

# MARINE GEOSPATIAL DATA INFRASTRUCTURE (MGDI) DECISIONS: A *SINE QUA NON* TO UBIQUITOUS GEOSPATIAL SOLUTIONS TO MARINE APPLICATIONS

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## Abstract

*Of recent, there have been agitations and more concerns about the concepts and development of Marine Geospatial Data Infrastructure (MGDI). While these trends are yet to be fully accomplished, there exist the dearth of knowledge gaps in evolving trends about the need for MGDI to support decisions, particularly, in relations to abundant marine activities that are ocean uses based as well as for other maritime applications. The objective of this paper therefore is to bring to light this new emerging concept of MGDI Decisions; as a substantial and indispensable MGDI concept, providing ubiquitous geospatial solutions to marine applications for effective decision making. In addition, marine activities, ocean uses based have multi-agencies characterisations; thus, requiring methodologies that can effectively handle such multi-criteria complex environment. Such methodologies that are based on multi-criteria evaluation trends are used for this study. The results obtained showed the effectiveness of the proposed algorithms for MGDI Decisions. A number of marine applications are being considered for further evaluations; providing geospatial solutions to varied maritime activities for effective ubiquitous service deliveries.*

**Keywords:** *Marine Geospatial Data Infrastructure (MGDI)<sup>1</sup>, MGDI Decisions<sup>2</sup>, marine environment<sup>3</sup>, ocean resources<sup>4</sup>, maritime activities ocean used-based<sup>5</sup>.*

## 1 INTRODUCTION

### 1.1 Margin Marine Geospatial Data Infrastructure (MGDI)

The recent drives by coastal states towards optimising the potentials that are accruable in deriving maximum benefits of maritime extents based on the varied available resources of the oceans as well as other water bodies necessitated the concepts and developments of Marine Geospatial Data Infrastructure (MGDI). For the Asia Pacific region, the agitations commenced over a century ago, since around 2000, and later through the activities of the member countries of the Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP)(PCGIAP, 2000), particularly for the marine cadastre initiatives. Despite the number of different efforts at different administrations, the initiative is yet to be fully harness in terms of its full potentials; more so when compared to such other initiatives in other regions. The concepts and developments of MGDI is burn out of the fact for sustainable

ocean resources in terms of management, conservation, and monitoring (Gouveia *et al.*, 2004; Hamid-Mosaku and Mahmud, 2010b; Hamid-Mosaku, Mahmud, and Mohd, 2011a; Hamid-Mosaku, Mahmud, and Mohd, 2011b; Hamid-Mosaku, Mahmud, and Mohd, 2011c, d; Miller and Small, 2003; UN, 2000, 2001; UNCED, 1992). Thus, as a subset of the National Geospatial Data Infrastructure (NGDI) of coastal state (Mahmud, 2010; Pepper, 2009; Philpott, 2007; Rajabifard, Binns, and Williamson, 2005), the geospatial datasets for the various stakeholders must therefore be fulfilled as is the case for the land. Others related developments are provided in (GeoConnections, 2002, 2009; Pepper, 2009; Rajabifard, Binns, and Williamson, 2005; Vaez, 2012; Vaez, 2007a, b; Vaez, 2010); INSPIRE project (Longhorn, 2006); MOTIIVE project: (Ng'ang'a *et al.*, 2004; Pepper, 2009; Rajabifard, 2002; Rajabifard and Williamson, 2001).

## 1.2 MGDI Decisions

The MGDI in terms of being an initiatives and in its development have been proven to be characterised as a multi-faceted concepts in most of the case studies in literatures (Bruton, 2007; Cho, 2006; Hamid-Mosaku and Mahmud, 2009; Hamid-Mosaku, Mahmud, and Mohd, 2011a; Hamid-Mosaku, Mahmud, and Mohd, 2011b; Hamid-Mosaku, Mahmud, and Mohd, 2011c, d; Saharuddin, 2001; Taib, 2009a, b; Vaez, 2010; Wescott, 2000) often in a fragmented and uncoordinated fashion, due to many agencies involvements. Taking viable decisions among such establishments require approaches that built in these multi-concepts into the modelling parameter.

