The Regional Training Workshop on Methodologies for Coastal Inventories & Information Management

Appendix IX

APPLICATIONS OF GIS IN COASTAL RESOURCE MANAGEMENT: Database design and management issues

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- **Background**
- **Application Areas Relevant to CRM**
- **Database Design Issues**
- **Database Management Requirements**
- **Risks Factors to be Considered**
- **Pilot Project**
- **Gulf of Paria Database**

DATABASE DESIGN ISSUES

- **Corporate view**
- **Integrated view**

Formats
Scales
Currency
Projection

- **Spatial integration**
- **Data classification and codification**
- **Temporal consideration**

DATA MANAGEMENT REQUIREMENTS

- **Data Collection and Data Entry Strategies**
- **Storage, Retrieval and Distribution Processes**
- **Data Updating and Maintenance Strategies**
- **Security & Confidentiality**
- **Usage Evaluation**
- **Creation and Maintenance of Metadata**
- **Financial Consideration**
- **Capacity building**

DATA AUTOMATION TECHNIQUES

TYPES OF DIGITAL DATA USED BY GIS

- **vector based files**
- **raster images**
- **records in a database**
- **text files**
- **Video images**

DATA CONVERSION METHODS

- **Map digitizing**
- **Scanning**
- **Keyboard data entry**
- **Digital Photogrammetry**
- **Automated conversion between software**
- **Automated Field Survey**

CRITERIA FOR CHOOSING MODES OF INPUT

- **Type of data source**
  - **images favor scanning**
  - **maps can be scanned or digitized**
- **The database Model required**
  - **scanning easier for raster**
  - **digitizing for vector**
- **Density of data**
  - **dense linework makes for difficult digitizing**
- **Expected applications of the GIS implementation**

DATABASE DESIGN & MANAGEMENT QUESTIONS

What storage media to use?

How large is the database?

What data should be stored on-line?

What is the likely growth-rate of the database?

Will new attributes be added?

How should the data be partitioned? By:

Is data source partitioned?

What security is needed?

Who should be able to redefine the data schema?

Who should be able to edit/update the data?

Should database be distributed or centralized?

What standards and formats are required?

What are the cost recovery mechanisms?

The Basic Database Design Questions?

- **What data is needed to support the required and planned applications?**
- **What is the positional accuracy required?**
- **What are the database requirements?**
- **What are the required data relationships for a complete database design?**
- **What is the target GIS platform?**
- **What is the target GIS data format and database structure?**

Sources of Data

- **From what sources are the data to be obtained?**
- **Are the available data suitable for the GIS?**
- **How well will the data fit the GIS database?**

Techniques of Populating a GIS Database

- **Does the data conversion approach meets the project requirements, and is it appropriate for the available source data?**
- **Is the conversion approach cost-effective?**
- **Should outside expertise and/or resources be used in the design and implementation stages?**
- **How will the converted data be maintained and by whom?**

Making It All Fit Together

- **Does the implementation plan meet the criteria for success?**
- **Does the project have executive support?**
- **Have risks been minimized?**
- **Have realistic and reasonable budget estimates been established?**
- **Is the schedule both appropriate and realistic?**
- **Have roles and responsibilities been clearly defined?**
- **Is the organization prepared for the challenges brought by a GIS?**

RISKS FACTORS TO BE CONSIDERED

Sound conversion practices reduce risks such as:

