

International Federation of Surveyors 5th Regional Conference for Africa

Promoting Land Administration and Good Governance

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A National Geocentric Datum and the Administration of Marine Spaces in Malaysia

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Abstract

Malaysia is a country with two primary land masses, Peninsular Malaysia and East Malaysia (on the northern part of the island of Borneo). The country has a total land mass of approximately 330,000 square kilometers and 4320 kilometres of coastlines. The marine spaces within its jurisdiction are approximately 574,000 square kilometers. Approximately 30 percent of these spaces are under State jurisdiction. Administering and managing Malaysia's marine spaces across the extent of the country represents a challenge for both surveyors and administrators

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Abstract (cont)

A national geocentric datum was adopted in 2002 which, among others, united Peninsular Malaysia and East Malaysia under a single national mapping datum. Prior to the adoption, the country embraces two separate mapping datum.

This presentation will discuss an early attempt to identify the technical constraints and challenges within the spatial dimension when embarking on the development of an appropriate marine administration (cadastre) system in Malaysia. One of these constrains was overcome by the adoption of a national geocentric datum. The presentation will also discuss to a certain extent the derivation and features of this national geocentric datum and attempt to outline additional challenges towards the development of an appropriate marine administration (cadastre) system for Malaysia.

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Content of Presentation

Introduction

Challenges and Constraints

National Geocentric Datum

Concluding Remarks

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PREAMBLE

Malaysians refer to their homeland as "tanah-air", literally translated to mean "land and water (or sea)". The concept of land/water continuity exist since the country's recorded history.

The need to administer and manage both land and marine spaces are thus not an alien concept.

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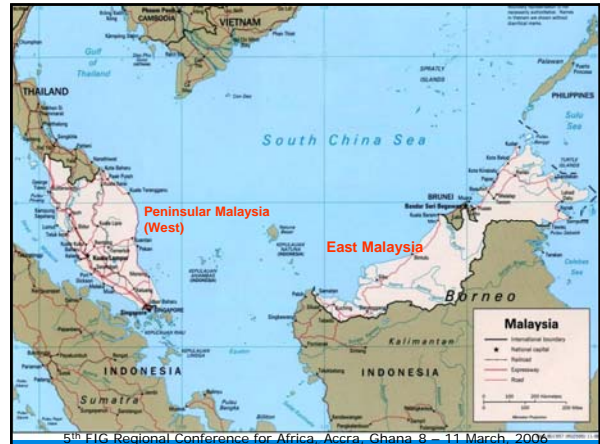
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The South East Asia Region

PREAMBLE (contd)

Malaysia, a country with two primary land masses, Peninsular Malaysia and East Malaysia (on the northern part of the island of Borneo). The country has a total land mass of approximately 330,000 square kilometers and 4320 kilometres of coastlines. These land masses support a population of 25 million.

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SYSTEM OF GOVERNMENT

Malaysia's system of government is similar to that of the British, but modified because Malaysia is a Federation of 13 states and 3 Federal Territories. The government is based on a parliamentary system, headed by a Prime Minister.

The Federal Government has jurisdiction, among others, external affairs, defence, internal security, shipping, navigation, fisheries, ports and harbours whilst the State Government has jurisdiction, among others, *land and its administration*, agriculture, forestry, mining.

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National Marine Spaces

Territorial Seas	the belt of seas measured 12 nm seaward of the territorial sea baseline
Contiguous Zone	the belt of seas, contiguous to the territorial sea, measured 24 nm seaward from the territorial sea baseline
Exclusive Economic Zone	the area beyond and adjacent to the territorial sea, measured 200 nm seaward of the territorial sea baseline
Continental Shelf	the area beyond and adjacent to the EEZ, measured to a limit (usually 350 nm from territorial sea baseline) where a physical continental shelf exists beyond the 200nm

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Administrative Constraints

Jurisdiction over marine spaces and management responsibilities are split between the State and Federal Governments.

The marine spaces within Malaysia's jurisdiction are approximately 574,000 square kilometers. Within this space are more than 600 islands, few have yet to be named. This National Marine Spaces is classified as follows –

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(cont)

The State effectively control up to 3 nm from the low water mark (coastal waters) whilst the Federal Government has jurisdiction and management from that point to the outer edge of the EEZ and the Continental Shelf.

State Jurisdiction (Coastal Waters - 3nm offshore)

Peninsular Malaysia	17950 sq km
East Malaysia	20250 sq km

Federal Jurisdiction (Territorial Waters - 12nm offshore)

Peninsular Malaysia	38800 sq km
East Malaysia	20300 sq km

These areas (only territorial waters) represent approximately 30% of Malaysia's land mass.

