A Review of MyGDI: The Catalyst of the evolution of Geographical Information Systems in Malaysian Public Sector

Mageshwari Valachamy[1,] *, Shamsul Sahibuddin[2], Noor Azurati Ahmad[3], Nur Azaliah Abu Bakar[4]

[1] *Universiti Teknologi Malaysia*

[1]*mageshwarivalachamy@graduate.utm.my*, [2]*shamsul@utm.my*, [3]*azurati@utm.my*, [4]*azaliah@utm.my*

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*Corresponding author
mageshwarivalachamy@graduate.utm.my

Abstract

Spatial Data Infrastructure (SDI) is the base for the development and implementation of geospatial direction in many countries. SDI is made of framework of geographic data, Standards, Policies, Tools, Geographical information systems (GIS), Technical Infrastructure, Metadata and legal procedures. GIS being one of the components in the Spatial Data Infrastructure is important for dissemination of geospatial information and services. In Malaysia the Spatial Data Infrastructure or Geospatial Data Infrastructure is known as the Malaysia Geospatial Data Infrastructure (MyGDI). MyGDI enables the evolution of geographical information Systems in Malaysia Public Sector. Over the years many GIS applications have emerged through the development of MyGDI at the federal, state and the local authority levels. GIS application can be categorized into different disciplines such as public safety, disaster management, transportation, traffic control, tracking, health, environment, natural resources, mining, agriculture, utilities and many more. The aim of the paper is to discuss on how MyGDI has facilitated the evolution GIS in Malaysian Public Sector.

Keywords: *Malaysian Centre For Geospatial Data Infrastructure, MyGDI, Geographical Information System, Spatial Data Infrastructure and Evolution.*

1. Introduction

Geospatial information can play an important role as a catalyst for the socioeconomic development of the nation, as well as in providing strategic information for physical planning and national security, when it is efficiently and effectively utilised. The success of the Government and private sectors in implementing development projects that lead to high economic growth depends crucially on the availability of reliable and timely geospatial information. Geospatial information also needs to be viewed as one of the nation's critical enablers to support the management and preservation of a sustainable environment for future generations. As a developing country that is moving towards becoming a developed nation, best practice in geospatial management is an important agenda in this millennium as it is able to enhance government service delivery in facing an increasingly challenging global environment. The goal to make Malaysia a developed nation should be supported through comprehensive planning and action by mainstreaming the use of geospatial information in various sectors.

* *Corresponding author. mageshwarivalachamy@graduate.utm.my*

The collaboration of all stakeholders to stimulate the transformation of geospatial information management will facilitate the objectives to be realised.

The usage and sharing of geospatial data have risen in most countries. It has become part of human activities where an element of geospatial essentially used while working, travelling and planning. The usage of geospatial data can be seen in variety of field including land related analysis, environment, educational, health, administrative and government [1,2,3,4].

Geospatial Information System (GIS) is a tool which can be described as an information system that capture, stored, manipulate and display geospatial data [5]. GIS helps to utilize sources, time, knowledge and cost. To ensure the effectiveness of geospatial data especially in decision making, an effective data sharing and distribution management is crucial. Thus, the concept of Spatial Data Infrastructure (SDI) has emerged to ensure rapid growth of geospatial data is manageable [6]. SDI is a collection of technologies, policies and institutional arrangement that facilitate the availability of and access to geospatial data [7]. Moreover, SDI provides a basis for geospatial data discovery, evaluation and application for users and providers within all levels of public, private, non-profit sector, academia and ordinary citizens. In Malaysia the Spatial data infrastructure is known as MyGDI. MyGDI is the backbone of the development of many Geographic information system in the Malaysian Public Sector.

