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### Marine Spatial Data Infrastructure (MSDI) Challenges and Opportunities: The Cuban Experience

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# MARINE SPATIAL DATA INFRASTRUCTURE CHALLENGES AND OPPORTUNITIES: THE CUBAN EXPERIENCE

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# INTRODUCTION

**This paper describes the challenges and opportunities associated with implementing MSDI in Cuba. More specifically, a case example is provided on how Cuba's National System of Protected Areas (SAMP) could become a component of an overall MSDI.**

# **SPATIAL DATA INFRASTRUCTURE**

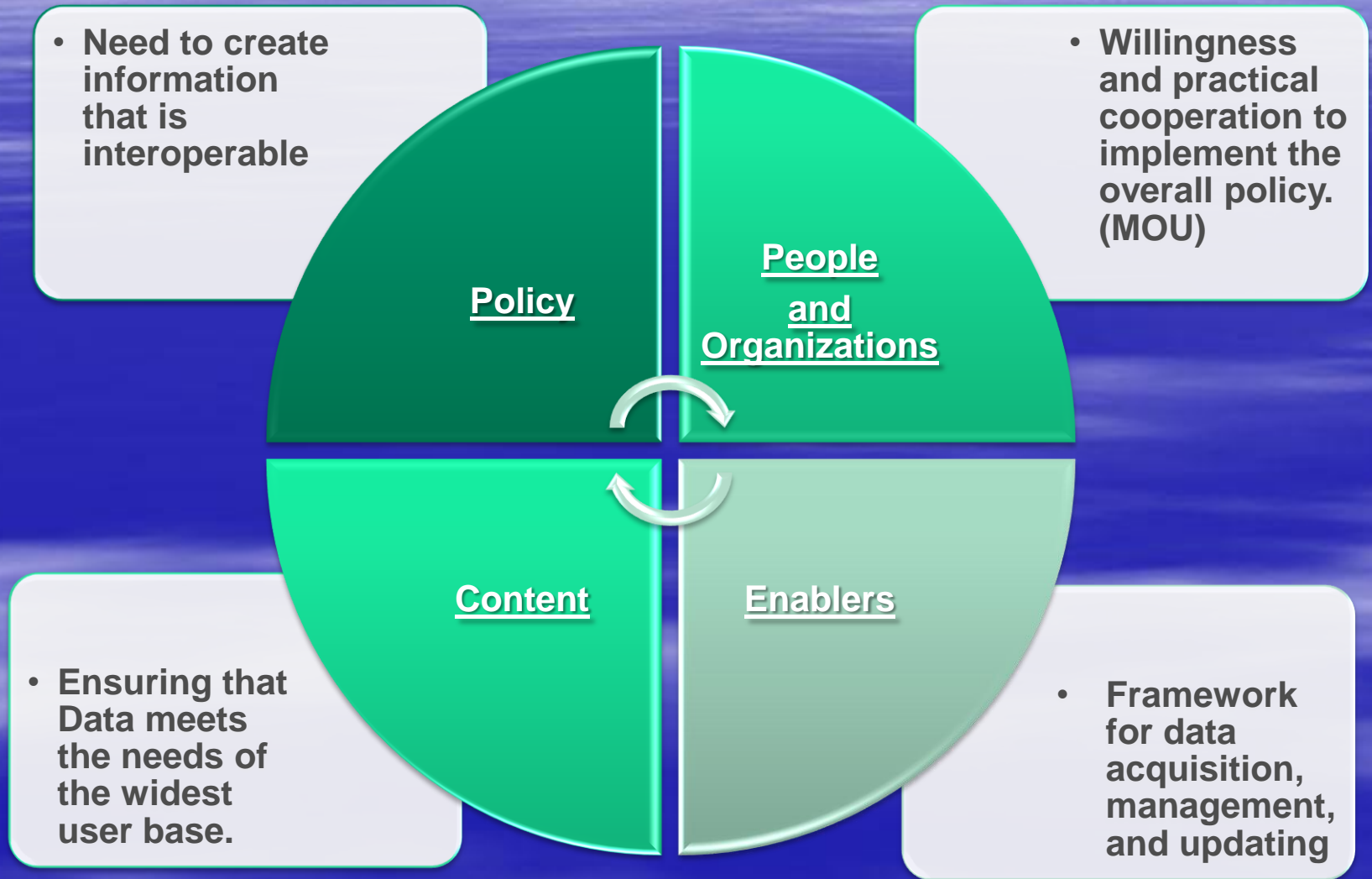
**Spatial Data Infrastructure (SDI) is a broad term used to summarize a range of concepts, processes, relationships and physical entities that, taken together, provide for integrated management of spatial data and information. In concept, it is the process required to integrate technology, policies, criteria, standards and people to promote geospatial data use throughout all levels of Government.**



# MARINE SDI

**Marine SDI (or MSDI) encompasses marine geographic and business information covering sea areas, inland navigable and non-navigable waters. This would typically include seabed topography, geology, marine infrastructure (e.g., bathymetry, wrecks, offshore installations, pipelines and cables, etc); administrative and legal boundaries, areas of conservation, marine habitats and oceanography.**