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Coastal Marine Ecosystem



Aquaculture and Fish Farming



Coastal Communities



Recreational Spaces



Development along Coastal Zones



Coastal Resorts and Development



Uses (or value) of Marine Spaces include -

- Sources of food from animals, plants and fishes
- Means of transportation and communication
- Areas for development
- Areas for recreation
- Areas for dumping of waste
- Areas for scientific research

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Challenges

The construction of a system to administer marine spaces should incorporate a "seamless onshore-offshore" objective. The importance of spatial and textual continuity traversing land-water interface is to obtain coherence of, among others -

- the register of interests,
- the unique parcel identifiers,
- the cadastral survey system, and
- the cadastral map,

based on common national (sometimes international) coordinate system. [Hoogsteden and Robertson, 1998, 1999]

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To promote continuity of land/water (sea) interface, it is argued that the technical components of marine and land administration system should be similar or at the very least, closely linked. This pose certain challenges, among others -

Geodetic Reference Framework

- permits the proper spatial referencing of all data
- not possible to place monuments in marine space
- different state and local geodetic systems
- definition of vertical datum (the use of chart datum has always been a source of much confusion)

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Determination of base points

Determination of base points and baselines in accordance to UNCLOS 1982 and consequently the various maritime zones

Scale of Base Maps

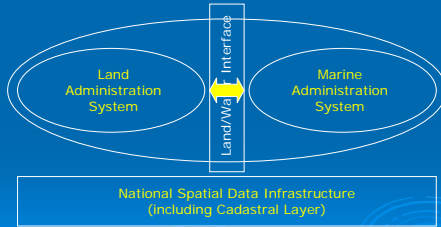
Maps is the primary medium for the location of parcels. There are issues of data sources, data contents and data accuracy.

Records of Interest

Recording interest within a water column (3D) with a temporal (t) component

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It has been recognised that a consistent spatial data infrastructure is necessary whereby the rights, restrictions and responsibilities are administered and managed effectively within the marine spaces, similar to that which has been carried out within the landed environment.



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National Geocentric Datum (GDM 2000)

Background

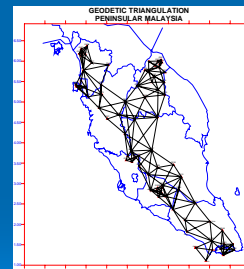
- Increasing use of GPS for various applications has revealed shortcomings in the existing Malaysian local datums
- Unified coordinate system referenced to a universally adopted datum is needed to accommodate needs of efficient acquisition and use of digital spatial data
- Homogeneous geodetic infrastructure would provide appropriate framework for the integration of spatial data for decision making

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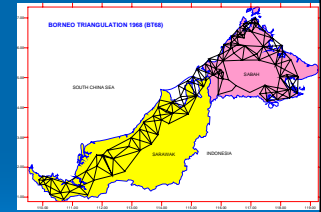
- Historically, Malaysian geodetic datums has been established since 19th century using conventional surveying techniques and procedures.
- Confined to small areas of the globe, fit to limited areas and to satisfy national mapping requirements.
- Local datums are not aligned with global geocentric coordinates frames.
- Existing datum not compatible with the wide spread use of modern positioning systems and international recommendation.
- Survey accuracy often degraded because of approximate coordinate transformation procedures.

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Triangulation Networks Peninsular Malaysia and East Malaysia



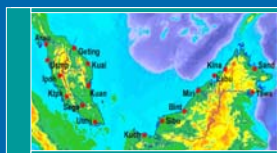
Malayan Revised Triangulation 1948 (MRT48)



Borneo Triangulation 1968 (BT68)

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Derivation of GDM 2000



MASS Stations

GPS data from MASS stations (17) and IGS stations (11) processed together



Connections made in between MASS stations and IGS stations

IGS Stations

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Features of GDM 2000

- Defined by the coordinates of seventeen (17) MASS stations.
- Referred to the following parameters:
 $a = 6,378,137$ meters
 $1/f = 298.257222101$

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• The Geocentric Datum of Malaysia (GDM 2000) will provide a single standard for collecting, storing and applying spatial data at all levels - local, regional, national and international.

• GDM2000 will facilitate the creation of an integrated national spatial data infrastructure.

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Significance of GDM 2000

General

- Made datum unification between East and West Malaysia a reality
- Forms the backbone for the national adjustment of all existing GPS control stations
- A high accuracy, homogeneous and up-to-date datum available for the nation
- Provide an internationally compatible system for all spatial data

Marine Administration

- Allows common geo-referencing of spatial data
- Facilitate data integration and spatial analyses for decision making in administering marine spaces

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In Conclusion

Most countries have a land administration system that operate as separate entities from their marine administration system. This causes management gaps at the coastal zone. *The idea of having a seamless spatial data administration system that includes the marine and terrestrial environments has been well accepted.*

This is evident at the conclusion of the International Workshop for Administering the Marine Environment held in Kuala Lumpur in April 2004 which recommended that a marine dimension be added to all coastal countries national SDI in the Asia Pacific region. The development of an appropriate seamless SDI would certainly help in the integration of the two systems. Consequently, the development of a seamless SDI that includes data from land, coast and marine environments will enable the access and sharing of data between those environments to be improved.

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In Conclusion

There is a clear need to consider and deal with the accuracy of marine boundary data in a future marine cadastre. Accuracy issues are certainly critical, not only to users who need to know where the boundaries are but also to data custodians themselves. Considering that the maritime boundaries are virtual in nature, the maintenance of marine cadastre would have to take into account aspect of data accuracy. *Thus, the need for a good geodetic infrastructure to support the delimitation of maritime boundaries.*

Basically, the delimitation issues boils down to answering where are the extent of rights, restrictions and responsibilities in the marine environment and how to realize them with certainty. To accurately visualize and depict the extent of those areas, the various spatial entities have to be identified and an unambiguous technical implementation based on a reliable geodetic datum and infrastructure need to be provided.

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Finally -

While the country's administrators look into how best to effectively administer her marine spaces, some of the technical (spatial) challenges have been overcome by the adoption of the National Geocentric Datum (GDM 2000) introduced by the Department of Survey and Mapping Malaysia in 2002.

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Thank You

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