Full Paper

TOWARDS SUSTAINABILITY OF OPEN SPACE'S PLANNING AND MANAGEMENT IN NIGERIA: THE ROLE OF SCIENCE AND TECHNOLOGY

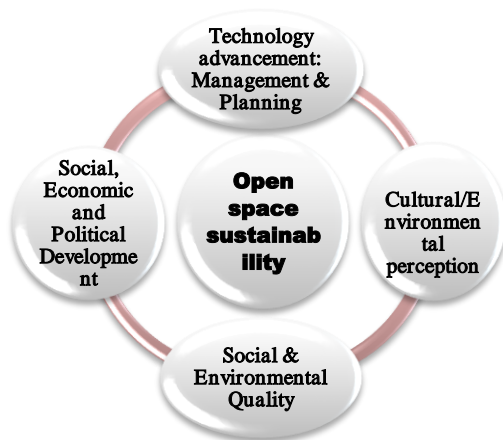Oluwagbemiga Paul Agboola*, Solomon Dyachia Zakka, Modi Sule Zango

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Graphical abstract

Abstract

The challenges associated with integrating technology to achieve an efficient sustainability in environmental planning, and management has been the utmost concern of the researchers and professionals in built environment globally. This has equally been a major issue among the environmentalists and allied professionals in developing countries such as Nigeria. Consequently, this paper relied on extensive literature search through published books, journals, and periodicals. It critically explores the influencing role plays by science and technology in a sustainable environment integrated with appropriate open space planning and management. It identified and discussed the strategic imperatives for sustainable development, and recommends the need for the government of developing countries to initiate an effective policy formulation with follow-up in this regard. In view of this, desirous efforts will be geared towards matching up with open space planning and managements, as already been practised in the developed countries.

Keywords: Sustainability, open space planning, management, science and technology, Nigeria

1.0 INTRODUCTION

Sustainable development could be defined as maintaining a balance between the human needs with a view to improving lifestyles and feeling of well-being. It is as well relates to preserving natural resources and ecosystems for present and future generations. There are plethora definitions of sustainability and sustainable development, but the best known is the definition by [1] which is the World Commission on Environment and Development (WCED). The commission defined "sustainable development" as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Thus, sustainable development implies economic growth together with the protection of environmental quality, each reinforcing the other (www.gdrc.org). The essence of development is a stable relationship between human activities and the natural world. However, this does not diminish the prospects for future generations to enjoy a quality of life similar to our own.

The concept of "sustainability development" was rooted in forest management as early as the twelfth to the sixteenth centuries, but over the last five decades the concept has significantly broadened. In 1980, the international union for the conservation of nature published a world conservation strategy that included

one of the first references to sustainable development as a global priority. In 1981, a renowned scholar, Lester R. Brown's book "Building a sustainable society" was published. The book summarized views and opinions capable of harmonizing the material needs of society, the growth of the population and the rational utilization of the natural resources. The essence was targeted at reducing environmental pollution. The sustainable development has become a vital issue necessary for the alleviation and ameliorates the problems such as poverty militating against the poorest or the developing countries.

Consequently, the "sustainability development" succinctly comprises two concepts that encircle integrating economic and environmental policies. The first concept relates to the essential needs of the poor to which overriding priority should be given. And the second concept interlaced the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

The advent of science and technology has brought tremendous positive changes into the lifestyle of people and their environment. It has equally impacted on the socio-economic growth, political development and cultural relationship amongst others. The improved citizens' well-being coupled with drastic changes reflected in the status of the developed country has been eyed by the developing country. However, in order to catch up in this regards, onus lies on the developing countries' to see the needed changes with a view to knight a relationship between society as a whole and government organs responsible for making life meaningful for the citizenry.

Public open space is defined by [2] in terms of positive or negative views depending on individual perception and mode of engagement. While [3], coined it as space that could be small or large; owned by private individual, public agency or commercial concern? All open spaces have an important role to play either in recreation, aesthetics, landscape conservation or providing for amenities. In this regard, [3], identified associated problem in Nigeria as inadequacy in terms of planning, administration, and maintenance of public open spaces. The problem impinges on the inability to develop a suitable organization structure for initiating, coordinating and implementing general land use planning and management decisions. Open space planning and management efforts in Nigeria were deliberated upon in 1996 Habitat II global agenda, which focused on the need to improve the quality of residents in their settlement areas. It was advocated that the enhancement of the planning and management of open spaces would also improve the urban aesthetics, visual order and cultural characters of its inhabitants.

