o44'E
Gashaka-Gumti NP	Taraba	Gazetted	1975	6,363	06o40'N	11o10'E
CRNP	Cross River	Gazetted	1991	4463km ²	06o20'N	09o15'E
Oban	C/River	Gazetted	1991	4,463	06o20'N	09o15'E
Okwangwo	C/River	Gazetted	1991	1920	06o17'N	09o14'E
Chad Basin	Borno	Gazetted	1978	2,280	13o20'N	14o00'E
Okomu	Edo	Gazetted	1985	1,100	06o21'N	10o11'E
Kamuku	Kaduna	Gazetted	1999	1,127	10o45'N	06o30'E

The impact of human exploitation of biodiversity in Nigeria is enormous. Of all the anthropogenic impacts on biodiversity in Nigeria, the greatest is the degradation of the various biomes in the country. The diagram below summarizes the dynamics of biodiversity use in Nigeria.



Conceptual framework of the dynamics of Biodiversity exploitation in Nigeria

Park Effectiveness

Evaluating the effectiveness of protected areas is difficult, especially given the poor availability of data on ecological and social conditions and their change over time. Evaluating park effectiveness is also a politically fraught endeavour given the ambitious and disparate agendas imposed on protected areas. For example, a conservation biologist may label a protected area as a conservation success only if the full suite of native wildlife species is present in viable populations, including large and rare carnivores. An anthropologist viewing the same protected area may deem it a failure if local citizens' rights or livelihoods were undermined when the park was established. Thus, public discussions regarding the effectiveness of protected areas sometimes resemble the familiar blind-men-observing-an-elephant parable. For example, recently the Manager of Machalilla National Park in Ecuador publicly promised that this 39,000 ha protected area would serve as a *maquina de dinero* (money machine) for the surrounding province. In the same meeting, indigenous leaders testified that Machalilla was above all else a cultural homeland and "source of life" for the Agua Blanca people. Then an Ecuadorian botanist explained that the park represented the last hope for sustaining endemic species found in coastal dry forests.

By global mandates, protected areas are now supposed to do far more than conserve biological diversity. These areas are charged with improving social welfare, guarding local security, and providing economic benefits across multiple scales, objectives traditionally relegated to the development sector. These goals are vitally important and are founded on the truth that amidst desperate poverty the long-term prospect for biodiversity conservation is poor.

Beyond small-scale efforts to incorporate local communities in protected area management, biodiversity conservation today is challenged to engage with the most important UN Millennium Goal, which is to eradicate extreme poverty and end hunger. As the development community has increasingly focused on this goal, biodiversity funding has been linked more often, and more directly, to poverty alleviation.

The Special Case of Indigenous People

Globally, lands managed by indigenous peoples often have retained high levels of biodiversity. Although these lands are not necessarily officially protected areas, and a treatment of this is well beyond the scope of this paper, it is essential to stress the contributions these areas make to biodiversity conservation. There has been active engagement of indigenous peoples in discussions about protected areas and biodiversity conservation, both at national scales and in international fora.

Although the explicit interest of indigenous peoples is not biodiversity conservation per se, the coincidence of interests between indigenous peoples and conservationists, especially given large-scale external threats, is high, even though critics of such alliances abound. Yet the reality is that both sides have far more to gain working jointly, especially recognizing that the greatest threats to both indigenous territories and protected areas are from mineral and energy exploration

and large-scale infrastructure development. As a result, indigenous peoples have taken an important role in recent international conservation meetings, such as the fifth World Parks Congress in 2003 and the World Conservation Congress in 2004. Strengthened alliances between indigenous peoples and conservation organizations are likely in the future, as both sides better understand and respect mutual positions, and as a common set of external threats increases in scope and scale..

The challenge for protected area management over the next 25 years will be to implement these multiple and often ambiguous aims as conservation strategies in the face of population growth, ever increasing resource demands by northern and southern countries, and political instability. The expansion of the protected area system has outpaced institutional and financial capacity for actual management, and even if there were a tremendous infusion of financial resources toward protected areas, managing protected areas would still be profoundly difficult, given the multiple and at times ambiguous mandates for parks and reserves.

Obstacles and threats to biodiversity conservation

Globally, biodiversity is in jeopardy. For example, 1,111 or 11% of the world's known bird species are under various degrees of threat which if not addressed may lead to their extinction. In Nigeria, most people are not aware that many of our biological resources are threatened by intense pressure from various human-related activities. For example, two bird species, the Bannerman's Weaver *Ploceus bannermani* and the White-throated Mountain Babbler *Kupeornis*

gilberti, are threatened by the loss of patches of their highland forest habitats on the Obudu and Mambilla Plateaus, the only locations where they are found in the country. These forests and many other important habitats throughout the country are being lost through forestry operations, agriculture, industrialization and pollution, urbanization and solid wastes, desertification and drought, wild fires, flooding and erosion, invasive species, and poor environmental policy. A brief overview of these major constraints to biodiversity conservation in Nigeria is as follows.

➤ **Loss of Biodiversity Through Forestry Operations**

About 20% of Nigeria was previously covered with forests of the Guineo-Congolese type. Both authorised and illegal forestry operations together with agriculture have combined to drastically reduce the country's forest cover to barely 10% of its original extent. The annual rate of deforestation in Nigeria averages 3.5%. Based on this, it has been estimated that the country will lose all her forests by the year 2020.

➤ **Effects of Agriculture on Nigerian Biodiversity**

Because a large proportion of Nigeria's population is rural, agriculture plays an important role in the national economy. Nigerian agriculture affects biodiversity because it is largely subsistence, and based on the shifting, slash-and-burn method, of which a piece of land is productive only for a few years. This farming method has combined with forestry operations to degrade a large proportion of each of Nigeria's biomes. Furthermore, even in rural areas, farmers are increasingly opting for high yielding and improved crop varieties in preference to indigenous cultivars. This potentially leads to impoverishment of the gene pool of local crop cultivars. Agricultural activities such as (over) fishing, (over) grazing, and the increasing and indiscriminate use of pesticides and chemical fertilizers, have also contributed to the erosion of Nigerian biodiversity.

➤ **Industrialisation and Pollution Impact on our Biodiversity**

The petroleum industry accounts for over 90% of Nigeria's national income. The majority of the industry's activities take place in the Niger Delta and in coastal areas, where they have caused considerable environmental pollution and forest degradation. Nigeria is widely believed to flare more gas than the rest of the oil-producing world put together. The impact of the gas emissions and other pollutants from the petroleum industry on Nigerian biodiversity is often overlooked or underestimated. Also roads constructed for oil exploration purposes often open up areas for use by poachers and other illegal exploiters of forest resources. Other minerals that their exploitation has also contributed or is contributing to environmental degradation in Nigeria include coal, iron ore and tin. Illegal mining of gemstones in some parts of north-central Nigeria is also degrading the quality of the environment there. The problems arising from mineral explorations and their exploitation may be added that of pollution arising from other industries such as the textile,

tanning, and cement industries, whose industrial wastes are undermining the ecological integrity of many of our rivers and streams.

➤ **Urbanization and Solid Wastes**

Although large urban areas constitute a small percentage of Nigeria's land area, many cities are growing very rapidly and spreading into critical habitats and sites of conservation interest. The pace of urbanisation has also increased with the creation of 36 states and their administrative capitals. For example, large areas of the Lekki Peninsula (an important mangrove and lowland swamp forest habitat for many threatened hydrophilic species) has been cleared and "reclaimed" to create more space for the rapidly expanding city of Lagos. Our new capital city, Abuja, also stands on what was two decades ago, a near pristine savannah woodland. The city's original plan which provided for many green areas, to offer biodiversity connections with the city's surrounding countryside, appears to have been abandoned for the construction of large contiguous concrete jungles.

➤ **The Impact of Desertification and Drought on Nigeria's Biodiversity**

Researchers have reported evidences of increasing aridity in the north of Nigeria. The aridity is largely human induced, but is also exacerbated by periodic drought. Some of the activities blamed for the increasing dryness include large-scale land clearing for agriculture and river damming. For example, the extent of flooding reduced from about 3,500 km² in the 1950s to less than 1,000 km² in the 1990s as a result of the construction of the Tiga, Challawa and over 20 other dams and river impoundments in Kano State.

➤ **Wild Fires**

Wild fires, often started by humans, impact negatively on biodiversity. Small mammals, ground nesting birds and numerous invertebrate species are often victims of wildfires. In forest ecosystems, wildfires repress seedling establishment and create wounds on big plants through which disease agents may enter. Sources of wildfires include the use of fire for clearing farmlands, and for driving animals out from cover during hunting.