The agitations for the decisions aspects of MGDI / NSDI from literature have received an adequate attention compared to either the main implementation of MGDI and NSDI or partial. In all, areas wherein the implementation were achieved opined to the needs for the decisions making consideration for MGDI and NSDI (Feeney, 2003; Mokhtar, 2012).

This is the bane of the new concept of *MGDI Decision* in cognisance with the understanding that there exists a multi-conceptual nature of the stakeholders in the realms of decision making as well as the marine environment needs, hydrographic services, marine surveys services, and the various applications to be explored.

## 2 MARINE ACTIVITIES and APPLICATION AREAS

Over the years, there have been emphasis on land use / land covers (LULC) phenomena, with no adequate considerations for the ocean uses / marine activities; as rampant for LULC. In line with these trends, according to Hamid-Mosaku, Mahmud and Mohd (2011c, d) since the distributions of the living and non-living natural and man-made resource of the oceans abound, this necessitates the categorisations of marine ocean uses based on marine activities (MOUOA), as provided in Table 1; subject to the fact that such categorisations are both application and location dependents. It also consistitues the hydrographic services and the peculiar marine survey services, including hydrographic surveys and campaigns, site investigation survey and environmental surveys and studies.

Thus, there is need for assessing the performance of these ocean uses in line with the diversified marine activities. The need for such assessment as well as the innovative geospatial solutions pursuant to the development of MGDI are highlighted in Hamid-Mosaku, Mahmud and Mohd (2011a; 2011b; 2011c, d); Hamid-Mosaku and Mahmud

(2010a). This must be achieved from the backdrop of the various considerations for the stakeholders' interest.

Table 1: Categorisation of Ocean uses, Ocean Activities (Adapter from: Hamid-Mosaku and Mahmud (2010a)).

S/N	Traditional Marine-Based	Non-Traditional and New Marine-Based
i.	Marine Fishing	Marine Eco-tourism
ii.	Non-renewable resources - Crude Petroleum and Natural Gas Production	Marine Education
iii.	Sea Transport Services	Sports and Recreation,
iv.	Naval Administration, Sovereignty and Defence	Manufacture of Seafood
v.	Telecommunication	Marine engineering works and services; Manufacture of Marine Engines.
vi.	Cable Laying	Fresh water resource management
vii.	Industrial Discharge of Waste	Integrated coastal zone management
viii.	Aquaculture	Renewable resources: e.g. fish stock management.
ix.	Conservation	Habitat management
x.	Marine heritage	Ocean Research and Development
xi.	Marine Biotechnology	Disaster management and emergency response

The methodology adopted therefore is based on a multicriteria evaluation concepts, as partly presented in Hamid-Mosaku, Mahmud and Mohd (2011a; 2011b; 2011c, d); Hamid-Mosaku and Mahmud (2010a).

Consideration for the assessment of these ocean uses were carried out based on the proposed algorithms and with Non-renewable resources - Crude Petroleum and Natural Gas Production on the lead, with Naval Administration, Sovereignty and Defence coming next, with Marine Heritage as the least for the Traditional Marine-Based. For Non-Traditional and New Marine-Based, the Integrated coastal zone management was highly favoured on the lead while there were tallies for Sports and Recreation, Marine Eco-tourism, and Habitat management with same ranking.

### 3 UBIQUITOUS GEOSPATIAL SOLUTIONS

For effective deliveries of hydrographic services to the marine communities, require viable decisions by the stakeholders that must be ubiquitous in nature. This means in effect, 'geospatial solutions' that are readily available, accessible, timely and distributable anywhere and in different formats. Such decisions and solutions must therefore be seen from the holistic views within the realm of MGDI Decisions. To date, MGDI Decision are yet to be given adequate research attention in literature despite the overwhelming importance and implications of MGDI to every coastal state, it is therefore a *sine qua non* to ubiquitous geospatial solution to marine applications.

## 4 CONCLUSION

In order to assess the innovative geospatial solutions to the development of MGDI, the various factors of the various oceans' living and non-living marine resources should be given adequate sustainability considerations. Access to data is pivotal to this assessment, the non-availability and / or inaccessibility to such information would hamper the results and necessary information deduced will not be adequate. Realizing the facts that some of the marine data are classified, the methodology to be adopted is been addressed as part of this on-going research

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