The underlying premise of this article explores an overview of the perception of environmental, sustainability in open space planning and management. The influencing roles of science and technology education in the context of Nigeria are also iterated. In achieving these, the paper will answer following research questions (i) How do people perceive the environment? (ii) Identification of sustainable development strategies and dimensions (iii) what are the roles of Science and Technology Education in National Development? (iv) How do we integrate Science and technology to solve open space planning and management? (v) What are the limitations and challenges?. Thus to achieve the aforementioned research objectives, the methodology employed in this study involve the extensive literature search through various on-line search engines, periodicals, published books and various research among others.

2.0 LITERATURE REVIEW

2.1 Perception of Environment

"Environment" is the total complex of tangible and intangible spatial manifestation of the continuous interaction between man and nature [4]. The definition buttressed surroundings that provide the setting for human activity, ranging from the large-scale civic surroundings to the personal places. [5] Defined it as an aggregate of all external condition and influences affecting the lives and development of an organism.

Succinctly, the following are the environmental typology as identified by [4].

(i)   The physical environment: this forms the essential components because of its peculiarity in which people has direct contact and impacts. It includes buildings, neighbourhoods and the physical features.

(ii)   The economic environment: This component includes the productive sub-system, the distributive and technological sub-system.

(iii) The social-cultural environment: This component includes those social and cultural variables, which influence the perception and interpretation of the geographic, economic and physical elements of the environments. The major components of this factor rely on the socio-economic status of the individuals in terms of his education, income, occupation, upbringing amongst others. The cultural traits including his language, ethnicity, religion as it affects the individual living habits, dress and family structure.

(iv) Political environment: this is the policy arrangements in an area that determines the ease and convenience with which services are administered and subsequently determine the overall welfare, growth and development of the population.

(v) Demographic environment. This associates with the socio-cultural environment and equally to the population, size, distribution, age, sex ratio, and the dependency ratio. This type of environmental attributes determines the type of amenities to be provided the ability of the beneficiary to made payment and maintain them as well as the quality environment expected.

The manner human being perceives the situation could suggest the articulation of knowledge acquired by individuals through a direct relationship with the immediate environment imbued with various identified memories and meanings. Man's recognition of his surrounding features is rooted in wide emotional importance filtered by perceptual intrigues through the social interaction process. Thus, as individuals create a diverse perception based on homogenous classes of age, sex, culture, occupation, social familiarity: amongst others. There seem to be substantial agreements among members of the same group. [6], opined that, behavioural response towards spaces is rooted in three components. First, the cognitive (facts), affective (emotive response to perceived information) and finally, the conative (predisposition to various forms of behaviour the result after evaluation of the perceived factual. Resident's responses influence their movement or actions within the environment. The people culture, tradition and meaning of the natural environment stand to be changing every moment; therefore, people re-shaped their surrounding space through different methods as identified by [7] in Figure 1.
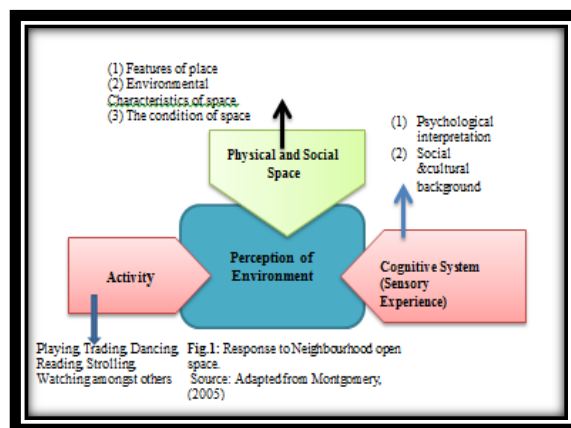

Figure1 Response to neighbourhood open space. source: Adapted from Montgomery, (2005)

The summary of the interrelationships of open space sustainability is shown graphically in figure 2 below.
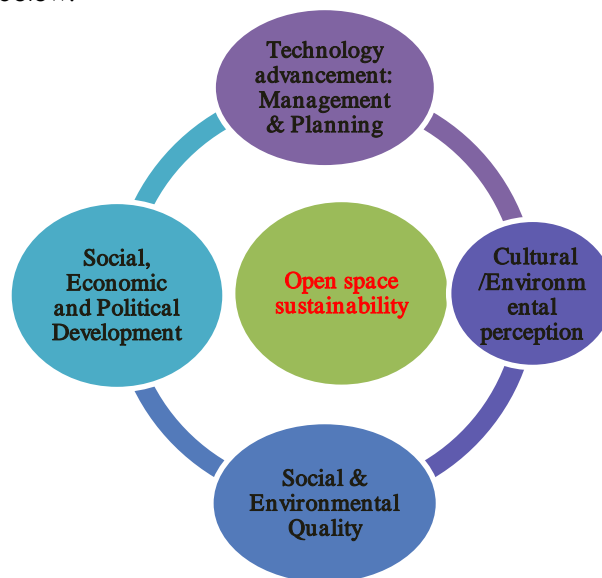