➤ **Flooding and Erosion**

Flooding and erosion is a serious ecological problem in most parts of the country. About 18,000 km² of Nigeria is affected by gully erosion and 20% of the country's population is potentially at risk of annual flooding of their homes and or farmsteads. Whereas gully and sheet erosion ravage parts of the south (particularly the southeast), wind erosion is culprit in the north. All forms of erosion are exacerbated by widespread poor agricultural practices, which denude the landscape. Nigeria is also experiencing serious coastal erosion believed to be worsening as a result of borrowing of sea sand for swamp reclamation from the nation's continental shelf. In both the inland and coastal erosion biodiversity are lost and livelihoods are threatened.

➤ Invasive Species

Some exotic and indigenous species are invading habitats from where they were previously unknown. In coastal mangrove swamps, the Nipa Palm *Nypa fruticans* is displacing native species. Water Hyacinth *Eichornia crassipes* another exotic plant species is rapidly clogging up waterways and lakes throughout the country, as is *Cattail Typha spp.* In farm fallows in the southern and central parts of the country, an introduced weed *Chromolaena odorata* is often the dominant plant, and sometimes forms monospecific plots. It is widely believed that these invasive species were either accidentally introduced or brought in as ornamental plants. Because invasive species can have deleterious effects on native biodiversity, it is important to institute monitoring programmes that would assist in predicting the impact of invasive species on local biodiversity.

➤ Widespread Poverty

Despite her rich renewable and non-renewable resources, poverty in Nigeria is widespread and rated among the world's worst. A 1996 survey showed that about 67% of Nigerians (mostly women) live below the poverty level. This is an indication that the countries natural resources are being poorly harnessed, and demonstrates the need for environmental policies that are tailored to marry conservation and development in a practicable manner. In Nigeria poverty is directly linked to biodiversity loss. This is because rural livelihoods depend almost entirely on biodiversity. In order to address biodiversity concerns, the problem of poverty must be addressed by providing alternative livelihood options to rural communities.

Goals of Conservation in Nigeria

Nigeria as a country aim to conserve biodiversity for the present and future generations. In order to achieve this aim, the strategic direction of conservation in the country is as follows:

Goal – Conservation

Strategic Directions:

- Promote and enhance measures for both in-situ and ex-situ conservation through identification, evaluation, monitoring, research, education, public awareness and training.
- Increase understanding of the status, genetic diversity and ecological relationships of species and populations.
- Expand and strengthen the network of protected areas to include all the major ecosystems: Savanna, High forests, Wetlands, Mangrove, Montane, Coastal and Marine vegetations.
- Restoration and establishment of grazing reserves and stock routes for nomadic pastoralists
- Protect watersheds along all intra and interstate watercourses to protect the water bodies and aquatic biodiversity.

- Establish migratory corridors where practicable for isolated species and populations.
- Identify genetic resources at the species level based on their present or potential socio-economic value and their conservation status.
- Assess the conservation status of target species and their population.
- Identify specific conservation requirements or priorities at the population level for single species and at the ecosystem level for groups of species.
- Encourage the development of ex situ facilities including rescue and breeding centres to protect threatened species.
- Develop and implement restoration/rehabilitation plans in degraded ecosystems.
- Conserve biological resources that are essential to agriculture, industry, domestic animals, plants and microbes and their wild relatives.
- Develop and promote programmes that encourage beneficial co-existence of biodiversity in agricultural farms.
- Establish reserves to conserve freshwater, brackish water and marine biodiversity
- Establish and maintain gene and clone banks for plants and animals genetic diversity.
- Implement measures to eliminate or reduce environmental pollution that adversely affect biodiversity

In--Situ Conservation in Forests, Game Reserves and National Parks

The aims of In-situ conservation are as follows:

To establish an integrated protected area system with all terrestrial habitats represented and covering approximately 25 per cent of Nigeria's land area.

To strengthen the Federal Ministry of Environment, the main agency for Environmental Protection and Natural Resources Conservation including biodiversity.

To strengthen Institutions and Departments, custodians of Forest, Fish and Wildlife Resources.

To gain local support for biodiversity conservation through buffer zone projects and involvement of local communities and NGOs.

To develop appropriate and sustainable strategies for funding the management of Forest Reserves, Game Reserves and National Parks.

In Situ Conservation Outside Reserves

The state of in situ conservation in Nigeria is such that even if the Forest Reserves in Nigeria are restocked and adequately protected, they will still constitute less than 10 per cent of the total land area of the country as against the United Nations requirement of 25 per cent minimum conservation area for each country. To achieve this goal, the role of local people in biodiversity conservation has become crucial.

Priority Actions

- i. Survey of flora and fauna outside forest reserves including those in sacred groves, community lands, abandoned farmlands and homesteads and assist local people in the management of such sites on a sustainable basis.
- ii. Strengthen the capability of communities, private industries, Universities, and NGOs to manage natural forests outside forest reserves on a sustainable basis.
- iii. Carry out a study of the indigenous knowledge of timber and non-timber plant species and ascertain values from the utilisation of these plants and encourage local people to participate in joint research programmes.
- iv. Conserve wild species that are of significance particularly those that have become almost lost or have gone extinct.
- v. Conserve special ecosystems e.g. wetlands, arid lands and montane vegetation types.

Review and up-date the marine coastal conservation strategy. Encourage oil exploration without the destruction of natural vegetation (especially the mangrove).
- vi. Encourage local communities to participate in natural regeneration of wetlands and arid Zone vegetation.

Ex Situ Conservation

The aims of Ex-situ conservation are as follows:

To strengthen ex-situ collections as a supplement to in-situ conservation in botanical gardens, gene banks, germplasm collections and plant breeding centres.

Priority Actions

- i. Evaluate all projects, which involve capturing or collection of rare or endangered species to determine that these operations do not threaten the survival of wild populations. This will involve an inventory of ex-situ population and scientific studies of wild species.
- ii. Survey and collect indigenous fruit trees and other useful plants and extend arboreta and Germplasm collections.

- iii. Establish captive propagation programmes for non-protected wildlife that are easily bred in captivity to reduce the drain on wild populations (Relevant Research Institutes, Universities and NGOs).
- iv. Promote collection of genetic resources and development of appropriate biotechnology for improving food production, pharmaceutical products including indigenous knowledge and biodiversity prospecting by local and international industries (Relevant Research Institutes and NGOs).
- v. Encourage Local Governments, Local Communities, NGOs and private individuals to develop private forests of multipurpose trees in rural and urban area (Federal Ministry of Education).
- vi. Rehabilitation of plant nurseries operated by States for the production of 5 million multipurpose plant seedlings every year. The nurseries will eventually be turned over to Local Governments and local communities to manage on a sustainable basis. The action plan will also provide training for schools, NGOs and local communities on seedling production and establishment.
- vii. Establishment of a National Arboretum. This is a high priority project, which will involve the acquisition of 5,000 ha within the rainforest zone to be located in the Delta State of Nigeria. Other arboreta, 1,000 ha each, will be located in 10 other parts of the country covering major ecological setting in each zone of the country, including Abuja. Development of a National Herbarium and other herbaria in the country. The Forestry Herbarium (FHI) at the Forestry Research Institute of Nigeria, Ibadan, has collected over 100,000 specimens.
- ix. Establishment of Botanical Gardens, Urban Parks and Recreational areas, Peri-urban woodlots and promotion of 36 Botanical Gardens, one in each State Capital to add to the new one in Abuja. It will also involve the development of recreational open spaces in many towns, where indigenous and exotic plants will be developed. Peri-urban plantations will be established for conservation and fuelwood. Each Local Governments would be encouraged to take charge of the beautification of towns, villages and cities within its jurisdiction.

Land use

Settlement is the occupation of land by humans, typically referring to patterns of residential use, from dispersed to concentrated, along a continuum from rural to village to suburb to city. The term may also include infrastructure and commercial land-use patterns. Types of settlement include urbanization, suburbanization, rural agriculture, and rural subdivision. Settlement often includes simplification of the landscape; modification of disturbance patterns; changes in soil and water quantity and quality; and altered movement of nutrients, organisms, and other elements of ecological systems. Changes through settlement can be dramatic, such as paving over land to construct a shopping mall and parking lots, or less drastic, such as fragmenting the landscape by subdividing agricultural lands.