# MAIN COMPONENTS MSDI



# **ROLE OF IHO AND NATIONAL HO IN SUPPORTING MSDI**

**Questions/issues that need to be considered :**

- **Does the structure of the national SDI allow for:**
  - 1) a comprehensive MSDI,**
  - 2) a MSDI that excludes hydrographic information,**  
**or**
  - 3) only a specialized hydrographic SDI?**
- **Does the National SDI allow for a HO to become responsible for or partner in their national MSDI?**
- **Does the type of data provided by national HO support MSDI?**



# **ROLE OF IHO AND NATIONAL HO IN SUPPORTING MSDI**

**Questions/issues that need to be considered  
(Cont.):**

- **Does the HO collect data primarily for the safety-of-navigation, or can it meet the needs of a wider user community?**
- **Does the quality and usability of existing HO spatial databases include access to metadata?**
- **What are the requirements for quality assurance of data outside of its use in support of SOLAS?**



# **ROLE OF IHO AND NATIONAL HO IN SUPPORTING MSDI**

**Questions/issues that need to be considered  
(Cont.):**

- **Does the establishment of user requirements for supply of hydrographic information impact on any necessary restrictions on data access?**
- **Does the financial, administrative and technical requirements and/or national policy on cost recovery impact on the establishment and maintenance of the infrastructure?**

# CUBA'S NATIONAL MSDI POLICY

- Cuba's MSDI is an active component and a subsystem of the Spatial Data Infrastructure of the Republic of Cuba (IDERC).
- An objective assessment of the current situation in Cuba indicates that the demand for marine spatial information is relatively low, self-managed, and without a regulation or common standardization.

# CUBA'S NATIONAL MSDI POLICY

- It is likely that this situation could be overcome if some individual entities were to establish a potential market niche.
- But, this may result in some commercial entities producing and publishing their own set of data.
- These proprietary data formats would not always be consistent with the data that is considered “official” by the producing State.



# CUBA'S NATIONAL MSDI POLICY

- In the near term, competition may not reduce costs nor lead to increased MSDI information availability if the data is in a proprietary format.
- Cuba works with the objective of unifying the approaches in connection with the collegiate organization of the strategy of development of the MSDI



# **BARRIERS TO PROGRESS**

**As discussed in the report of the MSDI Working Group to the 20th meeting of the IHO CHRIS Committee there are several barriers and obstacles to progressing MSDI in Cuba. At present, the main barriers and obstacles are:**

- Funding.**
- Trust in other governmental entities.**
- Business model.**
- Knowledge (market - technology)**
- Data management practices**

# **BARRIERS TO PROGRESS**

**It has been agreed that the main achievements reached in the application of these work strategies should be based on:**

- **Developing mutual respect through working together.**
- **Understanding of the benefits and the necessity of the trans-disciplinary focus.**
- **Recognition of the necessity of the collegiate organization of the training and capacity building process.**
- **Methodological and executive structuring of data management practices, including knowledge transfer, training and confidence building.**

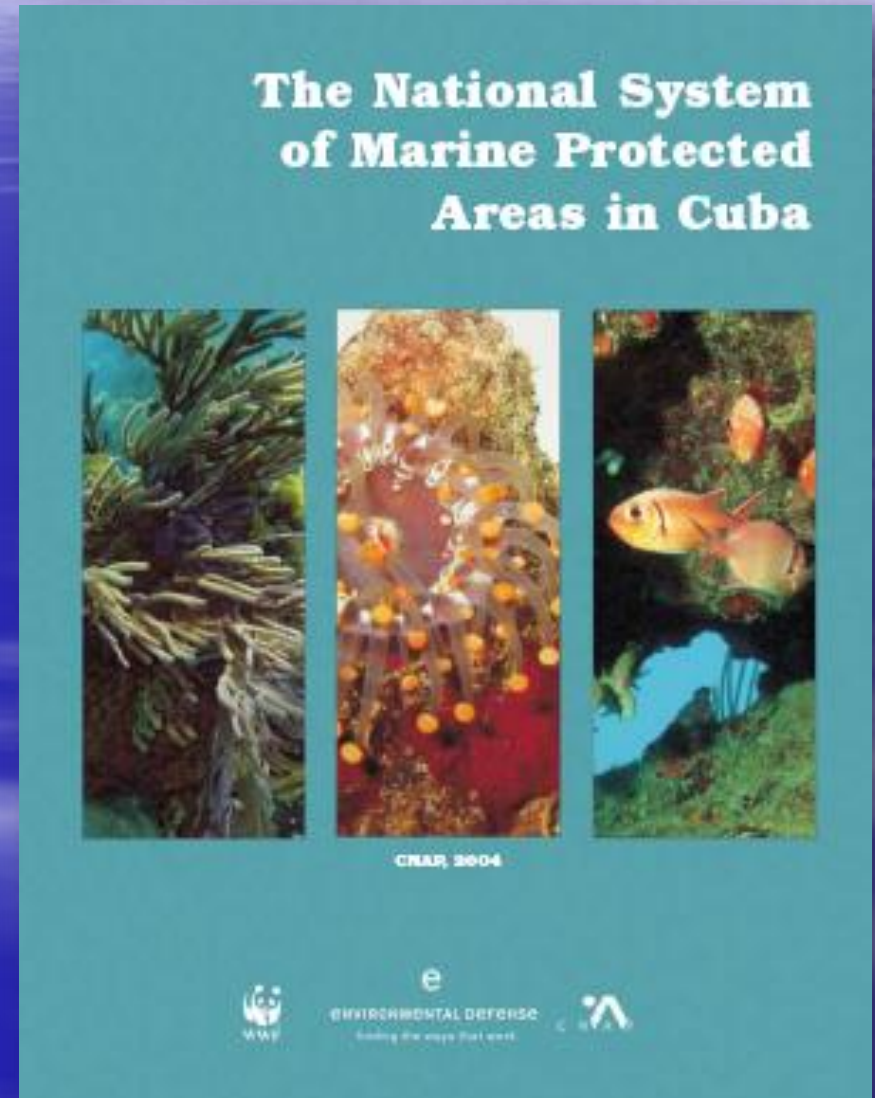
## **CUBAN INSTITUTIONS INVOLVED IN THE CURRENT WORK STAGE OF DEVELOPMENT OF MSDI**