2. Background

The evolution of GIS is very much tied to accessibility. In other words, the fact that these approaches to working with geospatial data are becoming increasingly available to people regardless of expertise is indicative of their evolution. By the same token, it is also accessibility and the lack of it that is an obstacle to progress. In the Malaysian context, geospatial management involves coordination among various levels of agencies and sectors. This can be seen as a response to the current scenario in addressing the issues and challenges that exist in the geospatial industry in Malaysia. Geospatial management that is coordinated at all government agencies and industries at a national level will ensure the development and use of geospatial information could be implemented in a competent and efficient manner, creating more value for money and improving the country's competitiveness. In the Eleventh Malaysia Plan of 2016-2020, the Government intends to become more citizen-centric and focuses on enhancing productivity and efficiency of the public service.

Spatial Data Infrastructure (SDI) provides an accountability framework that enables collaboration and the building of trust necessary for the reuse of component systems. Governance comprises of the rules, policies and mandates; institutional frameworks and arrangements; processes; and tools that enable a community to develop, manage and communicate agreements and their implementations in the form of information systems which facilitate access to geospatial data resources. Therefore, Organisational arrangements have long been recognised as a critical enabler and fundamental component of Spatial Data Infrastructure (SDI).

2.1 Malaysia Geospatial Data Infrastructure (MyGDI)

Malaysia Geospatial Data Infrastructure (MyGDI) is a national program initiated by the government to provide and facilitate geospatial information sharing infrastructure, to enhance the awareness on the geospatial information availability and to improve the access to geospatial information among participating parties. MyGDI comprises of the development of policies, standards, geodata, technology, research and development (R&D) and human resource development program in the geospatial field as shown is figure 1. The main objective of this program is to assist agencies in planning, development and management by using and sharing of current, accurate and reliable geospatial information and to avoid duplication of effort in the collection and production of geospatial information. As such, through this infrastructure, smart partnership among agencies is continuously being developed to assist all parties in sharing and accessing geospatial information seamlessly. Thus, this will directly be enhancing the government service delivery system.

The goal of MyGDI is to enable members of the geospatial communities in Malaysia to share and access geospatial information by establishing key partnerships with federal and states agencies, local authorities, academia and the private sector. MyGDI facilitates online access to geospatial information, avoid duplication of effort in collection of data and to ensure the accuracy, timeliness, correctness and consistency of available data that enables far more comprehensive analysis of data to help decision-makers choose the best course(s) of action.

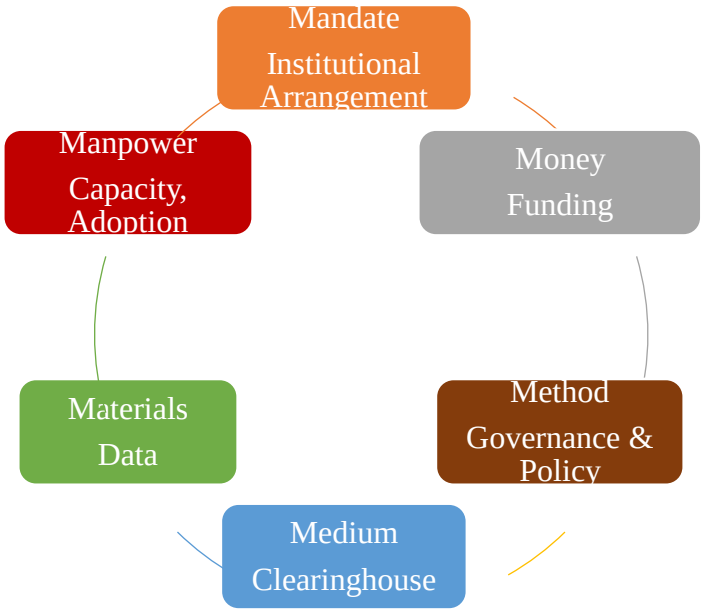

Figure 1: MyGDI Components

2.2 MyGDI activities and services

As the Spatial Data Infrastructure of Malaysia, MyGDI comprehends of many activities and services such as development of national geospatial data centre, the development of policies and standard, GIS application development, a platform for data sharing services, infrastructure development and other research activities as shown in figure 2.