Figure 2 Sphere of open space sustainability

2.2 Appraising Local Environment

According to [8], apprising local environments' entails a clear understanding how the public realm is defined. As a result of this, the definition of open space and local environment was sought. Due to the nature of ownership and management of public space changes in recent time, a precise definition of public space could not be established. Consequently, [9] defined public space as those areas within towns, cities and the countryside that are physically accessible to everyone, where strangers and citizens can gain access without any

restrictions. Some relate the concept of public open space interpretation as "any area or place that could be visited when one is not at work or home [10]. Meanwhile, others have expanded the concept into 'cyberspace' [11]; [12]. A review for the Scottish Executive Central Research Unit [13] tackled the problem of defining open space and suggested that a common typology was absent from national guidance and legislation. The report recommended that a typology be made up as reflected in Table 1.

Table1 Typology of neighborhood public open spaces (POS)
Source: Kit Campbell Associates (2001)

Table1: Typology of Neighbourhood Public Open Spaces (POS)

OPEN SPACE	
Any unbuilt land within the boundary of a village, town or city that provides, or has the potential to provide, environmental, social and/or economic benefits to communities, whether direct or indirect	
GREEN SPACE	**CIVIC SPACE**
A subset of open space, consisting of any vegetated land or structure, water or geological feature within urban areas.	A subset of open space, consisting of urban squares, market places and other paved or hard landscaped areas with a civic function
Parks and gardens Amenity green space Children's play areas Sports facilities Green corridors Natural/semi-natural green space Other functional green space	Civic squares Market places Pedestrian streets Promenades and sea fronts

Source: Kit Campbell Associates (2001)

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The table 1 does not incorporate public space as associated with transport operators such as stations, terminals and transport interchanges. Also excluded are "pedestrian streets' and residential streets, which are yet to constitute valid public space

2.3 Sustainable Development

Based on the [1] WCED report of 1987, as contained in the book "our common future" submitted to UN General Assembly, the pursuit of sustainable development entails the following:

(i)   Technological system that persistently search for new solutions.
(ii)   A social system that proffer solutions for aftermath of tension emanating from disharmonious development
(iii)   An international system that foster sustainable patterns of trade and finance
(iv)   An economic system that could generate surpluses and technical knowledge on self-reliant and it sustainability.
(v)   A political system that secures effective citizen participation in decision making.
(vi)   A flexible economic, administrative system that is equipped with self-correction capacity.

2.4 New Dimension of Sustainability and Culture

Sustainable development has taken new dimension in terms of its relationship with economic, environmental and social. However, some researchers have incorporates fourth dimension which is "culture" with the premonition that the former three seems not to reflect the complexity of contemporary society. "Culture", as the fourth pillar of sustainable development". This was passed on 17th November, 2010 in the framework of the World Summit of Local and Regional Leaders – 3rd World Congress of UCLG, held in Mexico City. However, some observers argued that though, the economic issue is primary, better still, culture and politics should be included in 'the social'. The document established a new perspective and focused the relation between culture and sustainable development through a dual approach. Summarily, the sustainability approach encircles approach that distinguishes the four domains of economic, ecological, political and cultural sustainability.

2.5 The Roles of Science and Technology Education in National Development of Any Country

Science and Technology (S&T) education constitutes key agent of development, either in terms of developing human resources capacity or increasing the skilled workforce for modernization [14]. Other developmental agents include performing an identified role of personal freedom, developing capability and empowerment. Similarly, S&T provision is capable of producing the requisite 'manpower', which any country needed which invariably impacts on both social and private enterprise as a response to social demand [15]. However, diverse humanistic theories of development in the 1990s, has a direct effect on the general realization of S&T education. Not only as the key to economic development and human capacity building, but was also a basic human right and a necessity [14] reinstated. More importantly, S&T education is a humanistic right and as such should receive priority in the allocation of national resources. With this, it could be regarded as fundamental, perhaps to the economic development, as well as to the social and political development within nations and for individuals.

In the same vein, [16] argues that S&T education is also linked to human resources development and has an impact on more than just economic growth, but also an impact on the wider development of individuals and societies. The author argues that this also contributes to individual creativity, improved participation in the economic, social and cultural roles in society. In addition, it improved understanding of a person and respect for others, thus promoting social cohesion and material understanding. Host of other benefits includes an improvement in health and nutrition, improved chances of economic development, and technological development. Socio-cultural change, democracy and equality, ecological development and quality of life through people's awareness of their environments are other benefits derived.