- **National Office of Hydrography and Geodesy (ONHG),**
- **Centre of Marine Research of the University of Havana (CIM),**
- **Office for the Integral Development of peninsula Guanahacabibes (DIG),**
- **Institute of Oceanology (IdO)**
- **State Commission of the Outer Limit of the Continental Shelf of Cuba (CELPEC)**
- **National Centre of Protected Areas of Cuba (CNAP)**



# CUBA'S SYSTEM OF NATIONAL MARINE PROTECTED AREAS (SAMP)

- Cuban SAMP constitute a subsystem within the National System of Protected Areas.
- Marine protected areas (MPAs) are those protected areas that have a marine or coastal component; this includes coastal wetlands, the submerged coastal zone (mean high water line to a depth of 200 m), and offshore keys.





# CUBA'S SYSTEM OF NATIONAL MARINE PROTECTED AREAS (SAMP)

Key considerations of the Management and Planning Principles include:

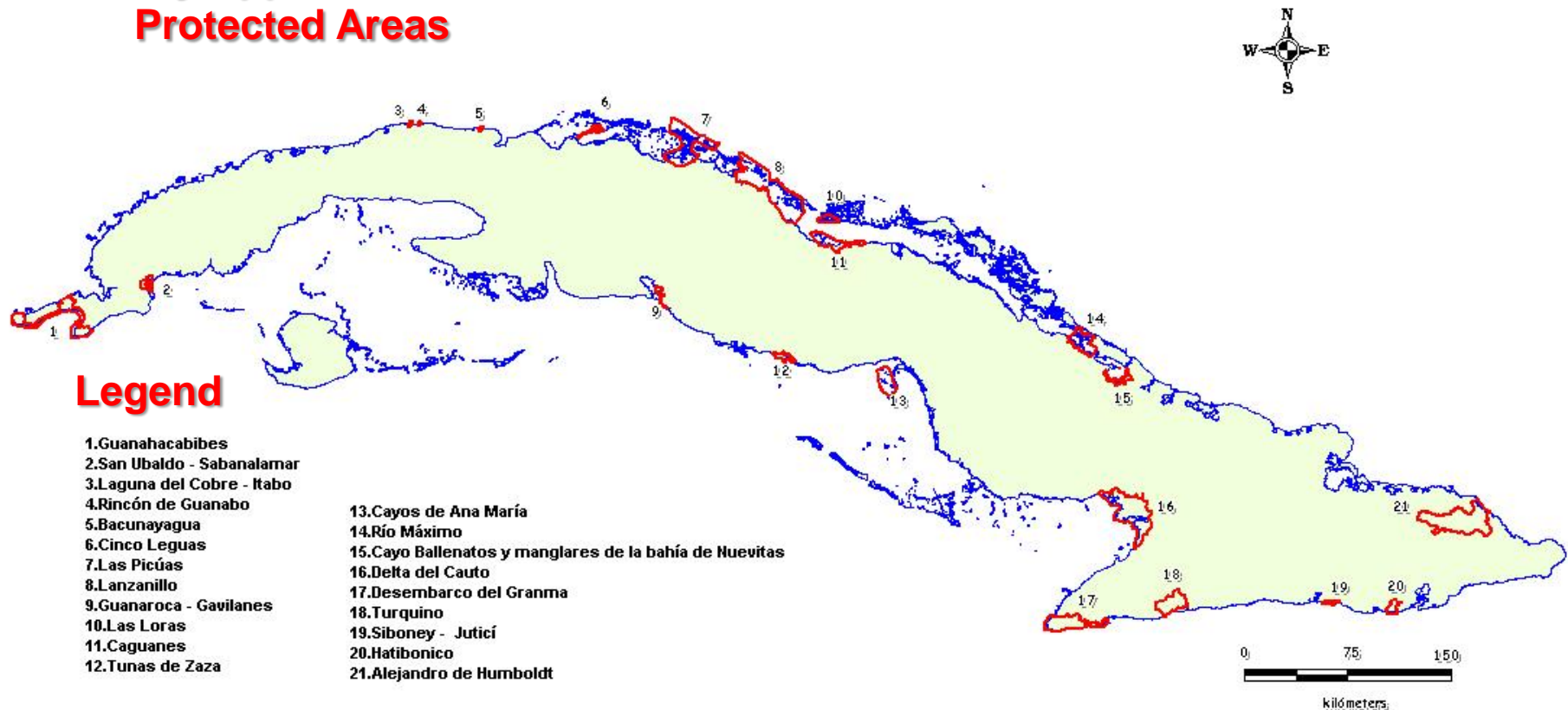
- the ocean as a public resource,
- the use of marine resources is common within MPAs,
- users are not aware that significant habitat impacts can result from their activities.



