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Environmentally sustainable urban planning: Concept and governing factors

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Abstract
Urbanization is rapidly increasing at an alarming rate all over the world in as much as that the total urban population of the world has increased by 5 folds during the last sixty five years. While total population of India has doubled during the last 50 years, urban population has grown nearly five times. The process of urbanization is faster in the developing world and more often unplanned and disorganized, resulting in various hazards due to ecological and environmental imbalance. Urbanization alters the environmental parameters by increasing concreting, reducing forest cover, increasing sediment yield, creating heat island, reduce ventilation, increased air and water pollution and adding significant GHG emissions. Change in hydrological cycle and land use pattern lead to various hazards like flood, landslides and drought. The authors of the present paper have focused on different issues relating to environment linked to sustainable urban planning.

Keywords: urbanization, urban population, GHG

1. Introduction
The magnitude of urban population growth in developing countries is directly governed by the economic development resulting from development of industries, commerce, vehicles, energy consumption, water use, housing, education, and other supporting infrastructure. These developmental components results in waste generation, air pollution, water pollution, noise pollution, traffic agglomeration, drainage problems, health problems and other environmental stresses. Generally, most countries seek to generate increasing economic development which tend to exacerbate such problems which may exceed both the preventive and solution capacity of the government as well as the assimilative capacity of nature. Urban areas and populations are growing rapidly in developing countries. People flock to urban areas to seek employment, entertainment, shopping, and a generally higher standard of living. At the same time environmental infrastructure of works and services are inadequate to serve the resulting increases in population and its densities. The inevitable congestion causes environmental hazards and degradation until strategies for reversing environmental deterioration are effectively implemented.

Majority of the cities around the world, particularly developing countries, are experiencing rapid growth. Yet, in the absence of adequate environmental policy and action, this growth is occurring at a considerable, and often increasing, economic and social cost. More people, more industry, and more motor vehicles cause ever-worsening air pollution which poses a serious environmental threat in many cities. The World Health Organization (WHO) and other international agencies have long identified urban air pollution as a critical public health problem. Many developing countries and emerging economies, for example China, Indonesia, and Mexico, have therefore included air pollution into their list of priority issues to be tackled. On our planet, the air we breathe is one of the most important things around us. It is a vital natural resource on which all life depends. Clean air is something that we all need for good health and the well-being of humans, animals, and plants. However, our atmosphere is being continuously polluted which affects human health as well as other environmental resources such as water, soil, and forests. Thus, air pollution also hampers development. Larger cities with highly concentrated industry, intensive transport networks and high population density are a major source of air pollution. The present paper briefly described the following issues with a view to orient towards environmentally sustainable urban planning:

- Physical Planning
- Environmental Health Management
- Sustainable Development
- Urban Environmental Management Strategies

2. Physical Planning
Planning is described in many ways as physical planning, land use planning, urban & regional planning or town planning. Physical planning is described as the systematic assessment of land & water, alternative pattern of land use & other physical, social & economic conditions in such a way so as to encourage land user to select options that increase productivity & meet social needs in a sustainable manner (Onibokun, 1985). It can be considered as the science of organizing the use of land for the betterment of society. Physical planning involves the reconciliation of land uses, provision of the right site for right use, provision of facilities, services & public goods, control of development, protection & conservation of resources (Oduwaye, 2009). Physical planning also ensures compatible land uses, guarantees orderly development & provides functional & visually pleasing environment & satisfactory services in a sustainable manner. Urban land control & management especially in areas with rapid urban sprawl is crucial to tackling growing land use problems such as slum formation, rising costs of land, accessibility to urban land for housing, incompatible use, flooding, overcrowding & congestion among others for

the purpose of achieving sustainable city developments (Oyesiku, 1997).

It would be interesting to note that Sustainable use of land can help strengthen communities as well as provide a considerable amount of benefits basically environmental, economical, social & cultural. Sustainable physical planning may respond to range of interests in any community by encouraging land use that provide people from a variety of incomes, age groups, cultural backgrounds & other abilities.

