Synergizing Population Densities and Metadata for the Development of Urban Centres in the Guinea Current Large Marine Ecosystem Region

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Abstract

There has been a rapid increase in the world's population over the years, and as a result, experts have suggested that the quality of life for most people in the future will be determined by the quality of cities. Urban growth has resulted in a phenomenon referred to as a megacity or megalopolis in the past years. This phenomenon is predominantly experienced along the coastal zones of the world. One of the reasons is that these zones are rich and diverse in resources such as that of the Guinea Current Large Marine Ecosystem Region. Even with the Region's endowments, it is bedevilled by a number of problems such as urban over-crowding and congestion, pollution and erosion, industrial and domestic waste discharge and degraded water supply. Details of spatial and non-spatial information, as well as information on population in the Region were obtained through a questionnaire distributed to sixteen GIS experts in the Region and also through other sources such as the population commission and the Internet. The ArcGIS 9.1 software was used to catalogue the information acquired, produce metadata and map of the Region. The analysis carried out on the population data showed an upheaval in population in the different parts of the Region, whereby a megacity status has already been attained.

Keywords: *Urban Growth, Megacity, Population Density, Metadata, Information Management and GCLME Region*

1.0 Introduction

The growth of urban areas has depended largely on the economic prosperity of the immediate surrounding region. Since the 1970s, however, the most rapid large-scale growth of cities has occurred in the newly industrializing nations [10]. The term "megalopolis" was initially applied to those urban agglomerates, or super-conurbations, that developed when separate towns and cities grew together. A megacity is usually defined as a recognised metropolitan area with a total

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population in excess of 10 million people. Some definitions also set a minimum level for population density (at least 2,000 persons/square km).
The UN. Forecasts that today's urban population of 3.2 billion, will rise to nearly 5 billion by 2030, when three out of five people will live in cities. The Megacities initiative originates from the awareness of the future role of cities, as the dominant type of settlement for humanity. Cities will play this role not only as a matter of fact, but also as a matter of necessity, as the only other way of housing the increasing world population [14]. Migration and demographic change combine to produce the megacities [13].

Despite the fact that megacities are increasingly a phenomenon of the developing world, there are three major reasons why the developed world needs to pay attention to them. First, what happens in the megacities of the developing world affects the rest of the world. The second major reason is that they are key instruments of social and economic development. A third reason is that, they offer new market opportunities to both the developing and developed world alike. Megacity problems are exacerbated by what are usually serious deficits in the realm of knowledge. These are deficits in the generation of knowledge, such as the research necessary to address the problems of the megacity, and in the dissemination of knowledge, e.g., in the educational systems. In solving the problems of the megacities, technology is the key to providing more choices, to making available better tools to address the challenges, and to generating new markets, and thus new opportunities for economic development and employment [4]. The unplanned and uncontrolled urbanisation of the Africa's coastal zones is an issue of major concern. According to UN-HABITAT, Africa's rate of urban growth is the fastest in the world, with 72% of the population, or 187 million people, living in slums or informal settlements. It is estimated that the percentage of Africans living in cities will rise from the present 37% level to 53% in 2030 [16]. Up to 38percent of the African coastline is considered to be under a high degree of threat from developments which include cities, ports, road networks and pipelines.

In 1995, projections showed that Western and Central African coastal populations would double to 50 million by 2020, leading to a continuous chain of cities in the Gulf of Guinea. The demand for resources and infrastructure development in the coastal zones, is now putting immense pressure on fragile ecosystems which are under severe threat from development-related activities [6]. Concern with the natural environment is widespread and growing, as is the data collected to study and support regulation and compliance. But collectively, we need to do much more. It will take a well-connected globally integrated and sustained information and data management system to know the answers [9].

Due to a considerably increasing availability of and demand for information resources, the description, processing, management and exchange of information is one of today's challenges in the information society. Abbott in 1991 established that Hydroinformatics is a technology, as well as it is a combination of data with analysis and presentation tools to produce information in a form that allows decision – makers to come to sensible decisions about the management and use of bodies of water and their surroundings. Hydroinformatics has empowered decision- makers by allowing them to convert the data into information and to use that information to more sensibly decide on things such as development proposals or new regulations

[1]. It may be a small amount of data, such as a single assessment that a practice places people at risk, which allows a decision-maker to choose a course of action. Regardless of the decision however, information is required to make sensible and defendable decisions [2].

The forces of globalisation present a number of serious issues for the world's leaders, decision makers, and international institutions. Besides, without good data, we cannot derive sound information. The "Long-Term Coastal Data and Metadata Rescue and Product Dissemination" project by [3] enabled the Baruch Institute to coalesce, certify, archive, update, and document the long-term coastal datasets from the North Inlet and Winyah Bay Estuary using Federal Geographic Data Committee (FGDC) standards. The project was to rescue 14 core databases with their ancillary and metadata files. The project expected that all data and metadata would be made available to the public via Baruch's Web server. As a matter of fact, a study was conducted (in the latter half of 2006 and early 2007) on the current availability of fundamental geo-spatial data for each country in Africa. The study included data available in-country and from sources external to that country. The inventory was only as good as the responses received. While every effort was made to obtain data on every country, this proved not to be possible. From the data collected, a metadata facility was created at Economic Commission for Africa (ECA) [7].