Fundamental design principles include conservation biology and other biological and physical factors that are considered include bathymetry, meteorological and oceanographic (currents, wave action, etc.).

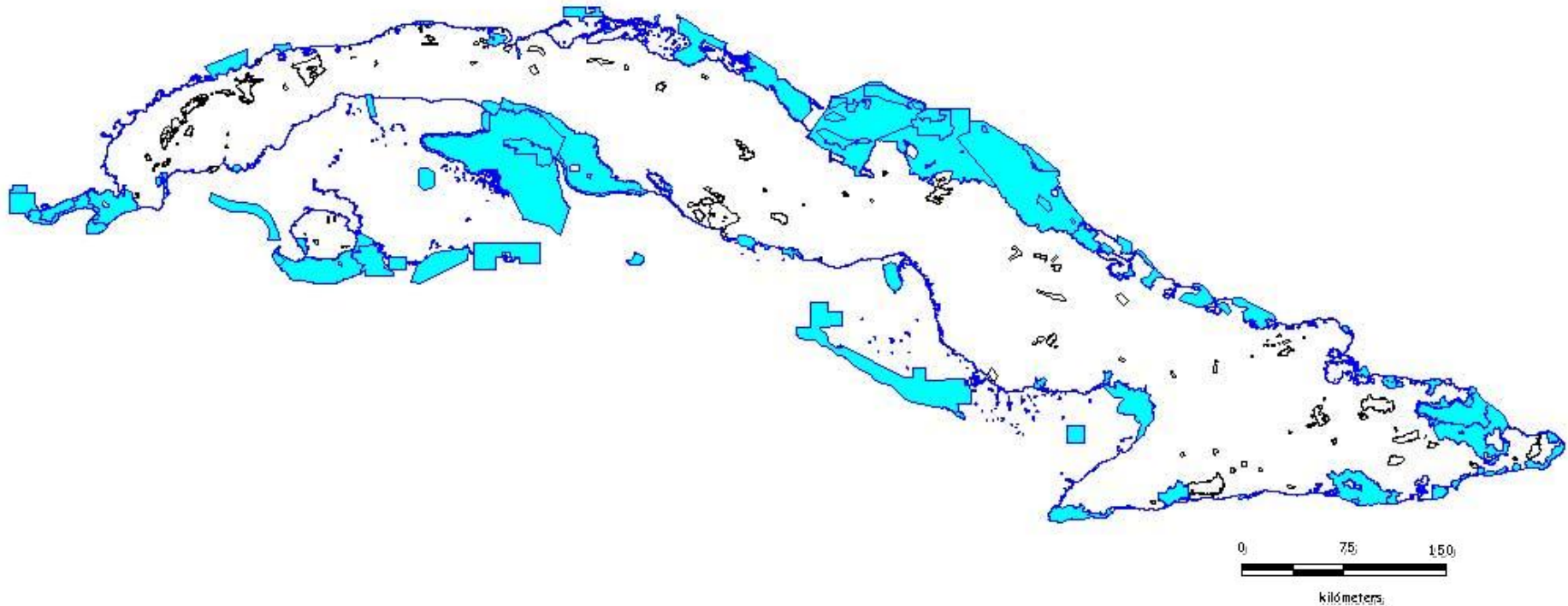
# CUBA'S SYSTEM OF NATIONAL MARINE PROTECTED AREAS (SAMP)

## Actually Approved Marine Protected Areas



# CUBA'S SYSTEM OF NATIONAL MARINE PROTECTED AREAS (SAMP)

**New Proposed Marine  
Protected Areas**



**Source: CNAP**



# CUBA'S SYSTEM OF NATIONAL MARINE PROTECTED AREAS (SAMP)

Actually the process of delimitation of the Cuba's MPA continues, and using the following points of decisions:

- Gap Analysis
- Objective Setting
- Action Plan
- Risk Analysis

In the process related with the Gaps analysis, SAMP works in the aspects related with the Data with the main goal of the establishment of a total capacity of Cuba's MSDI.





# CUBA'S SYSTEM OF NATIONAL MARINE PROTECTED AREAS (SAMP)

Questions/issues that must be accomplished in order for SAMP to become part of a Cuba's MSDI.

- Identify what Cuban data is available, including data on conservation biology, metapopulation biology, and landscape ecology, and fishery biology. Also, need core hydrographic data such as: bathymetry, coastline, tidal, oceanographic
- Assign metadata to provide the geospatial reference.
- Make the metadata searchable through some search engine.

