
Bay Gardens Inn, Rodney Bay, Saint Lucia
2-6 August 2010
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**ANNEXES**

- ANNEX I: Agenda of the Meeting
- ANNEX II: List of Participants
- ANNEX III: Template for National Reports on CMA Activities
- ANNEX IV: CMA Strategic Planning Surveys Report
- ANNEX V: List of Acronyms
The Intergovernmental Oceanographic Commission (IOC) of UNESCO celebrates its 50th anniversary in 2010. Since taking the lead in coordinating the International Indian Ocean Expedition in 1960, the IOC has worked to promote marine research, protection of the ocean, and international cooperation. Today the Commission is also developing marine services and capacity building, and is instrumental in monitoring the ocean through the Global Ocean Observing System (GOOS) and developing marine-hazards warning systems in vulnerable regions. Recognized as the UN focal point and mechanism for global cooperation in the study of the ocean, a key climate driver, IOC is a key player in the study of climate change. Through promoting international cooperation, the IOC assists Member States in their decisions towards improved management, sustainable development, and protection of the marine environment.
1. OPENING OF THE WORKSHOP

The meeting began on Monday the 2nd of August 2010, with a welcome address by the Regional Coordinator for the CMA, Mr. Ramon Roach of the Coastal Zone Management Unit (Barbados). Mr. Roach thanked the participants for being present at the workshop given the somewhat short notice of its announcement, and noted that he greatly appreciated their continued engagement in the project since the last training workshop in June of 2008. The Regional Coordinator also challenged the participants to remain committed to the project, stressing the potential benefits such as low-cost spatial data sharing, and improved coastal zone and marine area management. He then asked the participants to introduce themselves and indicate the agencies or organizations they represented (the participants list is included as Annex II to this document). Mr. Roach then welcomed the ranking local representative of Saint Lucia Mr. Peter Felix, Chief Surveyor of the Ministry of Physical Development, to open the meeting.

Mr. Felix welcomed the participants to Saint Lucia and to the workshop, and noted that he understood the value of improved access to, and management of, coastal and marine spatial datasets, and their relevance to improved decision-making. As such he expressed his support for the CMA project but indicated that the allocation of human and financial resources to project-related activities (such as a national atlas) could be an impediment unless highly apparent and tangible benefits could be demonstrated to high-level administrators.

The opening remarks from Mr. Felix were followed by those of Mr. Peter Pissierssens, Head of the IOC Project Office for IODE. Mr. Pissierssens welcomed the participants and thanked Ms. Portia St. Catherine and her team for coordinating the local logistics of the meeting. He went on to impress upon those in attendance the importance of sustained promotion of CMA and active coordination of both the regional and national atlas activities at the local level to encourage multi-agency buy-in and ensure the success of the national atlas initiatives.

1.1 Review of CMA activities

Mr. Roach, CMA Regional Coordinator, then proceeded to give a presentation on the inception of the CMA and the activities that have taken place as part of the project (all presentations for the meeting are available on the CMA website www.caribbeanmarineatlas.net). He began by relating the importance of access to data at every stage of the integrated coastal area management policy cycle (planning, implementation, monitoring, evaluation), and for decision-making in specific activities such as disaster management. In addition, he explained that the improvement of data sharing mechanisms between government departments, researchers and the general public not only promotes more effective coastal area management, but also encourages public participation in the decision-making process. Mr. Roach then discussed the inception of the CMA, with the African Marine Atlas as the template, and noting the ways an online atlas of marine datasets fulfilled the criteria outlined above, and as such has the potential to improve decision-making with respect to coastal area management. He then recounted the workshop held in Barbados in October of 2007 on the development of the CMA project, which was attended by representatives from seven Caribbean countries. The 2007 workshop had the following objectives:

- To inform the participating countries of the potential benefits of a Caribbean Marine Atlas
- To identify current national coastal zone management arrangements, data availability and data and information management needs
- To identify national and regional coastal and marine issues that could be the focus of the Caribbean Marine Atlas
- To identify the national resource requirements of the participating countries to enable full participation in a Caribbean Marine Atlas Pilot Project
To prepare a draft work plan of a Caribbean Marine Atlas Pilot Project, for submission to, and approval by the respective national governments

In terms of the national coastal and marine issues discussed by the participants (Figure 1), it was apparent that the majority of issues were common among nations, and as such were also regional priority issues, which would be a part of the CMA.

<table>
<thead>
<tr>
<th>National coastal and marine priority issues by country. Chart constructed during the CMA development workshop in Barbados.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Priority</strong></td>
</tr>
<tr>
<td>Marine habitats (Coral Reefs, Seagrass, Mangroves)</td>
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<tr>
<td>Natural hazards</td>
</tr>
</tbody>
</table>

In addition, the participants also identified data management related issues (quality control, metadata, lack of trained personnel) and data access issues (inter-departmental sharing) as impediments to truly effective integrated coastal zone management. Those at the meeting also identified training activities that would need to occur to allow regional marine data managers to actively contribute to the CMA.