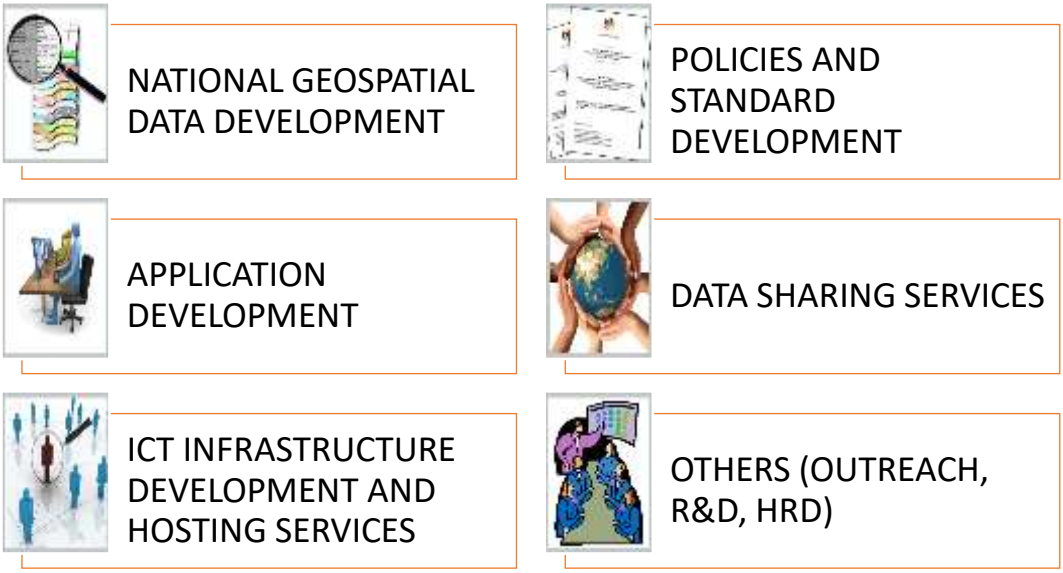

Figure 2: MyGDI Activities and Services

These activities and services have been the factors for the evolution of GIS application in many sectors. The government of Malaysia had recognized the geospatial information as a necessary resource that supports the economic, social and environmental interests of the nation. The demand for accurate, up-to-date, relevant and accessible geospatial information at the various levels of government in Malaysia is critical for the successful delivery of many government services [8]. Not only in the government, private sector has started to move towards spatially enable data to improve the service and support the growth of their business. providing customer focused, cost effective and timely delivery of geospatial data toward realizing Spatially Enabled Government in Malaysia [9].

3. Geographic Information System (GIS)

Geographic Information System can be defined as tools for consulting, analyzing and editing data, maps and spatial information in general. They are computer systems (hardware and software) used for analysis, consulting,

developing, manipulating, storing, or in short, for handling geographic information. Therefore, GIS are systems that work with geographic information databases [6].