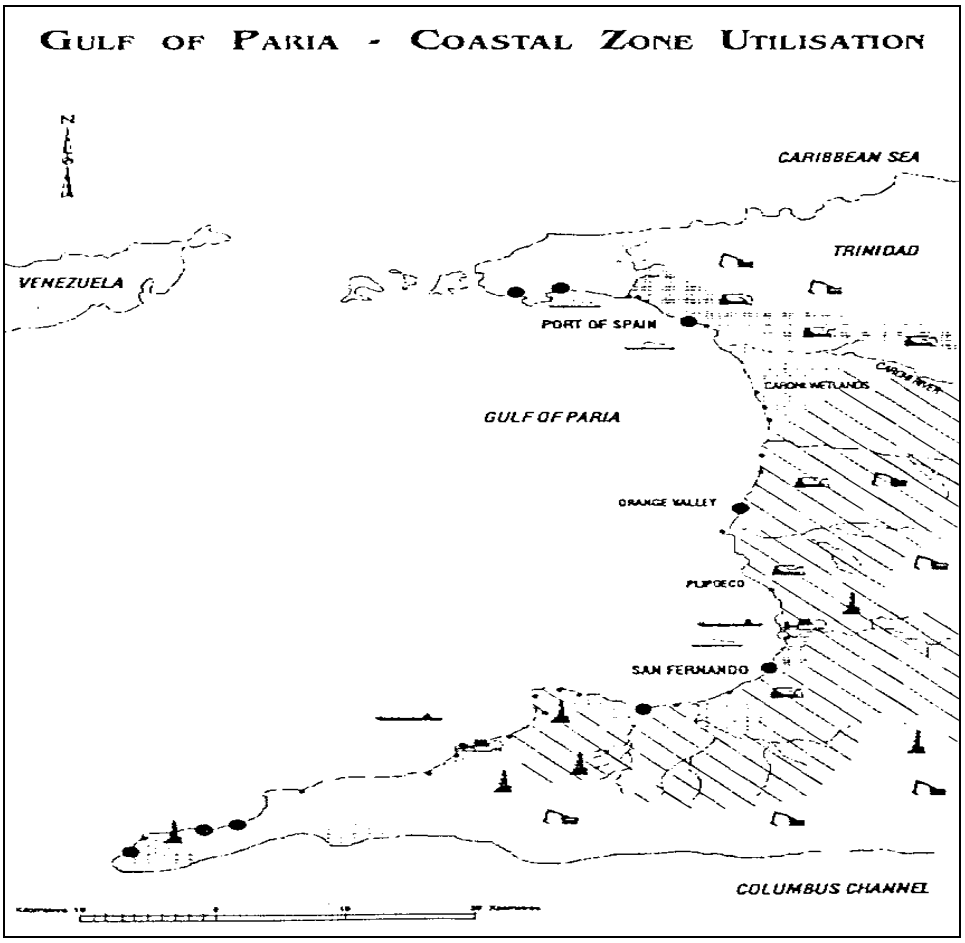
- **Data quality**
- **Cost containment**
- **Meeting the schedule**
- **Staffing**
- **Database Maintenance**
- **Satisfied Users**
- **Upper management support**
- **Procedural innovation**

PILOT PROJECT

Pilot Projects can be design to:

- **Test database content**
- **Test suitability of sources**
- **Test database structure**
- **Test document preparation and scrub activities**
- **Test data conversion procedures**
- **Confirm project-specific symbology**
- **Test quality assurance procedures**
- **Test data acceptance procedures**
- **Test pilot applications**
- **Confirm data conversion cost estimates/ budget**

Gulf of Paria Database
INTEGRATED COASTAL FISHERIES MANAGEMENT SYSTEM (ICFMS)



SECTORAL ACTIVITIES AND THEIR IMPACTS

- **Human Settlement and Commercial Activities**
- **Agricultural Activities**
- **Industrial Activities**
- **Shipping Activities**
- **Fishing Activities**

RATIONALE FOR INTEGRATED COASTAL FISHERIES MANAGEMENT SYSTEM

- **Information Gathering and Research**
- **Awareness Building**
- **Integrated Planning, Co-ordination and Management**

REQUIREMENTS FOR INTEGRATED COASTAL FISHERIES MANAGEMENT

ICFM entails a number of activities that must be undertaken concurrently. These activities include:

a. **Control of over-exploitation of the fisheries stock.**
b. **Control of the water quality against:**
   - **Oil & fuel pollution from exploration & transportation activities**
   - **Effluent from industrial, residential, & agricultural activities**
   - **Sediment and flooding from inland waters**
c. **Improvement of fishing practices and facilities**
d. **Control & monitoring of coastal activities**
e. **Protection of marine habitat and ecosystem.**

In order to perform these activities an understanding of the following features as well as the relationship are important:

a. **Coastal/Inland settlement patterns**
b. **Land use patterns**
c. **Land cover with special reference to the wetlands**
d. **Hydrology and its dynamics**
e. **Topography of the land**
f. **Bathymetry of the sea**
g. **Urban infrastructure e.g. drainage and sewerage**
h. **Off-shore activities e.g. oil, ports, and cabling**
i. **Physical and Chemical properties of the Gulf**
j. **Fisheries oceanography.**

This Information Reside in different agencies:

a. **Ministry of Agriculture**
b. **Hydrographic Unit**
c. **Ministry of Energy**
d. **Town and Country Planning Division**
e. **Water and Sewerage Authorities**
f. **Drainage Division**
g. **Ports Authority**
h. **Point Lisas Industrial Company**
i. **Forestry Division**
j. **Water Resources Agency**
k. **Lands and Surveys Division**
l. **Institute of Marine Affairs**
m. **Ministry of Industries**

DATABASE DESIGN FOR ICRMS

The database is designed on three main criteria:

a. **reduction in redundancy and duplication,**
b. **application independence,**
c. **flexibility of use.**

The following data themes were identified for the project:

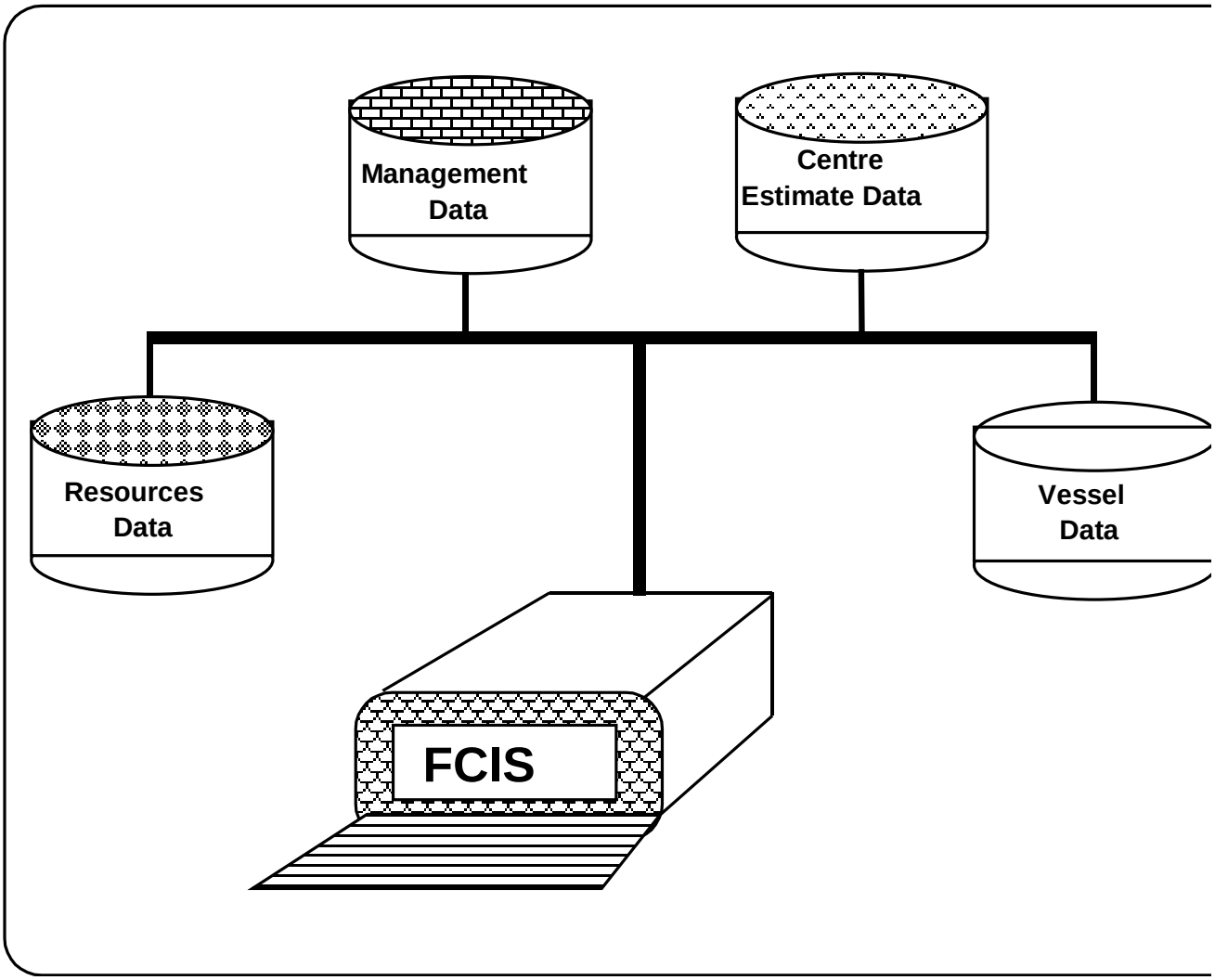
a. **Fishing centre**
b. **Topography and bathymetry**
c. **Off-shore physical features**
d. **Off-shore oil & gas exploration**
e. **Industrial activities**
f. **Agricultural activities**
g. **Human settlement**
h. **Vegetation**
i. **Hydrology.**

Presently, work has been completed in the design and development of the following databases:

a. **Fishing Centre Information System (FCIS)**

b. **Special Off-shore Features Database (SOFD)**

c. **Digital Elevation/Bathymetry Database (DEBD)**


Management
Data
Centre
Estimate Data
Resources
Data
Vessel
Data
FCIS

Structure of the FCIS

Attributes of the FCIS

MANAGEMENT DATA

Center Name and Number *County Name*

Agency Number
Caretaker Name

Collector of Statistics

RESOURCES DATA

Number of Vessels *Engine Wash Trough*

Number of Fishermen *Engine Storage Room*

Electricity **Jetty**
Floodlights **Slip-way**

Water *Ramp*

Bathroom *Office Accommodation*

Toilet/latrine **Market/No of Stalls**

Lockers *Gas Station*

Netshed
Cooperatives
Freezer
Association

CENTRE ESTIMATES DATA

Revenue **Number of Landings**

Number of Trips **Number of Hours**

Year

VESSEL DATA

Vessel Number **Vessel Method of Fishing**

Vessel cost Vessel owner/Captain

vessel