While human activities like farming result in land transformation over great spatial extent, few alterations of the land surface are as profound as human settlement. Globally, only a relatively small amount of land conversion takes place through urbanization and suburbanization. However, the increase in human population, especially in settlements, is gaining momentum in both the developed and developing countries and worldwide. By 1900, only 14% of the world's population lived in urban communities, however 38% of the global population was urban by 1975, and 45% was by 1995; that figure is projected to increase to 61% by 2025 by the World Resource Institute (WRI 1997). In the decade from 1982 to 1992, 2.1 million ha of forest land, 1.5×10^6 ha of cultivated cropland, 0.9 million ha of pasture land, and 0.8 million ha of rangeland came under urban uses in the United States (WRI 1997). The same pattern of urbanization occurs in the developing world as well. In many developing countries, urban-population growth rates outstripped rural-population growth rates between 1990 and 1995 (WRI 1997).

Rapid urbanization, the concentration of the urban population in large cities, the sprawl of cities into wider geographical areas and the rapid growth of mega-cities are among the most significant transformations of human settlements. It was estimated that by the year 2005 the majority of the world's population were living in urban areas, and approximately 40 per cent of them were children. Urban areas strongly influence the world of the twenty-first century, and urban and rural populations are increasingly interdependent for their economic, environmental and social well-being. Among the economic and social factors influencing this process are:

- ✓ population growth and voluntary and involuntary migration,
- ✓ real and perceived employment opportunities,
- ✓ cultural expectations,

- ✓ changing consumption and production patterns and
- ✓ serious imbalances and disparities among regions.

The sustainability of the global environment and human life will not be achieved unless, among other things, human settlements in both urban and rural areas are made economically buoyant, socially vibrant and environmentally sound, with full respect for cultural, religious and natural heritage and diversity. Urban settlements hold a promise for human development and for protection of the world's natural resources through their ability to support large numbers of people while limiting their impact on the natural environment. However, many cities are witnessing harmful patterns of growth, of production and consumption, of land use, of mobility and of degradation of their physical structure. Such problems are often synonymous with soil, air and water pollution, waste of resources and destruction of natural resources.

Some human settlements are also subject to limited water supply, sanitation and drainage and to dependency upon toxic and non-renewable energy fuel sources and irreversible loss of biodiversity. Many of these trends are aggravated or accelerated by high population growth and the magnitude of rural-to-urban migration. Demographic factors, combined with poverty and lack of access to resources and unsustainable patterns of production and consumption, particularly in industrialized countries, can cause or exacerbate problems of environmental degradation and resource depletion and thus inhibit sustainable development. Therefore, a largely urbanized world implies that sustainable development will depend very largely on the capacity of urban and metropolitan areas to manage the production and consumption patterns and the transport and waste disposal systems needed to preserve the environment.

The impacts of human population growth might be even greater than they are today if the population were dispersed rather than concentrated in cities. The major anthropogenic causes of change in land cover and land use include population and associated infrastructure; economic factors, such as prices and input costs; technological capacity; political systems, institutions, and policies; and socio-cultural factors, such as attitudes, preferences, and values. Human population growth can be considered an ultimate cause for many land-use changes. However, population expansion is affected by many factors, such as political dynamics and policy decisions that influence local and regional trends in suburbanization, urbanization, and colonization. Moreover, local demography and variability in per capita resource consumption can modify the effects of population. In Brazil, for example, one of the highest rates of deforestation currently occurs in the state of Rondônia, where a high rate of land-cover change results from road establishment and paving and government policies that have allowed colonists to immigrate, clearing forests so farms can be established. The rate of natural-resource exploitation also depends on technological advances in resource extraction and enhancement such as logging, mining, hydroelectric power, fertilizers, pesticides, and irrigation. The relative importance of these factors varies with the situation and the spatial scale of analysis.

The living and working conditions in all human settlements, including regional urban centres, rural service centres, rural hamlets, rural communities, market towns and villages, must be improved, with particular emphasis on shelter, social and physical infrastructure, and services. The maintenance and the development of rural settlements require sustainable agriculture and forestry activities and improved agricultural technologies, economic diversification, and expanded employment opportunities created by encouraging appropriate and environmentally sustainable investment in industry and related economic production and service activities.

In order to mitigate the unbalanced geographical development of human settlements, and to effectively reinforce the creation of a dynamic economy, Governments at the appropriate levels should create partnerships with relevant interested parties to encourage the sustainable development and management of cities of all sizes and should create conditions that ensure that these different cities provide employment opportunities and services in the process of securing economic development, social welfare and environmental protection. They should devise strategies and support measures that address the issues relating to the movement of population which leads to extreme population concentration in some areas, pressure on fragile ecosystems such as coastal areas, and loss of population in other areas.

Depending on the context and the needs of the cities, towns and villages in each country and region, special attention should be paid to the most critical issues, such as changing production and consumption patterns; energy efficiency; sustainable resource and land-use management; poverty eradication; population and health; water supply, sanitation and waste management; disaster prevention, mitigation, preparedness and management; cultural, natural and historical heritage; environmental protection; industry; infrastructure; and basic services such as health and education facilities and services. Habitat II provides an opportunity to focus on the effect that current patterns of human settlements development will have on the ability to achieve the objectives established at recent United Nations conferences. Close attention to trends in urban development is essential to the viability of sustainable human settlements development in rural and urban areas alike.

Urbanization, Urban Environment and Land Use

Urbanization has been the dominant demographic trend, not only in the Nigeria, but also in the entire world, during the last half century. With the high pace of social and economic development in Nigeria and the resulting growth of city and town population, lack of infrastructure, congested traffic, environmental degradation and a housing shortage became the major issues faced by cities and towns in their sustainable development. Over the past half century, a great rural-to-urban population shift has occurred and the process of urbanization (the concentration of people and activities into areas classified as urban) is set to continue well into the 21st century. Major demographic evidence has indicated that already the many areas in the country like other areas of the world are well advanced in the transition from predominantly rural to predominantly urban societies.

It is projected that some of the big countries of the region like China, Indonesia and Pakistan where current urbanization levels are below 50 per cent, will cross this figure by the next quarter of the century. There is a strong positive link between national levels of human development and urbanization levels, while cities spearhead their countries' economic development, transforming society through extraordinary growth in the productivity of labour and promising to liberate the masses from poverty, hunger, disease and premature death. However, the implications of rapid urban growth include increasing unemployment, lack of urban services, overburdening of existing infrastructure and lack of access to land, finance and adequate shelter, increasing violent crime and sexually transmitted diseases, and environmental degradation.

The economic opportunities cities offer compared to those offered by rural areas are the gravitational force that has attracted an inflow of residents into urban and suburban areas. However, only a fraction of immigrants have been able to find formal employment, while the rest have had to make do with occupations in the informal sector, such as begging or carrying out some sort of street activity (e.g., watching parked cars and washing windows). As a consequence, a large share of population lacks a reliable source of income and often struggles to survive in very unsafe environments characterized by degraded residences, exposure to diseases due to the lack of sanitation and public services related to environment and health (water supply, sewerage, and solid waste disposal), difficulty in accessing public support services for families and youth, and the spread of crime and violence.

Urban Housing Problems

The major housing problems in urban areas include:

Lack of affordability: poor people are unable to buy or rent housing in secure urban areas with an adequate provision of water, sanitation, and solid waste services. Moreover, poor people cannot afford to live in areas accessible to good transport systems. Therefore, the poor end up living in inadequate conditions, either on the periphery or in downtown urban areas.

Informality in housing ownership or rental arrangements: frequently, poor people own places without having legal titles or rent from informal landlords. The insecurity of land tenure implies that poor people are permanently at risk of eviction and other legal problems. Informal settlements that are unregulated are often not planned and lack adequate provision of essential services and infrastructure.

Poor housing conditions: low-income people are likely to live in dilapidated housing that is often built with low-quality materials and under improper conditions. They are also likely to live in overcrowded buildings that negatively impact living conditions and the quality of life.

Inadequate public services: the inadequacy of infrastructure and utilities generate inappropriate living conditions. This problem is present both in peripheral slum areas and in downtown areas. In the peripheries, people tend to live without water or sanitation, waste collection, and

appropriate transportation systems. Poor people usually crowd in old buildings that lack adequate sanitation and infrastructure services. In this case, the improvement and adjustment of existing infrastructure to deal with the higher occupation density are needed. According to a joint MIT and World Bank (2001: 1) resource book on upgrading urban communities, “the resulting exposure to microbiological pathogens due to unsafe drinking water, inadequate sanitation, and poor waste management is one of the most serious environmental health threats in developing countries. Rapid rates of urban population growth strain the capacity of national and local governments to provide basic services. Often the resulting inability to keep pace causes human suffering, environmental damage and unsustainable patterns of development.”