Moreover, transportation is yet another important factor related to sustainable physical planning wherein Sustainable physical planning guide transportation. Transportation gets seriously affected in absence of comprehensive physical planning and as such Transportation should be designed to accommodate and support the increasing urbanization including the changes needed in urban form. Some factors arising out of urbanization and which need to be paid importance from sustainable point of view are:

2.1 Housing & community development

House & community environment have direct and greatest impact on people. Encouraging development of neighbourhood infrastructure and improvement of living conditions is important for the well-being of people & community altogether.

The basic principles of healthy housing include:

- Fundamental physiological needs (e.g. Atmospheric purity, direct sunlight, noise levels, exercise, illumination etc.)
- Fundamental psychological needs (e.g. Privacy, normal community life, normal family life, maintenance facilities, social standards, aesthetic satisfaction etc.)
- Protection against accidents (e.g. Accident prevention, fire prevention & escape, electrical protection, protection against gas hazards, automobile hazards, mechanical injuries etc.)
- For a sustainable living in urban areas, the housing & community development are guided by different codes:
- **Housing code:** deals with matters of lighting, ventilation, sanitation, arrangement of rooms, fire protection etc.
- **Building code:** deals with materials, equipments, structural safety etc.
- **Sanitary code:** deals with sanitation conditions throughout the community
- **Zoning code:** deals with development & use of private property

Factors related to physical planning are critical as they are determinants of environment quality. It's therefore of vital importance that land use controls should be practiced effectively to deal with problems like pollution, loss of open space & cultural resources, degradation of wetlands & other coastal resources etc. The steps to deal with the above stated problems are as below:

- Land use & maintenance: ecological land use planning, building/ restoration of area, open space preservation, plantation of tress, increased number of community gardens etc.
- Water: water conservation & waste water reuse :
- Energy efficiency: energy efficient buildings, energy conservation
- Food: increase in yield using less synthetic chemicals
- Pollution control : recycling of solid wastes, reduction of industrial wastes, air/ noise pollution control
- Population growth: reduction in population growth rate
- Economic development : increase in investment & other services in rural areas to reduce migration into urban areas

3. Environmental Health Management

Human community is undergoing radical transformation of its ecology. The percentage of urban population living in urban areas has grown from 5% to 50% over the past two centuries. It is estimated that by 2030, approximately two thirds of the people will be based in large towns or cities. Urban living is considered to be the keystone of modern human ecology. Cities & towns are sources for economic growth, creativity & technology. Moreover, urban places are also the major centers for overcrowding & increased migration rate thereby posing pressure on the urban environment and its various health related factors such as good living conditions, good environment, acceptable air & water quality, housing etc.

Larger towns or cities or urban places have been associated with ideas of public health & practices. The modern public health revolution began in European cities in 19th century. The health of most of the people during that time was said to be deteriorated due to industrialization, poverty, crowding & changes in the traditional ways of living

Urbanization of the cities has led to two conflicting views regarding health factor. On one hand, increased technology & advancements in health sector have resulted in development of advanced medicines, reduced mortality rates, better availability of medical facilities etc whereas on the other hand it has led to increased pressure on the environment leading to microbial contamination of the environment, poor sanitation & hygiene, inadequate & unsafe food & water etc. While factors associated with the developmental process & the changing uses of technology have resulted in considerable gains throughout the world, they have also presented additional threats to public health.

Some of the factors affecting health in the twenty first century are stated below:

- Widespread absolute & relative poverty
- Demographic changes: ageing & growth of cities
- Epidemiological changes: continuing high incidence of infectious diseases, increasing incidence of non-communicable diseases, injuries & violence
- Global environmental threats to human survival
- New technologies: information & telemedicine services
- Advances in biotechnology
- Partnerships for health between the private & public sectors & civil society
- Globalization of trade, travel & spread of values & ideas

(Source- WHO)

The main feature of Environmental health management is Environmental Health Engineering. It is defined as that branch of Engineering that is concerned with protecting the environment from the potential effects of human activity, protection of human population from the effects of adverse environmental factors & improving environmental quality for human health & well-being. A complete list of such responsibilities is stated below:

- Environmental planning of infrastructural works & services
- Resource pollution/degradation prevention(Air, water, land, energy)

- Waste management (liquid & solid)
- Public health aspects (food safety, vector control)
- Housing, institutions & the built environment
- Environmental emergencies(natural & man made)