A considerable amount of urban research, has been directed towards the interrelationship between spatial forms, and their underlying mechanisms in terms of social processes, originating in different spheres and operating at several levels. It was argued that the research framework of urban spatial transformation depends on the methodology of building the interface between the sociological approach and the geographical approach. Urban spatial transformation has to be fundamentally related to the development of social relations in different spheres, and the spatiality of social processes is of direct importance in a particular location to the understanding of spatial transformation [17]. Besides, a successful partnership between Local Government Authorities and State Governments has resulted in the State providing and updating the basic spatial data infrastructure (SDI) for Local Government; and Local Government in turn providing land parcel and property data to the State Government. This has resulted in significant improvements being made to the core map bases in the State's SDI (such as the increased integrity of the state's street address file), a marked reduction in duplicative map base maintenance activity (particularly by Local Government), and an increased adoption of GIS technologies by Local Government with the beginnings of considerable flow-on benefits to the community being observed [8].

The term spatial data infrastructure is often used to denote the relevant base collection of technologies, policies and institutional arrangement that facilitate the availability of and access to spatial data. Spatial data are commonly delivered electronically via the Internet [5]. The backbone of SDI at any level is the interconnected spatial databases consisting of the fundamental and thematic datasets such as environmental data, satellite/raster data, topographic data and geodetic control data. Metadata is a key component of SDI which contains information on fundamental and thematic datasets, and is particularly useful in the planning and management of urban areas [12].

1.1 Objectives

The objectives of the study are to provide information from the results of analysis of population densities carried out on the conurbations in the Guinea Current Large Marine Ecosystem Region, as well as tie these information to the metadata created for the Region which are accessible to decision makers for the planning and development of the urban centres in the Region.

2.0 The Study Area

The Guinea Current Large Marine Ecosystem (GCLME) Region comprises of coastal areas including the adjoining drainage systems of the 16 countries of the West and Central Africa facing the Atlantic Ocean, from Guinea Bissau to Angola. Meanwhile, the GCLME Region, without a doubt, harbours a conurbation of cities along its coastal zones due to the fact that it is very rich in natural resources, such as crude oil, gas, diamond, gold, bauxite and various types of fish resources and mangrove ecosystem. The mangrove ecosystem in Nigeria is the largest in Africa, and about the third largest in the world. The coastal zone of the Region contains the major cities of this Region such as Lagos, Accra, Doula, Kinshasa, Abidjan, Cotonou and others. The Region is characterised by pollution, population growth, deforestation and coastal erosion [12].

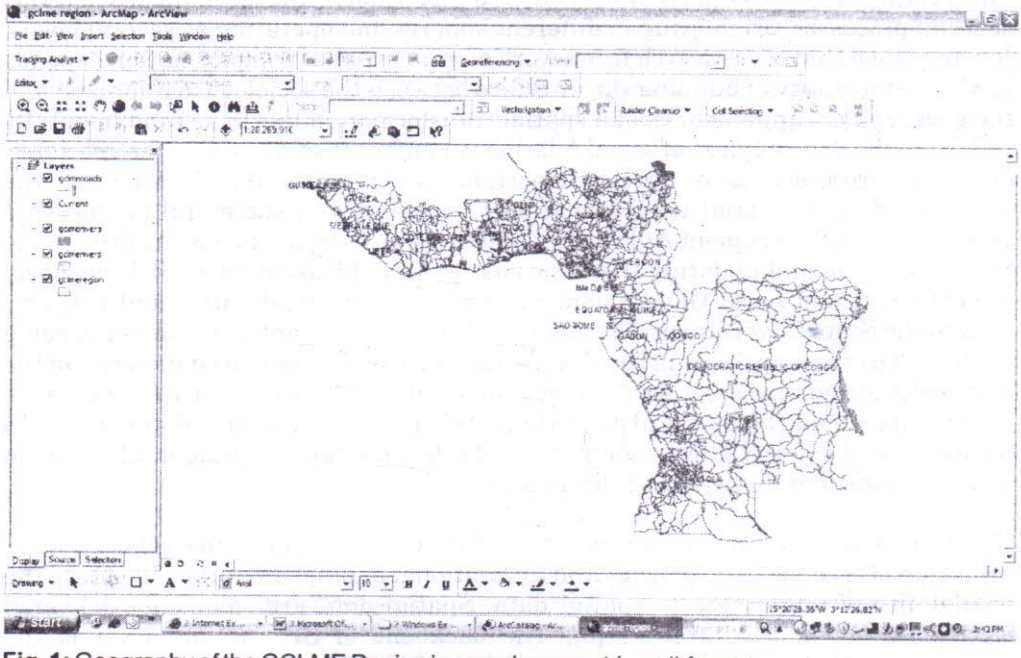

Fig. 1: Geography of the GCLME Region in map document (.mxd) format

3.0 Methodology

Information on the fundamental and thematic datasets that are available in the countries in the GCLME Region were obtained from the distribution of a questionnaire to GIS experts in each of the 16 countries in the Region and also from