Challenges of Urbanization

It should be noted that urban growth has a number of positive impacts on the environment and human well-being, i.e. higher population densities mean lower per capita costs of providing energy, health care, infrastructure and services. Also, urbanization has historically been associated with declining birth rates, which reduces population pressure on land and natural resources. Despite all these positive impacts, almost all major cities of the region are increasingly plagued by environmental problems. Some major aspects are as follows:

- a) As a direct result of urbanization, great threat to health and safety in cities comes from water and air pollution, especially at the households and community levels. While ambient air pollution impairs the health of almost all urban residents in many cities, indoor air pollution is particularly hazardous for women and children of low-income households who are regularly exposed to higher concentrations of air pollutants from cooking and heating sources in poorly-ventilated housing. Waterborne diseases are found most commonly in low-income neighbourhoods as a result of inadequate sanitation, drainage and solid waste collection services. Health risks, especially to the poor, are also posed by pesticides and industrial effluents.
- b) The productivity of many cities is adversely affected by traffic congestion and water pollution. The loss in productivity includes the total productive time wasted in traffic and the associated increase in the costs of operating and maintaining vehicles. The rising costs of treating polluted water for industrial and domestic purposes are damaging the productivity of urban economies. Fisheries are also being severely harmed by water pollution.
- c) Uncollected and improperly handled solid waste can have serious health consequences. They block drainage systems and contaminate groundwater at landfill sites. In many cities, particularly those in Pacific island countries; it is difficult to secure land for waste disposal facilities, especially onshore landfill sites. Most cities in the region are also

unable to manage the increasing amounts of hazardous wastes generated by rapid industrialization.

- d) Conversions of agricultural land and forest, as well as reclaiming of wetlands, for urban uses and infrastructure, are associated with widespread removal of vegetation to support urban ecosystem and put additional pressure on nearby areas that may be even more ecologically sensitive. Groundwater overdraft has led to land subsidence and a higher frequency of flooding, particularly in the lowest-lying and poorest areas.
- e) Urbanization in coastal areas often leads to the destruction of sensitive ecosystems and can also alter the hydrology of coasts and their natural features such as mangrove swamps, reefs and beaches that serve as barriers to erosion and form important habitats for species.

Urbanization does not have only local environmental impacts but also large so-called 'ecological footprints' beyond their immediate vicinity. Intensive and extensive exploitation of natural resources to support urban economy includes excessive extraction of energy resources (including fuelwood), quarrying and excavation of sand, gravel and building materials at large scales, and over-extraction of water. These all contribute to degradation of the natural support systems and irreversible loss of critical ecosystem functions, such as the hydrological cycle, carbon cycle and biological diversity, in addition to conflicts with rural uses of such limited resources. Other effects can be felt further afield such as pollution of waterways, long-range air pollution that impact on human health as well as on vegetation and soils at a considerable distance.

The growth of large cities, particularly in developing countries, has been accompanied by an increase in urban poverty which tends to be concentrated in certain social groups and in particular locations. Pollution especially affects the poor live at the urban periphery, where manufacturing and processing plants are built and where environmental protection is frequently weak. Environmental sensitive sites such as steep hillsides, flood plains, dry land or the most polluted sites near solid waste dumps and next to open drains and sewers are often the only places where low-income groups can live without the fear of eviction. The poorest groups thus suffer the most from the floods, landslides or other disasters that increasingly batter the cities of developing countries.

Waste generation in urban areas continues to increase world-wide in tandem with concentration of populations and increase in living standards, and has reached to unmanageable levels in many localities. High proportion of the waste could be recycled, not simply to reduce the amount of waste to be disposed of. The practice also provides an opportunity to generate income for the urban poor, to prevent environmental damages of waste dumping, and further to demonstrate less material- and energy-intensive consumption patterns. Promotion of sustainable consumption

should have the far-reaching benefit of fostering domestic enterprises and pushing the production sector towards sustainable pathways. There is a need to develop an integrated approach where the public, private and community sectors work together to develop local solutions promoting sustainable waste management of material recycling.

Challenges of ecologically sustainable land use

A critical challenge for land use and management involves reconciling conflicting goals and uses of the land. The diverse goals for use of the land include resource-extractive activities, such as forestry, agriculture, grazing, and mining; infrastructure for human settlement, including housing, transportation, and industrial centres; recreational activities; services provided by ecological systems, such as flood control and water supply and filtration; support of aesthetic, cultural, and religious values; and sustaining the compositional and structural complexity of ecological systems. These goals often conflict with one another and difficult land-use decisions may develop as stakeholders pursue different land-use goals. For example, conflicts often arise between those who want to extract timber and those who are interested in the scenic values of forests.

Local vs. broad-scale perspectives on the benefits and costs of land management also provide different views of the implications of land actions. Understanding how land-use decisions affect the achievement of these goals can help achieve balance among the different goals. The focus of this paper is on the last goal: sustaining ecological systems, for land-use decisions and practices rarely are undertaken with ecological sustainability in mind. Sustaining ecological systems also indirectly supports other values, including ecosystem services, cultural and aesthetic values, recreation, and sustainable extractive uses of the land. To meet the challenge of sustaining ecological systems, an ecological perspective must be incorporated into land-use and land-management decisions. Specifying ecological principles and understanding their implications for land-use and land-management decisions are essential steps on the path toward ecologically based land use.

The urban and rural condition and their interaction are in good part shaped by systems of social relations that support the current, environmentally damaging configuration. We now have enough evidence to know that beyond adoption of good practices, such as waste recycling, it will take a change in these systems of social relations themselves to achieve greater environmental sensitivity and efficiency. A crucial issue raised by all the above is the question of the scales at which damage is produced and intervention or change should occur. These may in turn differ from the sites where the responsibility for the damage and the sites for demanding accountability lies.

The city is, in this regard, an enormously complex multi-scalar system where many of the environmental dynamics that concern us come together and where different policy levels, from

the supra to the sub-national, get implemented. Further, specific cross-border networks of mostly global cities, also constitute a key component of the global scale at which these dynamics occur and hence can be thought of as a network of sites for demanding accountability of global economic actors. Because cities bring together our economic, political, cultural, ideological, and technical systems and practices, the treatment of the subject demands multiple forms of knowledge. Dealing with the question of the environment in the context of cities and rural-urban interactions requires an extraordinary mix of disciplines. Further, because we are dealing with an enormous variety of political and economic systems, levels of wealth and power, cultural understandings and ideological convictions, it is necessary to include analyses that represent many of these differences. It is not a question simply of scientific knowledge and shared theoretical understandings.

This complexity and variety assume even more weight when we consider that the question of urban sustainability requires engaging the legal systems and profit logics that underlie and enable many of the environmentally damaging aspects of our societies. This in turn requires addressing some of the major dynamics of the current era: globalization and the ascendance of markets. The question of urban sustainability cannot be reduced to modest interventions that leave these major systems unaddressed. And the actual features of these systems vary across countries and across the North– South divide. In brief, non-scientific elements are a crucial part of any discussion of urban and rural sustainability. Questions of policy and pro-active engagement possibilities are a critical dimension of treatments of urban sustainability, whether they involve asking people to support garbage recycling or demanding accountability from major global corporations known to have environmentally damaging production processes. There are, then, many different ways of organizing a volume on urban sustainability, each one with its own shortcomings.

It is only in the last few years that significant numbers of researchers and policymakers have begun to focus on cities as crucial environmental components. Most of the international attention by environmentalists in the 1980s was focused on issues of “the commons” or those that threaten global tragedy. The 1992 United Nations Conference on Environment and Development (UNCED) held in Rio made an important contribution towards changing this lack of focus. Urban and natural environments came to be seen as an indivisible matrix. Since the Rio conference it has become even clearer that the environmental regulation of cities is crucial to the future of the planetary ecosystem. Perhaps among the most significant outcomes of *Agenda 21*, the action plan that came out of the conference, was the formation of Local Agenda 21 programs in a large number of localities around the world.