# **CUBA'S SYSTEM OF NATIONAL MARINE PROTECTED AREAS (SAMP)**

**Questions/issues that must be accomplished in order for SAMP to become part of a Cuba's MSDI.  
(Cont.)**

- **Include the search engine capability on the organization's web page.**
- **Establish a licensing regime supported and underpinned where applicable by government policy.**
- **Capture data sets in digital form, provided by each one attendant entity.**
- **Capture data as close to source scale/ resolution as possible.**

# **CUBA'S SYSTEM OF NATIONAL MARINE PROTECTED AREAS (SAMP)**

**There are other actions that are also needed:**

- **Update the metadata search facility to identify raster or vector data availability.**
- **Facilitate download of data sets as flat files.**
- **Facilitate automated search and download of data sets via web mapping services, such as centralized searcher (clearing house) of available information.**



# **CUBA'S SYSTEM OF NATIONAL MARINE PROTECTED AREAS (SAMP)**

**There are other actions that are also needed: (Cont.)**

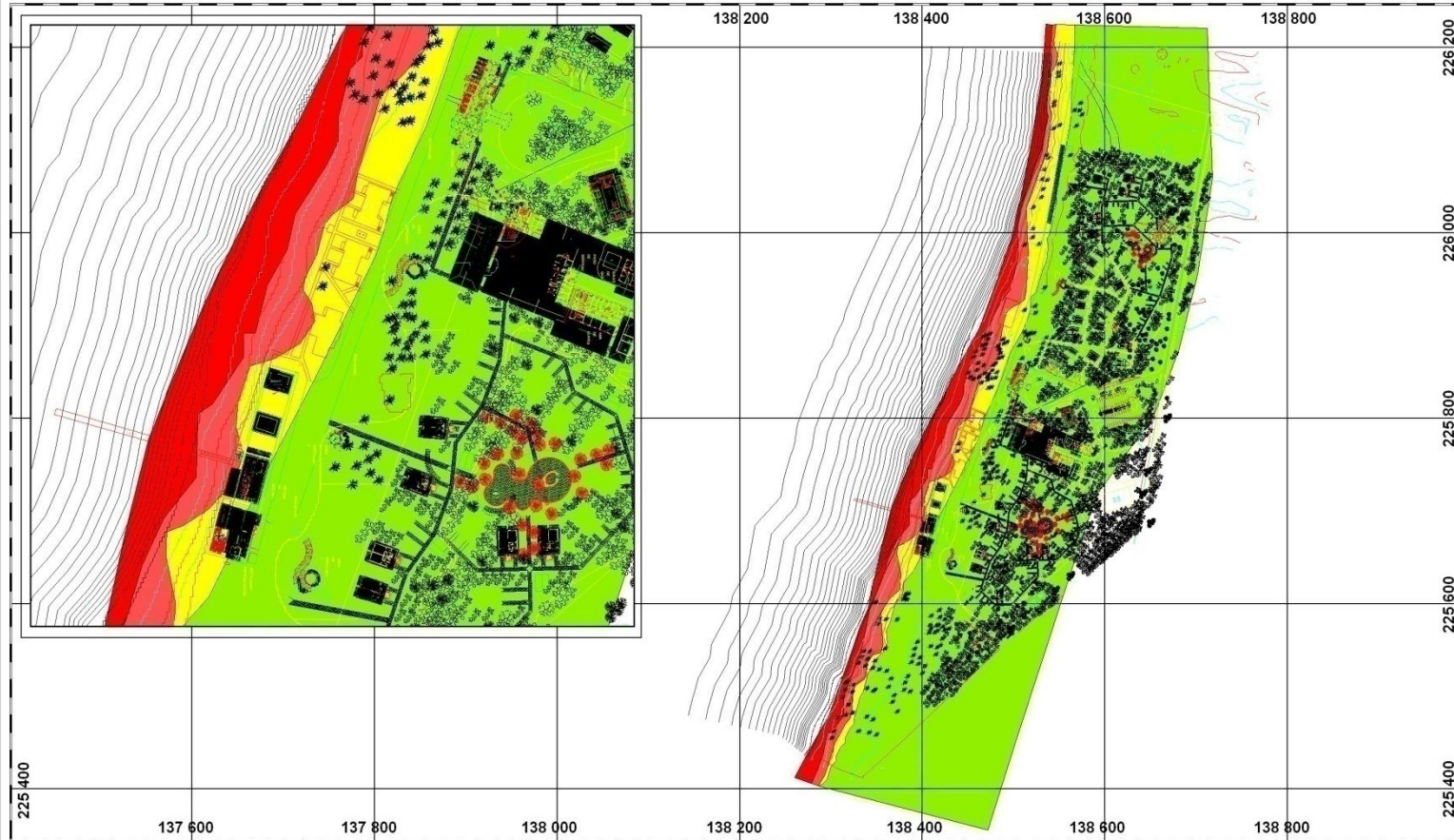
- **Develop a seamless validated database of vector data using international standards, e.g. S-57 or S-100 feature data dictionary or data model.**
- **Develop an acceptable level at which data can be made available either in-country or internationally.**
- **Facilitate automated search and download of data via Web Feature Service.**