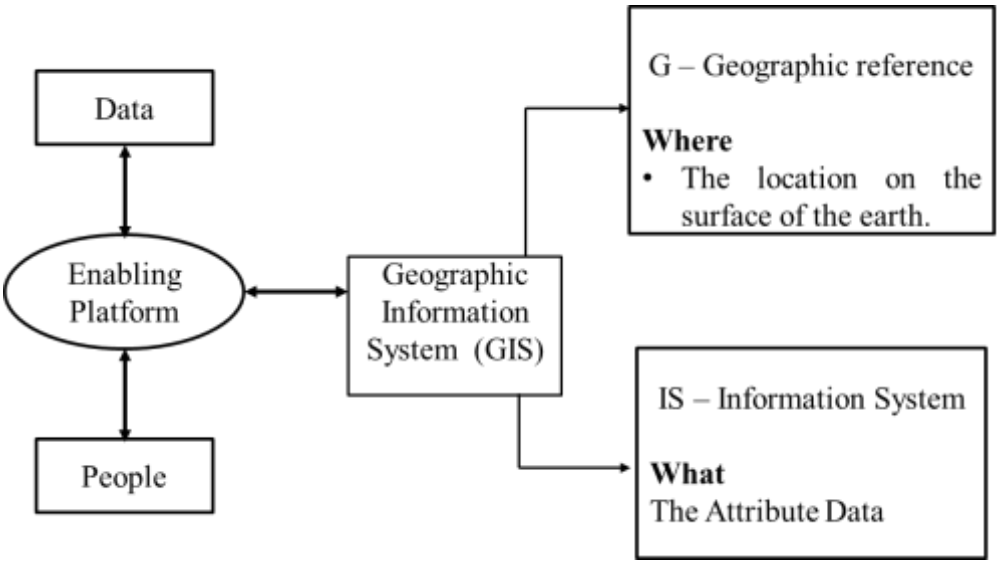

Figure 3. GIS Context

The successful combination of GIS and technical decision support is that they are perfectly complementary tools. GIS offers the decision-maker or decision-maker group the possibility of carrying out the analysis, management, storage and visualization of all geospatial information [10]. Figure 3 depicts the understanding of GIS from the context of people, enabling platform and data.

3.1 Component of Geographic Information System (GIS)

The five (5) GIS components in Figure 4 are similar to the components of the information system. Hardware, software, data, methods and people are the five (5) component of GIS. These components are linked to each other and has their own control toward the overall GIS applications. The software component provides the functions and tools users need to store, analyse and display geographic information. Data is one of the most important components of GIS. Data can be of vector type, raster type, image type and attribute type. The hardware component is the computer peripherals on which the GIS operates. The people in this component is equally important since they are there to manage the system and to develop plans for applying it. Methods are well plan and application specific business rules describing how technology is applied. Methods can be guidelines, specifications, standards and

procedures. All the components have been the base component of Spatial Data Infrastructure.

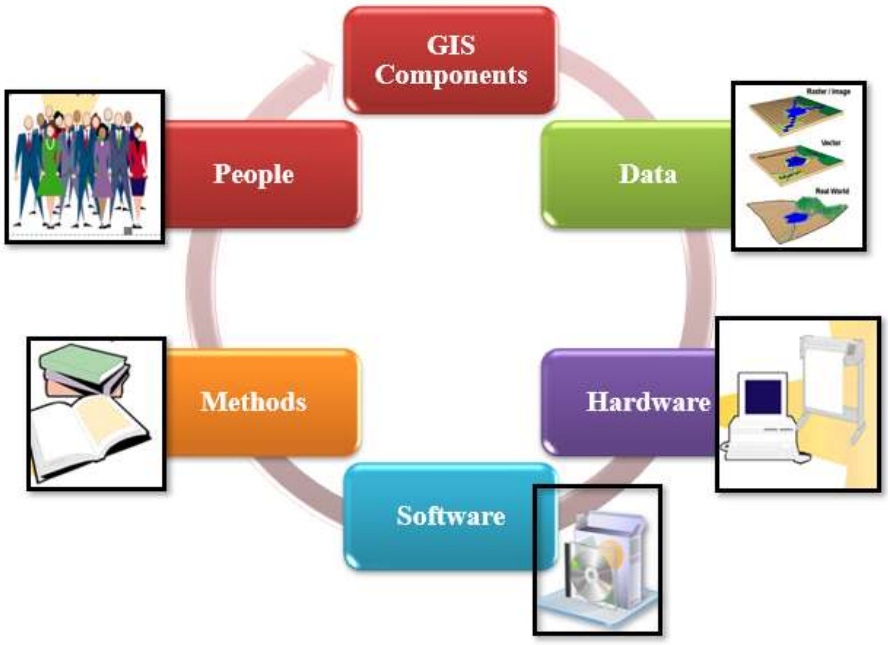

Figure 4. GIS Components

3.2 Geographic Information System (GIS) in Malaysia

In regions characterised by an availability of geographic information, in combination with the power of Geographic Information Systems (GIS), decision support tools, data bases, and the World Wide Web and their associated interoperability, the way better-resourced communities address critical issues of social, environmental, and economic importance is changing rapidly. However, even in the new era of networked computers, the social habits of the past continue to prohibit users from finding and using critical geographic information. [11]