Environmentalists are beginning to address urban questions, particularly through the notion of sustainable cities and more environmentally friendly forms of urban growth. The articulation of environmental and urban research has not been facilitated by the lack of a clear definition of key categories such as environment and sustainability. One difficulty is that environment has many

different meanings, depending on ideology, politics, situation, positionality, and economic and political capacities. Nonetheless, there is a whole range of ecological issues central to how we should be thinking about our rapidly urbanizing world. How we respond to some of the large global scale issues (warming, ozone, emissions) will have profound implications for urbanization processes

Beyond this overall difference, the environmental agenda being developed in the North may neglect issues of household level environmental problems such as sanitation, which may be crucial to sustainability in the South, but have often been solved for most people, though not the very poor in the North. The conditions that create high infant mortality and disease are, for some, of similarly global import as the destruction of forests, and are among the most urgent ones that need to be addressed. The consequences of hazardous indoor air quality (household airborne and water carried diseases) and inadequate sanitation have a far more direct and often fatal impact on large sectors of the world's population than the effects of global warming and emissions.

We have to shift environmental analysis “from an argument about protection or management of the natural environment to a discussion of social movements in response to the urban and industrial forces of the past hundred years.” A growing range of issues never previously understood in terms of class, such as global warming, environmental damage and destruction of local cultures can now be interpreted as class questions.

The notion of sustainable cities and sustainable development introduces a broad, often ill-defined range of issues. It is often not clear what the ‘sustainable’ refers to: cities, programs, or existing arrangements. There is a difference between those focused on meeting human needs and those who are more ecocentric and posit that the ecosystem should be allowed to develop on its own terms, without separate reference to the needs of humans. There are different meanings in the literature on sustainable development, though most are cantered on ecological sustainability with little mention of development in the sense of meeting human needs. Partly in reaction there is now a second literature that focuses exclusively on meeting human needs (e.g. the Habitat II documents). A third literature, mostly from international agencies, refers to sustainability in terms of the longevity of those projects instituted by these agencies once they themselves leave; there is often little reference to the ecological impact of these same projects.

One of the major contributions of the Brundtland Commission (1987) was its insistence that meeting human needs must be combined with ecological sustainability. It argued that the challenge is to meet today's needs without compromising the future ability to meet needs. It is suggested that ‘sustainable’ should refer to avoiding the depletion of environmental capital and that development should refer to meeting human needs. Drawing a distinction between ecological sustainability and the development components of sustainable development has the advantage of avoiding the confusions generated by terms such as economic sustainability, social

sustainability, and cultural sustainability, where it is uncertain what is being sustained and how it would affect environmental capital (Marcuse, 1998).

Sustainable development is not about the cities or the social structures in cities today but about the need to meet human needs without depleting the environmental capital; this would require some sharp changes in those conditions. Pursuing this also means seeking international regulatory frameworks in which “democratic and accountable city and municipal authorities ensure that the needs of the people within their boundaries are addressed while minimizing the transferring of environmental costs to other people or ecosystems or into the future.” This in turn requires consideration of the kinds of national policies, legal and international frameworks, and international agreements that encourage city and municipal authorities in this direction.

Cities and Damage

There is today a growing recognition among specialists that cities are the places where critical components of ecological modification associated with development come together. There may be sites that more directly reflect the sharpest environmental transformation, e.g. the desertification of once fertile land, but it is in cities where the multiple dynamics intersect and interact with complex multiplier effects. It is the concentration of intense economic processes and high levels of resource consumption that mark the urban condition. Unlike natural systems, cities are highly dependent on external supplies, both natural and man-made. Practitioners and researchers have focused on several aspects of these developments. For instance we can identify the following:

- i. the specific characteristics and effects of urbanization on the deterioration of local environments and on their contribution to global environmental change;
- ii. the socioeconomic impacts of urban environmental degradation;
- iii. the significance of environmental issues for the efficient and effective provision of urban goods, infrastructure and services;
- iv. the environmental impacts of different architectural and planning practices and policies;
- v. the significance of environmental issues for the sustainability of cities and development models.

Worldwide urban growth is associated with increased resource consumption, especially in cities in the North. Increases in human living standards tend to bring increased resource consumption. Moving from a rural, agricultural and craft based production economy to an urban-industrial economy raises the level of consumption of resources. We can see massive increased throughput of fossil fuels, timber, metals, meat, and manufactured products in urban

areas, along with poor waste management and hence additional environmental damage. In the South, poor waste management can lead to often serious health threats, as is evident with the epidemic dimensions of cholera, tuberculosis, and typhoid. Current accelerated urban industrial growth in Asia and Africa will add an enormous amount of demand for resources. For instance, China is planning to double the number of its cities to 1200 by 2010 with an expected 300 million people moving into cities in that country alone.

There is a growing body of research that documents the role of cities in producing environmental damage at various scales. Atmospheric changes associated with urbanization include: changes in radiation and rainfall levels; increased cloud cover; the creation of “urban heat islands” that produce dust domes; and convectional wind systems that circulate pollutants over the city. The most significant transformation is the generation of pollution, particularly acute in the South, which has 5 out of the 6 cities with the highest level of air pollution. The main sources of air pollution are the domestic burning of firewood and coal for heat and cooking; motor vehicle emissions; power station combustion; industrial emissions; and emissions from toxic and hazardous materials and waste.

Sustainable city

A sustainable city or eco-city is a city designed with consideration of environmental impact, inhabited by people dedicated to minimization of required inputs of energy, water and food, and waste output of heat, air pollution - CO₂, methane, and water pollution. Richard Register first coined the term "ecocity" in his 1987 book, *Ecocity Berkeley: building cities for a healthy future*. Other leading figures who envisioned the sustainable city are architect Paul F Downtown, who later founded the company Ecopolis Pty Ltd, and authors Timothy Beatley and Steffen Lehmann, who have written extensively on the subject. The field of industrial ecology is sometimes used in planning these cities.

A sustainable city can feed itself with minimal reliance on the surrounding countryside, and power itself with renewable sources of energy. The crux of this is to create the smallest possible ecological footprint, and to produce the lowest quantity of pollution possible, to efficiently use land; compost used materials, recycle it or convert waste-to-energy, and thus the city's overall contribution to climate change will be minimal, if such practices are adhered to.

It is estimated that around 50% of the world’s population now lives in cities and urban areas. These large communities provide both challenges and opportunities for environmentally conscious developers. In order to make them more sustainable, building design and practice, as well as perception and lifestyle must adopt sustainability thinking

These ecological cities are achieved through various means, such as:

- i) Different agricultural systems such as agricultural plots within the city (suburbs or centre). This reduces the distance food has to travel from field to fork. Practical work out

of this may be done by either small scale/private farming plots or through larger scale agriculture (e.g. farm scrapers).

- ii) Renewable energy sources, such as wind turbines, solar panels, or bio-gas created from sewage. Cities provide economies of scale that make such energy sources viable.
- iii) Various methods to reduce the need for air conditioning (a massive energy demand), such as planting trees and lightening surface colours, natural ventilation systems, an increase in water features, and green spaces equalling at least 20% of the city's surface. These measures counter the "heat island effect" caused by an abundance of tarmac and asphalt, which can make urban areas several degrees warmer than surrounding rural areas—as much as six degrees Celsius during the evening.
- iv) Improved public transport and an increase in pedestrianization to reduce car emissions. This requires a radically different approach to city planning, with integrated business, industrial, and residential zones. Roads may be designed to make driving difficult.

- v) Optimal building density to make public transport viable but avoid the creation of urban heat islands.

Solutions to decrease urban sprawl, by seeking new ways of allowing people to live closer to the workspace. Since the workplace tends to be in the city, downtown, or urban centre, they are seeking a way to increase density by changing the antiquated attitudes many suburbanites have towards inner-city areas. One of the new ways to achieve this is by solutions worked out by the Smart Growth Movement.

- ✓ [Green roofs](#)
- ✓ [Zero-emission transport](#)
- ✓ [Zero-energy building](#)
- ✓ [Sustainable urban drainage systems or SUDS](#)
- ✓ [Energy conservation systems/devices](#)
- ✓ [Xeriscaping - garden and landscape design for water conservation](#)

Key Performance Indicators - development and operational management tool providing guidance and M&V for city administrators.

[*International examples of sustainable cities*](#)

Australia

City of Melbourne. Over the past 10 years, various methods of improving public transport have been implemented; car free zones and entire streets have also been implemented.

Canada

In 2010, Calgary ranked as the top eco-city in the planet for its, "excellent level of service on waste removal, sewage systems, and water drinkability and availability, coupled with

relatively low air pollution.” The survey was performed in conjunction with the reputable Mercer Quality of Living Survey.

China

China is working with investment and technology supplied by the Singapore government to build an ecocity in the Coastal New District of Tianjin City in northern China, named the "Sino-Singapore Tianjin Eco-city".