# **CUBAN EXAMPLES OF USE OF MSDI CONCEPT**

# PROPOSED MARINE CADASTRAL STRUCTURE ON MSDI

## MARÍA LA GORDA PROYECCIÓN FUTURA PROBABILIDADES DE PENETRACIÓN DEL MAR DE UN HURACÁN SS5 CADA 5 AÑOS

PARA USO DE SERVICIO



### LEYENDA

- Muy Alto
- Alto
- Moderado
- Leve

El mapa ha sido confeccionado con la información del año 2005, sobre la base de materiales cartográficos escala 1: 50 000,

Elaborado a partir del Sistema de Información Geográfica de la Península de Guanahacabibes

PROYECCION CONICA CONFORME DE LAMBERT  
Sistema de coordenadas CUBA NORTE  
Sistema de Altura Siboney

Editado: 2008

OFICINA PARA EL DESARROLLO INTEGRAL DE LA PENINSULA DE GUANAHACABIBES





# APPLICATION OF METADATA STRUCTURE ON MSDI



## INFORME FINAL DE METADATOS DEL GT-CELEPC

¿Qué son los datos? Define al conjunto de datos.

ID\_D: L350

Título del conjunto de datos: Puntos de la línea restrictiva 350 desde la línea base. 2009/01/01

Fecha del conjunto de datos: 1/1/2009 Tipo de fecha: Creación Idioma: Español

Resumen descriptivo: Relación de puntos que describen el arco exterior de las 350 N medidas a partir de la línea base de la República de Cuba, utilizados para medir la anchura del mar territorial.

Propósito: Puntos que conforman la línea restrictiva en el proceso de la delimitación de la Plataforma Continental Extendida.

Formato de distribución: xls, tab, map, dat, txt

Recurso en línea: Base de dato temporal 2009/01/01

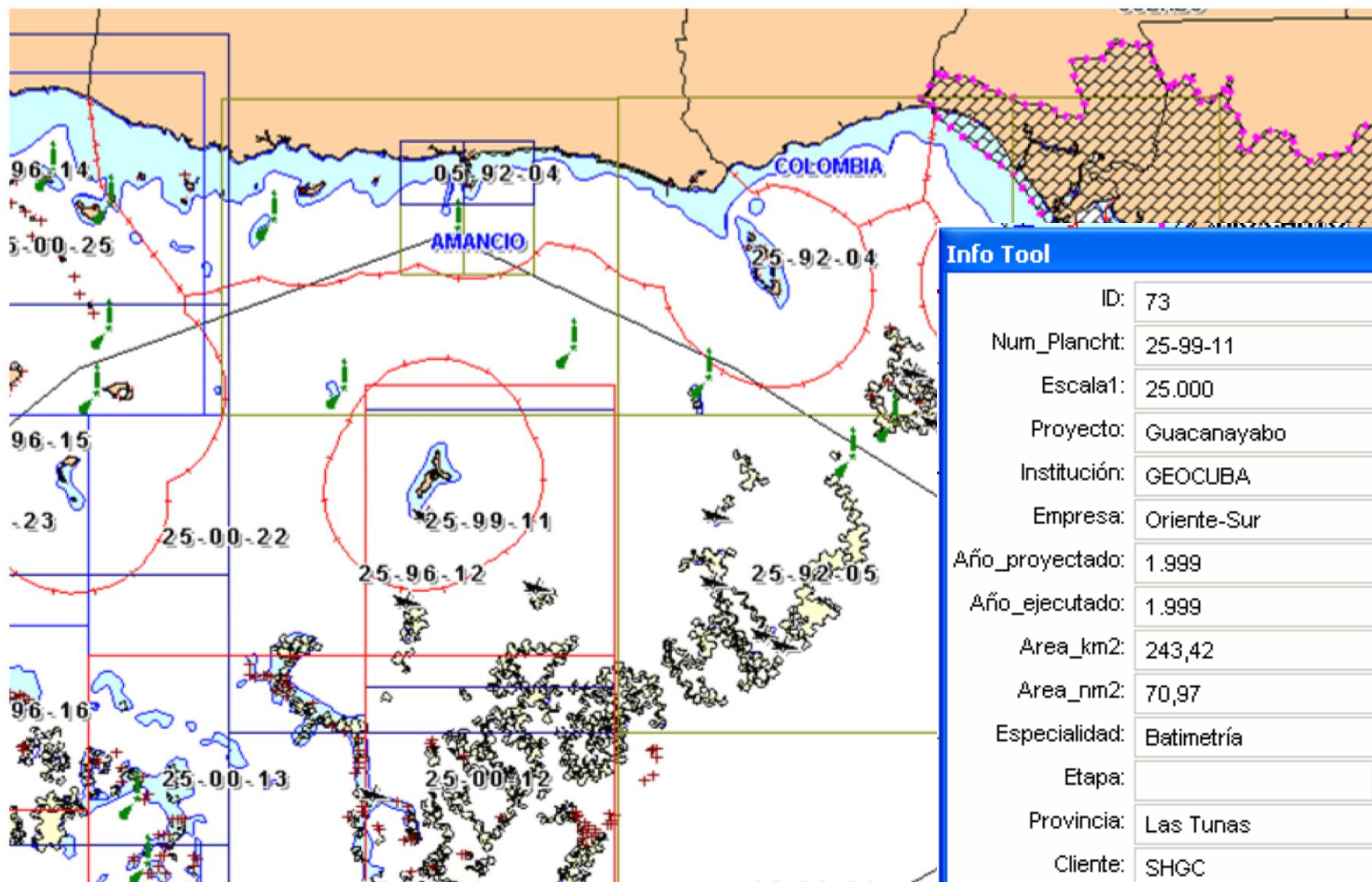
¿De donde los datos son originarios?