Geospatial information plays an important role in the everyday lives of Malaysian. Every time Malaysian watches a weather forecast on TV and uses a roadmap, they use geospatial information. Major advances in Information and Communication Technologies (ICT) in the last decade combined with the rapid growth of global information networks such as the Internet, have transformed businesses and markets in Malaysia. These trends have revolutionized learning and knowledge sharing, generated global information flows, empowered citizens and communities in new ways that have redefined governance and created significant

wealth and economic growth. The developments have exponentially expanded both the need for geospatial information and the access to this information [12].

3.3 Evolution of Geographic Information System (GIS) in Malaysia

Before embarking on the evolution of GIS in Malaysia it is important to know the history of evolution of GIS. According to the history of the construction of the map, the map has been used generally to represent the surface of the Earth in in the earliest civilisations Referring to book entitled "Geographical information systems: Management's Perspective", written by Stan Aronoff in 1989, the map is used to demonstrate the distinctive space by the land surveyor, and the army, which was conquered by the Roman Empire, however. measurements and map making has decreased due to the fall of the Roman Empire. A map given attention once again by Europe because of the Royal party noticed that the value of the map can be used in capturing and designing in the use of their land in the eighteenth century.

Study of original source continues to grow, causing the thematic map encouraged to use in representing such characteristics space geology, geomorphology, soil, and vegetation. Science and the technology developed in the twentieth century, and demand for geographic data produced in the form of a map. Technological developments such as aerial photographs and remote sensing satellite data, makes geography began increasing productivity double with the use of a wider and more sophisticated analysis. So, the current geographical data can be generated by faster, and become an important guide information for users in their daily life, for example the Global Positioning System (GPS).

The history of geographic information systems (GIS) as a computer application began with multiple projects in the 1960s, of which perhaps the best known and influential was the Canada Geographic Information System (CGIS), developed by an IBM team under the guidance of Roger Tomlinson. Other projects at that time included efforts by Duane Marble at North western University to support transportation research in the Chicago area; and the work of the UK's Experimental Cartography Unit [13].

In Malaysia, the Survey and Mapping Department (JUPEM) plays an important role in GIS development. As one of the oldest government agencies in Malaysia where survey activities began in 1885 with the establishment of the Department of survey Johor. The year 1885 to 1957, State survey departments and Topography has been established up to lead to consolidation gradually to an organisation such as today. In 1965, the Government has approved the establishment of Directorate National Mapping with the mandate of conducting the work of survey, mapping, Geodesy and topography [15]. The Directorate is responsible for the survey and mapping data in Malaysia to evolve from geography

and cartography with contributions from a variety of disciplines, including, for example, engineering, computer science, and mathematics.

As the technology keep on changing tremendously, in December 2002, Malaysian Centre for Geospatial Data Infrastructure (MaCGDI) was established under the Ministry of Natural Resources and Environment (NRE) to replace the Secretariat for National Infrastructure for Land Information System (NaLIS). MaCGDI is a centre established by the government to manage and promote the development of Malaysia Geospatial Data Infrastructure (MyGDI) as the National Spatial Data Infrastructure (NSDI). (MaCGDI is also responsible for coordinating access and delivery of the geospatial information held by all government agencies. The main role of the centre is to continuously make available and accessible current and accurate geospatial data that promotes a sustainable living environment, economic growth and social progress for public [16]. The Malaysian Geospatial Data Centre – National Geospatial Data Centre, State Geospatial Data Centre, and Local Geospatial Data Centre – are spatial databases that serve MyGDI activities. It consists of dataset in 12 categories namely Aeronautical, Built Environment, Demarcation, Geology, Hydrography, Hypsography, Transportation, Soil, Utility, Vegetation, Special Use and General. These datasets will serve as basic GIS data layers that may be used by departments and agencies in the three levels of government in developing various GIS applications. The GIS applications that may greatly benefit from the three levels of data centre can be categorised into many sectors such as Economic, Social, Environment and Infrastructure.