It could be established that for modernization and economic development of any country, the desirable impetus is therefore needed and should be enhanced accordingly. Participation in social, political and cultural activities and improvements in health as education goals are equally important. [17], noted that investing in education and training produces benefits for the individual and for society as a whole. Moreover, the return on investment for society will be a skilled workforce that will enable global competitiveness and economic growth. Meanwhile, the return for the individual will be an improved career path, increased earning power and a better quality of life. Science and technology are increasingly recognized to be central to both the origins of sustainability challenges. As a result, the prospects for successfully dealing affect the decision makers at all levels, need timely, reliable access to the knowledge generated by science and engineering. The introduction of national policies reflects a better understanding of complex technical, economic, social, cultural and ethical issues concerning the society, the Earth, and its environment.

2.6   Open Space Management, Planning and Information Technology in Nigeria

Nigeria is located at the extreme inner corner of the Gulf of Guinea on the west coast of Africa continent as shown in Figure 3. It occupies an area of 923,768 sq. Km, extending 1,127 km E-W and 1,046km, N-S. The country bordered by Chad on the North East, by Cameroon on the East, by the Atlantic Ocean (Gulf of Guinea), On the South of Nigeria is Benin and on the West, is Niger on the Northwest and North, with a total boundary length of 4,900km of which 853 km is coastline. Federal republic of Nigeria is a federal constitutional republic comprising thirty-six states, and its capital territory city is Abuja located at the centre of the country, as indicated in Figure 3. The population of Nigeria is about 173.6 million.

Figure 3 Map of Africa continent showing Nigeria
Source:http://www.manuelaresidence.net/wp-content/uploads/2014/08/nigeria_in_africa.png.

In Nigeria, the recent focus is on the roles of S&T education in enhancing entrepreneurial skills that will equip students for entrepreneurship education in Information and Communication Technology (ICT.) driven technological environment. The world has become globalized, and the future prosperity depends on comparative advantage. Technology education is to be considered as the key agent of technology development, either as a way of developing human capacity, increasing the work force for modernization, industrialization, environmental development or as a matter of personal freedom, developing capability and empowerment.

Public space management has been developed in recent years with a host of innovative approaches; among which is a handful community driven approaches such as the use of neighborhood and street wardens. The use of technology in surveillance is notable in environmental determinism that associated with "eyes on the streets" concept. This idea helps in natural surveillance of shared open space to detect undesirable or criminal behavior. Host of local or national government has incorporates Town Centre Management, the use of CCTV and town Centre strategies in developed countries. For instance, [18]; [19], have documented the impact of streets wardens and neighborhood watch. The DTLR Neighborhood Renewal Unit has reported on street warden schemes in the US, where safety and cleanliness in the public realm is regarded as important for quality of life and synergistic with crime and the fear of crime.

In furtherance to the above, a well-documented management technique is established in the use of CCTV or surveillance cameras; that are installed in nooks and crannies of numerous public open spaces. Initially, the control by monitoring associated with

private commercial shopping malls, but is now found in the public realm in recent time. In tackling security and crime challenges, CCTV has become a common strategic response for public space users and businesses [20]. It was found that CCTV could be most effective in reducing crime in open space and parks. According to [20], it is evident that, CCTV is generally perceived as a proven crime reduction.

2.7 Challenges of Using Technology in Open Space Management and Planning

The use of technology in open space planning and management happens to be a laudable approach. However, its peculiarity limitations to global development in developing countries associate with the scarcity of energy resources to power these gadgets to function effectively. Consequently, some of these challenges could be alleviated by the alternative utilization of renewable resources such as solar energy. [4] advocated an efficient ways of producing and using energy in developing countries such as Nigeria, in terms of government in partnership with private companies to come out with new ideas of generating alternatives energy to assists in the fields of urban development, industrial location, residential planning, transportation system, agricultural and industrial technologies. In addition, recycling of waste materials to generate the energy needed to be encouraged.

3.0 CONCLUSION AND RECOMMENDATION

Sustainable development especially in public space, provision, design, management, and improvements requires collaborative efforts and responsibility in decision making process. However, decision makers at all levels, need timely, reliable access to knowledge generated by technology and technical education to introduce rational policies that reflect a better global understanding. It equally comprises economic, social, cultural and article issues concerning the society, and our environment. Open space sustainability includes public discussion forums and seeking private sector support for projects. Science and Technology education is a human right and, as such, should receive priority in the allocation of national resources. It has become very necessary not to only keep technology education bound to the role of manufacturing skilled manpower but also to economic development and the global economy. In addition, involvement of communities in all aspects of planning, design, implementation and management is inevitable. This paper, therefore, recommended that appropriate policies could be formulated to provide adequate and uninterrupted power supply by increasing the generating and transmission capacity. Similarly, diversification of

sources through alternative means such as solar energy sources becomes imperative.

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