Localización geográfica: Coordenada Oeste: -90 Coordenada Este: -83  
Coordenada Norte: 29 Coordenada Sur: 20

Categoría del tema: 003 Límites, 008 Información Neocientífica

Formato de presentación: 011 (Tabla digital) Restricciones: Ninguna

# PROPOSED MARINE CADASTRAL STRUCTURE ON MSDI



## Info Tool

|                 |                     |
|-----------------|---------------------|
| ID:             | 73                  |
| Num_Plancht:    | 25-99-11            |
| Escala1:        | 25.000              |
| Proyecto:       | Guacanayabo         |
| Institución:    | GEOCUBA             |
| Empresa:        | Oriente-Sur         |
| Año_proyectado: | 1.999               |
| Año_ejecutado:  | 1.999               |
| Area_km2:       | 243,42              |
| Area_nm2:       | 70,97               |
| Especialidad:   | Batimetría          |
| Etapas:         |                     |
| Provincia:      | Las Tunas           |
| Cliente:        | SHGC                |
| TemátInvestig:  | Cartografía estatal |

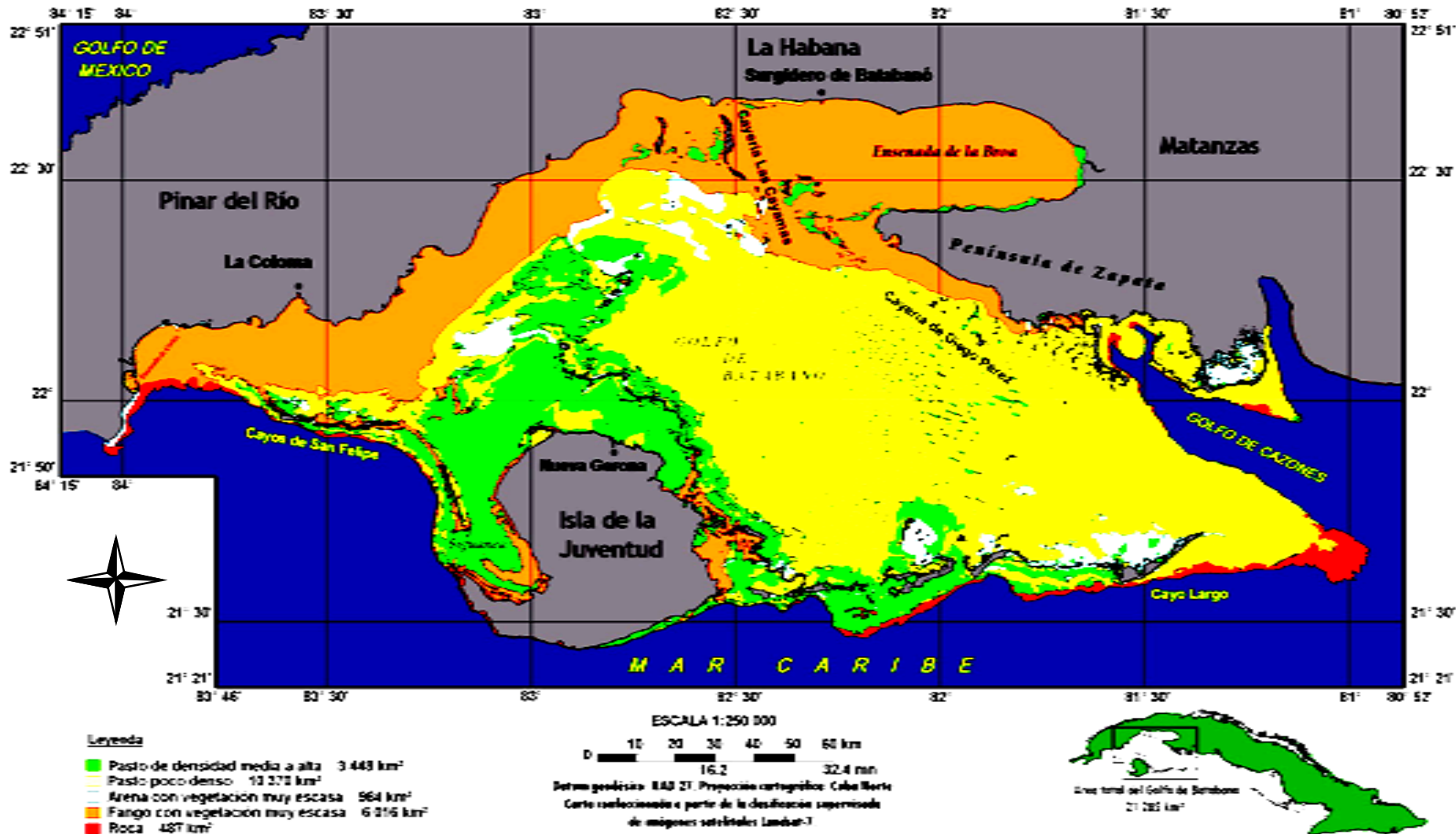


List

Guacanayabo\_Catálogo\_B

# TRANS-DISCIPLINARY FOCUS ON MSDI

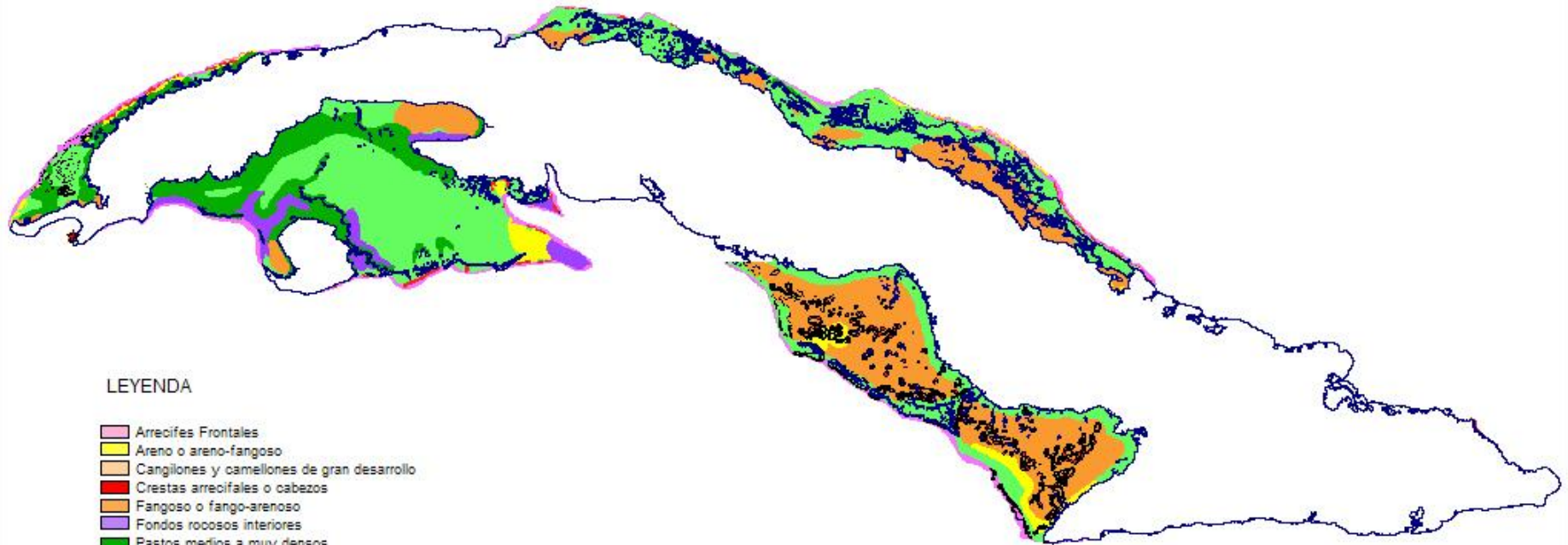
## HÁBITATS BENTÓNICOS DEL GOLFO DE BATABANÓ. 2005





# TRANS-DISCIPLINARY FOCUS ON MSDI

## BIOTOPOS MARINOS CUBA



### LEYENDA

- Arrecifes Frontales
- Areno o areno-fangoso
- Cangilones y camellones de gran desarrollo
- Crestas arrecifales o cabezos
- Fangoso o fango-arenoso
- Fondos rocosos interiores
- Pastos medios a muy densos
- Pastos poco densos