The features of modern environmental health engineering are as follows

- Public water supply
- Waste water disposal
- Solid waste management
- Air pollution control
- Housing & the built environment
- Recreation facilities
- Food protection program
- Energy development
- Environmental planning
- Institutional sanitation
- Noise pollution control
- Vector control
- Emergency Management

4. Sustainable Development

Cities & urban areas are known to be the foundation of modern civilization. They are considered to be the centers of economic growth, innovation, culture, knowledge& political power. The cities & urban places of greater migration rate & a spur in other factors tend to pressurize the environment in terms of almost all factors like land availability per capita, quality of air, water, food etc, housing conditions, health facilities, consumption of natural resources etc. The urban places therefore need to exhibit sustainable development in order to contribute to environmental sustainability in long term. Such urbanization would require conservation of non-renewable resources, reduction in energy consumption & reduction in waste produced

To achieve sustainability; a comprehensive, integrated & strategic approach combining the local government role as a service provider, its regulatory & legislative powers and its internal economic policies is needed. Based on this, the three core elements of sustainable development are:

- Sustainable development must incorporate as inescapable commitment to social equity
- "Development" must not simply mean "growth". It must imply both on qualitative as well as quantitative improvement.
- Environmental considerations must be established in policy making

The Environmental technology in sustainable development and its related governing factors are reflected in Table – 2 below:

Table 2: Environmental Technology in Sustainable Development

Development Scenarios	Environmental Factors	Sustainable Technology
Human Settlements	Building Infrastructure Land use	Adequacy Water/ waste systems Land management
Industry	Workplace Impact Energy use	Optimum environment Impact minimization Energy conservation
Agriculture	Irrigation/ drainage Food production Animal waste Agro chemical use	Soil/water conservation Food safety Waste management Chemical control
Tourism	Hotel construction Swimming pool Marina development	Water/ waste systems Sanitary design/ operation Pollution control
Zonal development	Coastal zone Urban development River basin	Environmental planning Environmental management Environmental Infrastructure
Human Resource Development	Environmental Health Personnel Non- environmental health personnel	Training of Environmental Health Engineer/ Officer Training of others in Environmental health

4.1 Greening the city

Greening the cities basically means strategies & techniques that protect & restore ecology within urban communities. It refers to combining urbanism & nature to create healthy, civilizing, pleasant & enriching places to live. It means a living area governed by nature than legislature & a sustainable human settlement based on 'ecological balance, community self –reliance and participatory democracy. Urban ecology strives to create & preserve green spaces. The green open spaces provide communities with several benefits such as:

- Reduces urban heat island effect
- Minimizes use of pesticides
- Conservation of energy
- Clean urban air
- Absorption of CO_2 from the atmosphere

Development of urban agriculture is another feature which comes under greening the city

- Protects land which produces food
- Supports local economy through local production
- Empowers communities through self-reliance; gives them increased food system security
- Enhances community well-being through improved health and nutritional conditions
- Increases environmental health because of reduced transportation of food
- Increases sense of community

Development of urban aquatic areas is yet another feature included in Greening the city

- Maintaining aquatic areas like streams, swamps & beaches
- Protection & restoration of above stated systems to

revitalize neighbourhoods and commercial areas
- Making seafronts, riverfronts etc. as special development zones from point of view of shopping & entertainment

4.2 Sustainable communities

While applying the concept of sustainable development, emphasis has to be given on following points:

Efficient and planned use of urban space

Efficient & planned use of urban space must be emphasized upon since most urban areas have fairly well established growth patterns; both residential & commercial. As such development understandably links residential areas to schools & workplaces by day as well as nightly entertainment & weekend sports along with recreation. Both physical and social environments play a major role in how urban spaces are utilized.

Minimizing the consumption of essential natural capital

"Natural capital is any stock of natural assets that yield a flow of valuable goods & services into the future". The total stock of environmental assets compromising this natural capital can be divided into three categories:
- Non-renewable sources such as minerals & fossil fuels
- The finite capacity of natural systems to produce " renewable resources"
- The capacity of natural systems to absorb man's emissions & pollutants without side effects, which imply heavy costs passed onto future generations
- Social capital: Social capital is the shared knowledge, understandings, & patterns of interactions that a group of people bring to any productive activity. It contributes to build strong community relations & often as a by-product of other activities, builds bonds of information, trust & inter personal solidarity. As the concept of understanding of social capital is important so is important to understand how to multiply the social capital for sustainable community development. Most of the social issues are related mostly to family, neighbourhood, community, decompression from work, cultural differences etc. As such we should take care that not only natural stock is preserved but improvement of socio economic well-being also takes place