The establishment of MyGDI nurtures the GIS development in Malaysian Public Sector. This can be seen when numerous GIS based application being develop in the federal, state and local authorities. This level from the Data Driven concept to Service Driven Concept. Recent years have brought about a great deal of progress toward GIS development from a mapping input to a process of decision making in various regimes including economy, social and natural resource management. Increases in computing resources have seen attempts to develop automated intelligent tools for exploration and displaying data. In the current climate, the public rightly expect greater value for money from local services and GIS has set a greater impact to enhance the citizen service delivery. The evolution of GIS in Malaysia from 1990 until 2020 has been depicted in figure 5. There are four (4) identified direction; Concept driven, data driven, application driven, and service driven. All the four direction has shaped the evolution of MyGDI thus it can be inline with the government's intention on making a spatially enabled government a reality.

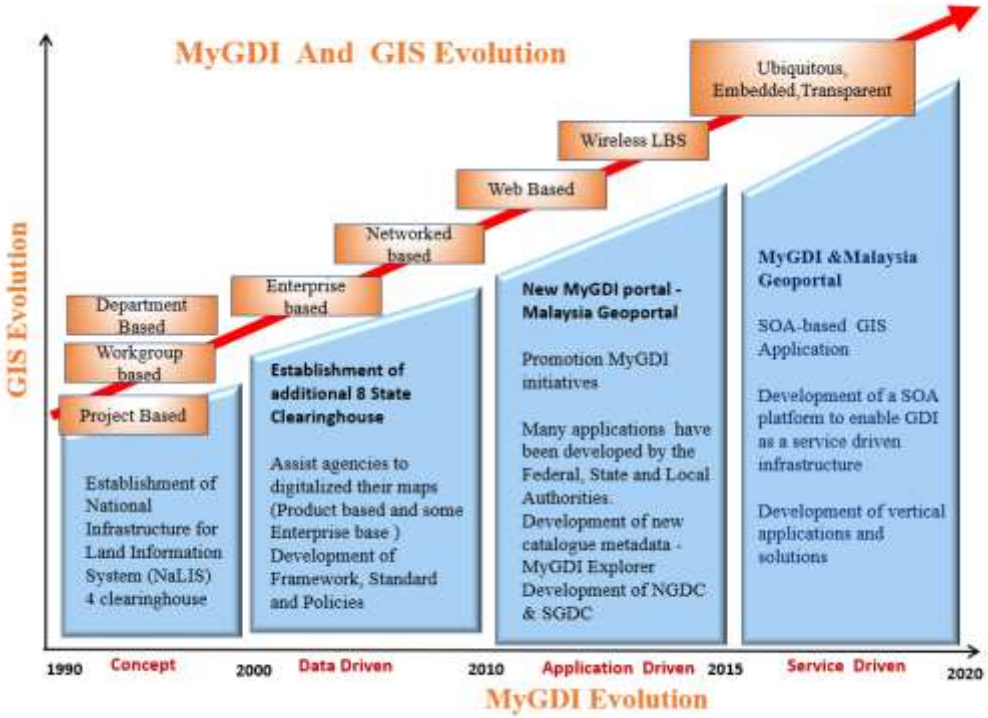

Figure 5. MyGDI and GIS Evolution

By automating processes with a GIS-enabled platform has benefitted the public/citizen directly or indirectly since '*a picture is worth a thousand words*', and geospatial technology combines the strength of visual communication with access to information and analysis. GIS becomes the single cross-government standard for information sharing, as well as being a simple and user-friendly means of reporting that data to the public/citizen as well as for decision making. Many public services are currently delivered using GIS. Information dissemination provide a platform for better decision making in order to provide the public/citizen with good quality of life.