0 50 100  
kilómetros

# SUMMARY AND RECOMMENDATIONS

- SDI provides integrated management of spatial data and information.
- MSDI encompasses marine geographic and business information covering sea areas, inland navigable and non-navigable waters. This would typically include seabed topography, geology, marine infrastructure; administrative and legal boundaries, areas of conservation, marine habitats and oceanography.
- MSDI has four key components: Policy, People and Organizations, Enablers, and Content.

# SUMMARY AND RECOMMENDATIONS

- Cuba's MSDI is moving toward a comprehensive structure that also includes Hydrographic information.
- In order to support MSDI, the Cuban Hydrographic Office will need to provide a variety of hydrographic-related information,
- At present, an official program of development of the MSDI in Cuba does not exist. Ideally, this present lack of coordination is temporary, and be overcome when there is increased realization about the benefits of a well organized MSDI.



# SUMMARY AND RECOMMENDATIONS

- For the development of the MSDI in general -- and in the case peculiar of Cuba -- it initiate a national MSDI, it will be necessary:
  - To identify the responsible entity to lead the MSDI.
  - Prepare white paper including introduction to MSDI, benefits, list of stakeholders and outline plan.
  - Obtain a decision to proceed including scope, depth and timescale.
  - Develop and get approval for a both a strategic and implementation plan.

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