Dongtan Eco-city is the name of another project on the third largest island in China at the mouth of the Yangtze River near Shanghai. The project was scheduled to accommodate 50,000 residents by 2010, but its developer has currently put construction on hold.

Denmark

The industrial park in Kalundborg is often cited as a model for industrial ecology.

Germany

No other country has built more eco-city projects than Germany. Freiburg im Breisgau is often referred to as green city. It is one of the few cities with a green mayor and is known for its strong solar economy. Vauban, Freiburg is a sustainable model district. All houses are built to a low energy consumption standard and the whole district is designed to be carfree.

Another green district in Freiburg is Rieselfeld, where houses generate more energy than they consume. There are several other green sustainable city projects such as Kronsberg in Hannover and current developments around Munich, Hamburg and Frankfurt.

India

India is working on Gujarat International Finance Tec-City or GIFT which is an under-construction world-class city in the Indian state of Gujarat. It will come up on 500 acres (2.0 km²) land. It will also be first of its kind fully Sustainable City.

Kenya

Hacienda - Mombasa, Kenya. It is the largest development of eco-friendly residential properties in East Africa; construction is currently ongoing, and it will eventually be one of Africa's first self-sustaining estates.

United Kingdom

St Davids the smallest city in the United Kingdom aims to be the first carbon neutral city in the world.

Leicester is the United Kingdom's first environment city

United States

Arcosanti, Arizona

Treasure Island, San Francisco: is another project that aims to create a small eco city.

Coyote Springs Nevada is the largest planned city in the United States.

Babcock Ranch Florida a proposed solar-powered city.

CULTURE AND ENVIRONMENTAL PATTERNS, HEALTH AND SAFETY

In the past, the emphasis of environmental action has most often been on wilderness, wildlife, endangered species, and the impact of pollution on natural landscapes outside cities. It is now the time to turn more attention to city environment because majority of the people now live in urban environments and have suffered from their decline. There is the need for more studies on the urban ecosystem looking at the cultural and environmental patterns that affect the health and safety of the city dwellers. Worldwide we are becoming an increasingly urbanized species, for instance in the USA, about 70 % of the people live on 3 % of the land area and 75% live in urban-suburban areas.

One of the ways we can improve on the management of the city environment is to analyze the city as an ecological system. It should be noted that like any life-supporting system, a city maintain a flow of energy, provide necessary material resources, and have ways of removing waste. These ecosystem functions are maintained in a city by transportation and communication with outlying areas. It is not a self-contained ecosystem as it depends on other cities and rural areas. . A city takes in raw materials from the country-side: food, water, wood, energy, mineral ore and everything that a human society uses. It in turn produces and export material goods and if it is truly a city, export ideas, innovations, inventions, arts, and the spirit of civilization.

As a consequence, if the environment of a city declines, almost certainly the environment of the surroundings will also decline. The reverse is also true: if the environment around a city declines, the city itself will be threatened.

Because the city changes the landscape, it also changes the relationship between the biological and physical aspect of the environment. Such changes aspects of pollution, water management, or climate.

ENVIRONMENTAL ETHICS

State of the environment

The state of the environment in this day and age is recognised as a worldwide predicament in need of global address, through the undertaking of a synchronised and integrated approach by the international community. A healthy and clean environment is essential for sustainable development, and can be attained through the efficient use of energy sources. The decision makers in each nation have the important role of ensuring the generation of safe and clean energy in their countries for the greatest benefit of a wide range of stakeholders, which includes those outside the national boundaries. Governments, as representatives of nation states, possess the means to decide which energy technologies people can choose and/or access. Setting of policy inside countries is the domain of governments through the principle of state sovereignty in international law. However, the rights of governments are constrained by their commitments to various international commitments invoking ethical principles relevant to energy and environmental issues, especially in the event where their decisions give rise to environmental or security risks either within their own nation states or to other nation states. Other stakeholders already have important roles in the process, including the private sector and civil society. However, full representation of the community in decision-making requires the involvement of all groups, and not all countries have managed to ensure that all persons are represented in this process.

Environmental Ethics

In general, ethics refers to correct behaviour within some social setting. In the narrow context of scientific procedure, 'ethics' refers to the rules of conduct: what is permitted. These rules have evolved along with science, both from more general codes of ethics such as religious value systems but also to aid scientific progress. The idea is that ethical behaviour isn't just "right" in some abstract sense, but also that it ensures good science. Behaviour is what people do and people perform a host of environmentally appropriate and inappropriate behaviours everyday.

The behaviours of individuals often have environmental repercussions. To change the state of our environment, we must learn how to encourage individual behaviours that are environmentally sound and alter those that are damaging to the environment. It must also be noted that awareness of that an environmental problem exist does not necessarily lead to behaviour to fix the problem.

Human behaviour has greatly harmed, yet holds a great deal of hope for the environment. Human behaviour must be addressed in order to achieve environmental sustainability. Such behaviours must be supported by knowledge and attitudes. This is because the attitudes of the people towards the environment are often unethical, unacceptable, and unsustainable and cause more

harm to the environment and hamper sustainable development. Pollution, illegal logging, illegal fishing, and destructive farming practices are only a few of the common problems confronted by environmentalists and environmental educators. Unfortunately, these unfriendly behaviours often have short-term economic and political pay-offs that encourage people to continue.

One difficulty is that environment has many different meanings, depending on ideology, politics, situation, positionality, and economic and political capacities. Nonetheless, there is a whole range of ecological issues central to how we should be thinking about our rapidly urbanizing world. Although, in some cases people show positive attitudes towards the environment especially in developed countries such as the USA, however, most of these people won't do simple things to conserve energy or water. There are calls for the promotion of new (healthier, more environmentally friendly) behaviours in groups of people.

All Codes of Ethics, whether for municipal officials, civil society organizations, the media or professional associations, must include certain basic principles of professional conduct. These could comprise (but need not be restricted to) the following:

- Impartiality, objectivity, discrimination
- Confidentiality
- Due diligence/duty of care
- Fidelity to professional responsibilities
- Avoiding potential or apparent conflict of interest
- Legality (respect for the rule of law)
- Integrity and honesty
- Transparency and openness;
- Efficiency;
- Equality;
- Justice; and
- Responsibility, i.e., maintaining one's reputation and responsibility for faults

Environmental Education

According to UNESCO (1978), Environmental Education (EE) is a process of developing a world population that is aware of and concerned about the total environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively towards solutions of current problems and the prevention of new

ones. Environmental education (EE) is an approach, a philosophy, a tool, and a profession. As a discipline, it is applied in many ways for many purposes. We recognize there are many different ways to categorize these strategies and believe this version has value for practitioners in both education and communication fields.

In its most basic form, EE implies learning about the environment. It is suggested that EE is education *in, about, and for* the environment. This simple description reinforces the different purposes that EE often serves: programs provide opportunities to explore nature in the outdoors, information about conservation and environmental issues, and opportunities to gain knowledge and skills that can be used to defend, protect, conserve, or restore the environment.

This multidimensional definition was confirmed by the delegates at the Tbilisi Intergovernmental Conference in Georgia, former USSR in 1977 in their three goals for EE:

- To foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas;
- To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment;
- To create new patterns of behaviour of individuals, groups, and society as a whole toward the environment.

Other evidence of change evolves from an increased interest in environmentally responsible behaviour. Educators and researchers have focused on the psychological and sociological foundations of behaviour. Behavior change theories appear to fall into “two avenues” for encouraging conservation behaviours ([Monroe, 2003](#)). The avenue most akin to education (e.g., building knowledge and skills) results in increased environmental literacy, which can be demonstrated through environmentally appropriate decisions. The other avenue applies communication strategies such as social marketing concepts to lead more predictably to specific behaviour change.

As African societies urbanize, it becomes evident that they do so in ways that challenge prevailing theories and models of urban dynamics. A great range and diversity of contemporary experience exists in the cities of the continent. Recent studies suggest that certain truisms about African cities may be falling by the wayside. The great variation of data on African cities, and variability in their reliability, makes comparison problematic, further challenging the notion that one can still speak of the continent’s urban areas as belonging to a single category.