Urbanization is the sociological & spatial counterpart to economic processes that shift people towards more productive & advanced sectors. The most famous examples of urban settlements are the Harappa & Mohenjo-Daro which date back to 3000- 1700 BC. Archaeological evidences reveal the high level of planning that existed in these civilizations. Proper drainage system, well laid streets & clearly demarcated public & private areas clearly declare these sites as the earliest planned urban settlements in the world.

5. Urban Environmental Management Strategies

Experience in both developed & developing countries demonstrate that an effective approach for confronting urban environmental problems/ issues is to develop an urban environmental management programme complete with policies, strategies & action plan. The approach is based on choosing effective policy interventions, commitment & effective participation.

5.1 Policies

The recommended policy messages are stated below followed by the strategies
- Mobilizing public support and participation; especially in low income areas where increased awareness can bring about necessary political commitment and the implementation of affordable solutions.
- Improving policy interventions - making strategic choices; which can include such tools as economic and regulatory instruments, property rights, land management instruments, and information/education.
- Building institutional capacity; through upgrading local technical and management capabilities with the accent on operational management.
- Strengthening service delivery; which involves the upgrading of the management of local environmental infrastructure and services (e.g. water supply, sanitation, drainage, solid waste management, etc.)
- Closing the knowledge gap; by emphasizing routine collection, assessment, use, and dissemination of critical data.
- Planning strategically; by focusing on essential interventions that can be implemented quickly and effectively, have a high chance of success, pave the way for future environmental control etc.

5.2 Strategies
- The environmental planning approach recommended attempts to blend careful analysis with consensus-building and the participation of a diverse cast of actors. A planning strategy should involve several activities:
- Informed consultation during which rapid assessments are conducted and environmental issues are clarified;
- The formulation of an integrated urban environmental management strategy that embodies issues-oriented strategies and actor-specific action plans.
- Follow-up and consolidation during which agreed programmes and projects are initiated, policy reforms and institutional arrangements are solidified, and monitoring and evaluation procedures are put in place.
- To work, any urban environmental strategy must reconcile three overriding tensions in

Environmental management as follows
- Integrated versus sector-specific approaches, although agreed actions can only be carried out effectively through designated agencies.
- Analysis versus process, while closing the gap between careful analysis and the interests of various constituencies.
- Decentralized versus centralized approaches, depending on the merits of municipal/regional action or the power of the relevant national agency.
- To formulate and implement urban environmental strategies and action plans, cities will need to integrate environmental considerations into urban life and initiate new environmental management programmes which will require stronger institutions, better facilities and equipment, and incentives for improved institutional performance.

Stakeholders Participation

It requires the efforts of wide range of institutions, organizations & individual's lack of synergy of action between different stake holders is one of the major factors for the existing stack of developmental problems in urban areas. As such to eliminate this stack of problems, working in unity towards a common goal is foremost required. Collaboration of stakeholders leads to more exchange of information and resources along with collective decision making

Reasons for stakeholder participation are

- Laws & regulations will only work with willing compliance
- Governments now face more complex developmental issues
- Resource allocation, protection & sustainability are more difficult
- Community groups must understand each other's interests
- Social & economic equity in resource management must be evident

Opportunity

- For information exchange
- Demanded by interests groups
- Desired by decision makers
- Generates solution to problems
- Required by law and/or policy
- Obtains consent or support
- Facilities implementation
- Joint analysis often involves conflicts

In addition to above, stakeholder participation must be genuinely followed at all stages of developmental form

6. Conclusions

With growing population growth particularly in urban areas coupled with mixed land use patterns has resulted in alarming environmental problems. This has necessitated the need of environmentally sustainable urban planning in an integrated manner, an absence of which might result into critical air pollution levels in urban areas, ever increasing water pollution problems, exposure to high noise pollution levels, ecological and environmental imbalances, and increased health problems of high magnitude, and so on so forth. It would therefore be of utmost importance to address all issues relating sustainable urban planning with infusion of environmental policy parameters judiciously and in an integrated manner.

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