GIS services are becoming important to government leaders, public and private sector where they can provide better services to all segments of society in land management, tracking programs, transportation, health-care, disaster management, business development, and community planning, urban planning, public works maintenance, safety security planning and natural resource and environment management. Figure 6 showing the important of GIS for the mankind. The important of having GIS can be divided into 3 main themes following the

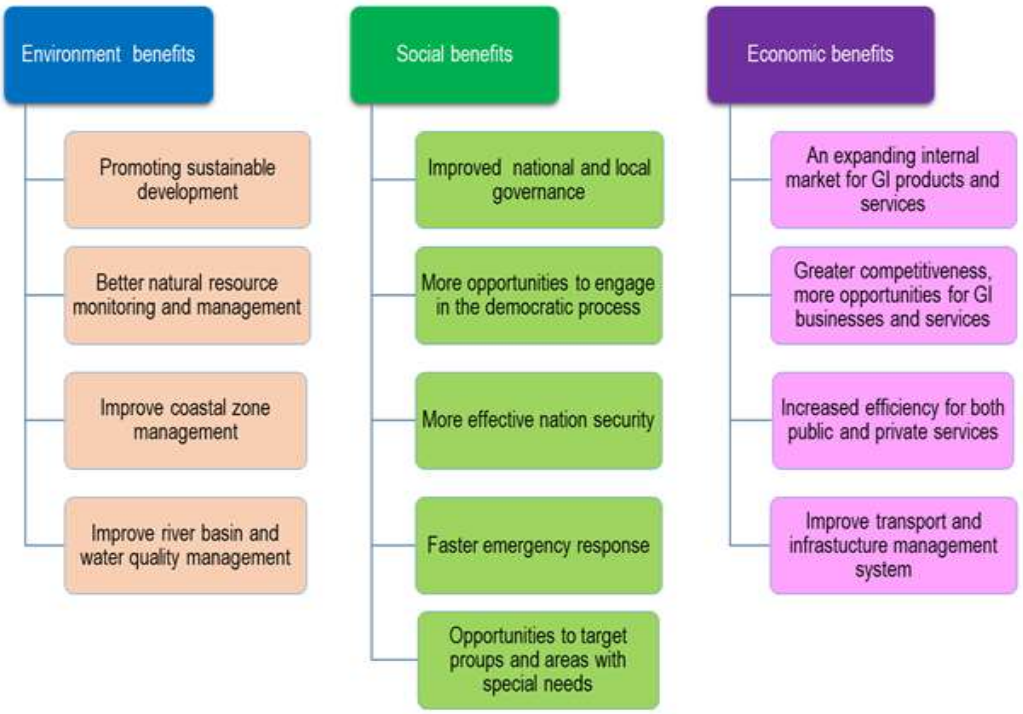

Figure 6. Important of GIS

4. Conclusion

Geospatial technology has been one of the trending high growth sectors in the past decade. Its growth and potential are also becoming more pervasive with its ability to complement and leverage on the growth of other industry trends, such as Internet of Things (IoT), Big Data and Cybersecurity. Instead of competing with these trends, geospatial technology fits in well with these to create innovative applications and solutions by providing geospatial data. Geospatial technology is commonly applied in disaster management, logistics, transportation, security and other areas that require location-based solutions. Popular geospatial-based solutions include Global Positioning System (GPS), Light Detection and Ranging - popularly known as LiDAR. GIS must be ready to follow global trends and the rapid development of technologies, disruptive and transformative issues.

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