During the past few millennia, humans have emerged as the major force of change around the globe. The large environmental changes wrought by our actions include modification of the global climate system, reduction in stratospheric ozone, alteration of Earth’s biogeochemical cycles, changes in the distribution and abundance of biological resources, and decreasing water quality (Meyer and Turner 1994, IPCC 1996, Vitousek et al. 1997, Mahlman 1997). However, one of the most pervasive aspects of human-induced change involves the widespread

transformation of land through efforts to provide food, shelter, and products for our use. Land transformation is perhaps the most profound result of human actions because it affects so many of the planet's physical and biological systems (Kates et al. 1990). In fact, land use changes directly impact the ability of Earth to continue providing the goods and services upon which humans depend. Unfortunately, potential ecological consequences are not always considered in making decisions regarding land use. Moreover, the unique perspective and body of knowledge offered by ecological science rarely are brought to bear in decision-making processes.

The most important environmental issue now is climate change. The authoritative Stern report on the economics of climate change concludes that it will:

... affect the basic elements of life for people around the world—access to water, food production, health and the environment. Hundreds of millions of people could suffer hunger, water shortages and coastal flooding as the world warms.

Moreover, it will be the poorest countries and people who are most vulnerable to this threat and who will suffer the earliest and the most. This has important implications for the work of urban planning: steering settlement away from flood-prone coastal and riverine areas and those subject to mud-slides; protecting forest, agricultural and wilderness areas and promoting new ones; and developing and enforcing local climate protection measures.

A second major environmental concern is oil depletion. The global use of oil as an energy source has both promoted and permitted urbanization, and its easy availability has allowed the emergence of low density and sprawling urban forms—suburbia—dependent on vehicle transport. Beyond this, however, the entire global economy rests on the possibility of moving both people and goods quickly, cheaply and over long distances. An oil-based economy and climate change are linked: vehicle and aircraft emissions contribute significantly to greenhouse gas emissions and hence

global temperature rise.

Sustainable Development

“Humanity has the ability to make development sustainable—to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.” - Brundtland Commission, 1987

Sustainable development contains within it two key concepts; the concept of "needs", in particular the essential needs, to which overriding priority should be given, and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs. How can we meet the needs of today without diminishing the capacity of future generations to meet theirs? Sustainable development implies a

broad view of human welfare, a long term perspective about the consequences of today's activities, and global cooperation to reach viable solutions

Development is all about the utilization of natural resources to provide goods and services, a business activity for the betterment of mankind. Sustainability is ensured only upon striking a balance between living conditions and resource usage. When one sidelines the other the whole system collapses, in most cases, with irreversible environmental damages. The real transition from “Development” to “Sustainable Development” is possible only with changes in business attitudes and actions. Expansion and intensification of agriculture, uncontrolled industrialization, destruction of natural habitats, and increasing urbanization to satisfy the needs of the growing population and economic development have been major threats to the regions rich heritage. The antagonism between population growth, resource depletion, and environmental degradation is being widely deliberated in the recent years. Arguments, most of the times, are between population growth as the main cause of increasing environmental pressures, economic development, unsustainable agricultural and industrial practices, and excessive or wasteful consumption.

Clearly an intrinsic relationship exists between population growth and environmental stress, but very little empirical evidence exists to prove or disprove it. Prescott-Allan, in his book *The Wellbeing of Nations* (2001), concludes that the countries where population is projected to grow fastest have some of the lowest income levels in the world. Eventually, these countries already rank high in terms of environmental stress. In the recent years, resource consumption patterns

have significantly changed and moved to a use-and-throw state of mind. Such a style, in addition to posing significant threats on resource consumption, also increases the stress on the environment in the form of the disposed waste.

Ecological Footprint and Biocapacity

Ecological Footprint measures humanity's demand on nature. The footprint of a country is the total area required to produce the food, fiber and timber that it consumes, absorb its waste and provide space for its infrastructure. In 2001, the global Ecological Footprint was 13.5 billion global hectares, or 2.2 global hectares per person (a global hectare is a hectare whose biological productivity equals the global average). This demand on nature can be compared with the Earth's bio-capacity, a measure of nature's ability to produce resources from its biologically productive area. In 2001, the Earth's biocapacity was 11.3 billion global hectares, a quarter of the planet's surface, or 1.8 global hectares per person. The global Ecological Footprint decreases with a smaller population size, lower consumption per person, and higher resource efficiency. The Earth's biocapacity increases with a larger biologically productive area and higher productivity per unit area. In 2001, humanity's Ecological Footprint exceeded global bio-capacity by 0.4 global hectares per person, or 21 per cent. This global overshoot began in the 1980s and has been growing ever since. In overshoot, nature's capital is being spent faster than it is being regenerated. If continued, overshoot may permanently reduce ecological capacity. (Source: WWF, 2005).

Ecological Principles and their Implications for Land Use

Changes in technology and modes of production have fundamentally altered the relationship between people and natural ecosystems. When people were sustained by hunting and gathering, the availability and distribution of plant and animal foods limited human population abundance and distribution; hunter-gatherers were tightly integrated into natural food webs. The dependence of humans on natural stocks of plants and animals declined with the advent of agriculture, which allowed people to concentrate in areas with high productivity, areas where soils were fertile and rainfall was abundant. No longer was the spatial distribution of people limited by the availability of "prey." Augmentation of rainfall with irrigation, and addition of fertilizers to natural stocks of nutrients, further reduced the spatial dependence of human population centres on the biotic and abiotic properties of ecosystems. The advent of extensive transportation networks and the development of food-preservation technologies during the Industrial Revolution extended the habitable area by allowing population of areas remote from agriculture. These trends have reduced the interdependence of ecological and human systems, and the consequences of land-use decisions often are not felt immediately. Planning is needed to avert long-term or broad-scale harmful ecological effects resulting from unwise landuse choices.

Urban Agglomeration

Having a large number of cities with multimillion populations is a new condition in our history, as is the urbanization of over half the people in the world. Urban agglomerations are today the engines of consumption of the world's environment: they occupy only 2% of the world's land surface, but use over 75% of the world's resources. Humans now consume nearly half of the world's total photosynthetic capacity, and cities are the major factor in this. Cities in the North require an average of 4 to 5 hectares of ecologically productive land per inhabitant. Further, much economic activity that takes place outside cities is geared towards cities. With the expansion of the global economy we have raised our capability to annex growing portions of the world to support a limited number of industries and places.

Cities also have a pronounced effect on traditional rural economies and their long-standing cultural adaptation to biological diversity. Rural populations increasingly become consumers of products produced in the industrial economy, one much less sensitive to biological diversity. The rural condition has evolved into a new system of social relations, one that does not work with biodiversity. These developments all signal that the urban condition is a major factor in any environmental future.

Through this enormously distinctive presence that is urbanization, we are changing a growing range of ecological systems from the climate to species diversity and ocean purity and we are creating new environmental conditions of heat islands, desertification, and water pollution. We have entered a new phase in human ecological history. For the first time humankind is the major ecological factor on the planet, in a way it was not in the past. Massive urbanization over the last few decades has created a set of global ecological conditions never seen before. But is it urbanization per se or the particular types of urban systems and industrial processes we have instituted? That is to say, are these global ecological conditions the result of urban agglomeration and density or are they the result of the urban systems for transport, waste disposal, heating and cooling, food provision, and the industrial process through which we extract, grow, make, package, distribute, and dispose of all the foods and services we use?

We can begin by conceptualizing the urban condition as a socio-ecological system in that it creates a whole new set of interrelations between, on the one hand, its constructed features and material practices and, on the other, various ecological systems. In the current stage, the systemic characteristics of this inter-relation are mostly in the form of environmental damage.

Because they are at the centre of the environmental future, urbanization and the city also must be understood and used as potentially containing the solutions to many of these problems. As has been much documented, cities have long been sites for innovation and for developing and instituting complex physical and organizational systems. It is within the complexity of the city that we must find the solutions to much environmental damage and the formulas for reconfiguring the socio-ecological system that is urbanization. Cities contain the networks and information loops that may facilitate communicating, informing, and persuading households, governments, and firms to support and participate in environmentally sensitive programs and in radically transformative institution building.

Urban systems also entail systems of social relations that support the current configuration. Beyond adoption of practices such as waste recycling, it will take a change in this system of social relations itself to achieve greater environmental sensitivity and efficiency. For instance, a crucial issue is the massive investment around the world promoting large projects that damage the environment. Deforestation and construction of large dams are perhaps among the best known cases.

The scale and the increasingly global and private character of these investments suggest that citizens, governments, NGOs, all lack the power to alter these investments patterns. The geography of economic globalization is strategic rather than all-encompassing and this is especially so when it comes to the managing, coordinating, servicing and financing of global economic operations. The fact that it is strategic is significant for a discussion about the possibilities of regulating and governing the global economy. There are sites in this strategic geography where the density of economic transactions and top-level management functions come together and represent a strategic geography of decision-making. We can see this also as a strategic geography for demanding accountability about environmental damage. It is precisely because the global economic system is characterized by enormous concentration of power in a limited number of large multinational corporations and global financial markets that makes for concentrated (rather than widely dispersed) sites for accountability and for changing investment criteria. This leaves out a whole range of less central and powerful economic factors responsible for much environmental damage, but are more likely to be controllable through national level regulatory interventions.

A crucial issue raised by all the above is the question of the scales at which damage is produced and intervention or change should occur. These may in turn differ from the levels and sites for responsibility and accountability. The city is, in this regard, an enormously complex entity. Cities are multi-scalar systems where many of the environmental dynamics that concern us are constituted and in turn constitute what we call the city, and where different policy levels, from the supra- to the sub-national, get implemented. Further, specific networks of mostly global cities, also constitute a key component of the global scale and hence can be thought of as a network of sites for accountability of global economic actors.

Urban socio-spatial change

The issue of how global economic change in the last few decades has impacted on socio-spatial change in towns and cities has received much attention, along with the qualification that both local and broader processes have shaped these changes. In essence, however, planners and urban managers have found themselves confronted with new spatial forms and processes, the drivers of which often lie outside the control of local government and urban planning. The nature of spatial change in cities has been described as a shift from ‘uniplex’ to ‘multiplex’ cities. This means a shift from cities as relatively self-contained and focused on a central node or CBD (central business district), with radial transport systems feeding coherent community neighbourhoods, to ‘multiplex’ cities: this emphasizes the dynamic and relational nature of cities, the complex interactions between cities and their inhabitants and their regional and global settings, and the emergence of multi-nodal, mixed use places where movement patterns and economic linkages are complex and multi-directional.

Movement patterns have become far more complex and extended, and administrative boundaries of urban areas far less meaningful in terms of defining the spatial extent of social and economic relations. The term ‘megalopolis’ has been used to describe multi-city, multi-centred urban regions with a high proportion of low density residential areas and complex networks of economic specialization to facilitate the production and consumption of sophisticated products and services.

Socio-spatial change seems to have taken place primarily in the direction of the fragmentation, separation and specialization of functions and uses in cities, with labour market polarization (and hence income inequality) reflected in major differences between wealthier and poorer areas. We can contrast up-market gentrified and suburban areas with tenement zones, ethnic enclaves and ghettos; and areas built for the advanced service and production sector, and for luxury retail and entertainment, with older areas of declining industry, sweatshops and informal businesses.

In many poorer cities, spatial forms are being driven by private-sector property developments and increased rental markets, in response to which low-income households are being pushed further out and into marginal locations. In some parts of the world, new urban (*ruralopolitan*) forms are emerging as the countryside itself begins to urbanize, as in vast stretches of rural India, Bangladesh, Pakistan, China, Indonesia, Egypt, Rwanda and many other poorer countries.

As well, large cities spread out and incorporate nearby towns leading to continuous belts of settlement (such as the shanty-town corridor from Abidjan to Ibadan, containing 70 million people and making up the urban agglomeration of Lagos), and as the poor seek a foothold in the urban areas primarily on the urban edge. It is these sprawling urban peripheries, almost entirely unserved and unregulated, that make up the bulk of informal settlement, and it is in these areas that the most urban growth is taking place.

These kinds of areas are very costly to plan and service in the conventional way, given the form of settlement, and even if that capacity did exist, few could afford to pay for such services. In fact, the attractiveness of these kinds of locations for poor households is that they can avoid the costs associated with formal and regulated systems of urban land and service delivery. Because of this, however, it is in these areas that environmental issues are particularly critical, both in terms of the natural hazards to which these settlements are exposed and the environmental damage that they cause. These urban forms do not simply indicate the failure of traditional master plans to be implemented. Rather, planning facilitates and promotes inequality and exclusion through criminalizing certain forms of informality (such as informal settlements) and sanctioning others (developer and middle-class driven property development and speculation). Both may be in violation of the plan, but those who have access to state power will prevail.

CASE STUDIES, EXAMPLES OF SIGNIFICANT HUMAN SETTLEMENTS AND DEVELOPMENT PROJECTS AND THEIR ENVIRONMENTAL IMPACTS

Human settlement planning and management in disaster-prone areas

Natural disasters are sometimes inevitable and can cause loss of life, disruption of economic activities and urban productivity - particularly for highly susceptible low-income groups, and environmental damage, such as loss of fertile agricultural land and contamination of water resources, and can lead to major resettlement of populations. Over the past two decades they are estimated to have caused some 3 million deaths and affected 800 million people. Global economic losses have been estimated by the Office of the United Nations Disaster Relief Coordinator to be in the range of \$ 30-50 billion per year.

There is an urgent need to address the prevention and reduction of man-made disasters and/or disasters caused by, inter alia, industries, unsafe nuclear power generation and toxic wastes

One of the objectives of Agenda 21 is the “*Protection and Promotion of Human Health conditions*”.

The objective is to enable all countries, in particular those that are disaster-prone, to mitigate the negative impact of natural and man-made disasters on human settlements, national economies and the environment. Three distinct areas of activity are foreseen under this programme area, namely the development of a

- culture of safety
- pre-disaster planning and
- post-disaster reconstruction.

Develop a culture of safety

To promote a "culture of safety" in all countries, especially those that are disaster-prone, the following activities should be carried out:

Complete national and local studies on the nature and occurrence of natural disasters, their impact on people and economic activities, the effects of inadequate construction and land use in hazard-prone areas, and the social and economic advantages of adequate pre-disaster planning;

(b) Implement nationwide and local awareness campaigns through all available media, translating the above knowledge into information easily comprehensible to the general public and to the populations directly exposed to hazards; (c) Strengthen, and/or develop global, regional, national and local early warning systems to alert populations to impending disasters;

(c) Identify industrially based environmental disaster areas at the national and international levels and implement strategies aimed at the rehabilitation of these areas through, inter alia:

- (i) Restructuring of the economic activities and promoting new job opportunities in environmentally sound sectors;
- (ii) Promoting close collaboration between governmental and local authorities, local communities and non-governmental organizations and private business;
- (iii) Developing and enforcing strict environmental control standards.

Pre-disaster planning

Pre-disaster planning should form an integral part of human settlement planning in all countries.

The following should be included:

- (a) Complete multi-hazard research into risk and vulnerability of human settlements and settlement infrastructure, including water and sewerage, communication and transportation networks, as one type of risk reduction may increase vulnerability to another (e.g., an earthquake resistant house made of wood will be more vulnerable to wind storms);
- (b) Develop methodologies for determining risk and vulnerability within specific human settlements and incorporate risk and vulnerability reduction into the human settlement planning and management process;
- (c) Redirect inappropriate new development and human settlements to areas not prone to hazards;
- (d) Prepare guidelines on location, design and operation of potentially hazardous industries and activities;
- (e) Develop tools (legal, economic etc.) to encourage disaster-sensitive development, including means of ensuring that limitations on development options are not punitive to owners, or incorporate alternative means of compensation;
- (f) Further develop and disseminate information on disaster-resistant building materials and construction technologies for buildings and public works in general;
- (g) Develop training programmes for contractors and builders on disaster-resistant construction methods. Some programmes should be directed particularly to small enterprises, which build the great majority of housing and other small buildings in the developing countries as well as for the rural populations which build their own houses;

- (h) Develop training programmes for emergency site managers, non-governmental organizations and community groups which cover all aspects of disaster mitigation, including urban search and rescue, emergency communications, early warning techniques, and pre-disaster planning;
- (i) Develop procedures and practices to enable local communities to receive information about hazardous installations or situations in these areas, and facilitate their participation in early warning and disaster abatement and response procedures and plans;
- (j) Prepare action plans for the reconstruction of settlements, especially the reconstruction of community life-lines.

Post-disaster reconstruction and rehabilitation planning

The international community as a major partner in post-reconstruction and rehabilitation should ensure that the countries involved derive the greatest benefits from the funds allocated by undertaking the following activities:

- (a) Carry out research on past experiences on the social and economic aspects of post-disaster reconstruction and adopt effective strategies and guidelines for post-disaster reconstruction with particular focus on development focused strategies in the allocation of scarce reconstruction resources, and on the opportunities which post-disaster reconstruction provides to introduce sustainable settlement patterns;
- (b) Prepare and disseminate international guidelines for adaptation to national and local needs;
- (c) Support efforts of national governments to initiate contingency planning, with participation of affected communities, for post-disaster reconstruction and rehabilitation.

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