Mr. Roach then briefly described the training activities conducted for the purpose of developing the CMA, following the recommendations of the 2007 workshop. In February of 2008, data managers representing eight Caribbean countries took part in the Ocean Data Management course at the IOC.
Project Office for IODE in Oostende, Belgium. The course used the OceanTeacher training system (http://www.oceanteacher.org), and introduced the regional managers to some of the more technical aspects of accessing and processing marine spatial data. In April of 2008, the regional data managers also received training for the development of the CMA at the Data Mining workshop held in Trinidad and Tobago at the University of the West Indies, St. Augustine. This workshop focused on the collection and processing of the datasets which would be included in the atlas under the following themes and sub-categories:

- **Geosphere**
  - Natural hazards
  - Soil types
  - Land use

- **Hydrosphere**
  - Bathymetry
  - Physical oceanography
  - Chemical oceanography

- **Biosphere**
  - Habitats
  - Marine flora and fauna
  - Protected areas

- **Atmosphere**
  - Climate
  - Weather

- **Human Environment**
  - Settlements
  - Infrastructure
  - Tourism

The course also outlined the importance of metadata and provided guidelines for its creation. And finally in June of 2008, a course was held at the IOC Project Office for IODE in Oostende which introduced the regional managers to the MapServer platform, which at the time was intended to be the server software and programming interface used in the CMA. Participants received training in online map publication and web map application design, and developed basic applications using the MapScript programming language and the data emanating from the data mining workshop in April.

Mr. Roach then explained that since the most recent event, work on the CMA has still been proceeding. The funding proposal for the project was approved in 2009 and work on the CMA prototype had been ongoing as well. He then summarized the results of the project thus far as:

- The establishment of a **regional Marine Data Manager Network**
  - Eleven regional data managers received training during pilot phase;
  - Regional network has improved communication among Caribbean marine/coastal management agencies;
  - Regional network expanded to include GIS experts;

- The development of a **CMA prototype**
  - The prototype atlas went through 3 revisions;
  - Published online in July 2010 [www.caribbeanmarineatlas.net](http://www.caribbeanmarineatlas.net)

The Regional Coordinator then opened the atlas webpage and gave a quick demonstration of some of the functionality of the prototype including layer control, zooming and panning as well as the loading
of web map service layers from third party servers such as NASA’s Blue Marble satellite imagery data set.

Figure 2: Sample image from the CMA prototype showing historical seismic events categorized by severity.

Mr. Roach stated that the second phase of the CMA project would involve the further development of the prototype as well as the development and publication of the national atlases of the participating countries, with functionality similar to that of the regional CMA, noting that the current workshop would function as the strategic planning meeting for the effort. He then concluded his presentation by outlining the goals of the current workshop, namely:

- **To review the progress of the project**
  - Participant presentations (regional, national, international)
  - Prototype Demo
- **To re-assess the goals and objectives of the CMA**
  - Results of institution and client surveys
  - Regional and national atlas structure and function
- **To create realistic workplans for the projects**
  - Revise/develop national workplans
  - Revise regional atlas workplan
- **To evaluate the future role(s) of the CMA project**
  - Links with other regional programmes (e.g. UNEP, CCDC)
  - Potential as an organizing group

Following the presentation there was much discussion among the participants. When asked about the practical aspects of how the atlases would be developed, Mr. Roach indicated that his plan involved the splitting of the participants into two groups. Those who wanted to be **atlas developers** would receive advanced training in areas such as database management and the use of the OpenLayers scripting language (the programming language selected for the CMA), and those who wanted to be **atlas editors** would receive further training in the manipulation of spatial data as well as metadata management training. Mr. Roach went on to explain that if the countries/institutions represented
lacked the resources and infrastructure needed to host their national atlases, they could be hosted by
the IOC Project Office for IODE, at least initially. One of the participants from the Cayman Islands
queried if the various national atlases would have a uniform user interface, and suggested that it would
make for a more pleasant user experience. Ms. Marcia Berman, representing the International
Coastal Atlas Network (ICAN) remarked that certain core functionality was essential for all of the
atlases, and that a user guide also had to be produced for all of the various web applications. The
participant from the Saint Lucian coastal zone management unit inquired as to the usefulness of a
national atlas, given the lack of data available at the national level. Mr. Roach indicated that there may
be a lot of national data available, but that it may be held by international agencies or private
organizations where it remains unshared. Another Saint Lucian participant suggested that the CMA
should recommend the collection of data nationally where gaps exist. However Mr. Roach noted that it
was not within the purview of the CMA to make recommendations on national data collection policy
and initially the national atlases should focus on existing datasets. However he also noted that the
national atlases could be used in gap analysis with respect to coastal and marine data. Finally, Mrs.
Simpson (Cayman Islands) inquired as to the presence of a marine data inventory. Mr. Roach informed
her that at the regional scale, a fairly exhaustive set of data had been identified, but this was not the
standard case at the national level.

2. REPORTS ON NATIONAL COASTAL MANAGEMENT
AND MARINE ATLAS ACTIVITIES

The Regional Coordinator introduced the topic of the national reports on activities related to country’s
national atlas programmes and marine data management in general. The aim of the reports was to gain
a better understanding of coastal management, data management and resource gaps in the various
countries. All participants were provided with a template (see Annex III to follow, which sought
information on a variety of topics including their national coastal zone management structure, coastal
and marine legislation, capacity and status of their national atlas coordinating committees. Participants
were invited to provide a written report answering the questions listed in the template as well as
deliver a presentation extracted from their reports. The responses of the participants are summarized in
the table below. As the Cayman Islands were new to the CMA project, not all of the questions were
valid in their context, and this is reflected in their responses. In addition although Dominica’s
representative was not available for the workshop, he did submit a national report and it is included in
the summary table.

From the presentations and the discussions following, it was again clear that there are significant
differences in capacity between member countries within the CMA project. Some countries such as
Jamaica and Trinidad have mature spatial data management systems, whereas others such as Saint
Lucia and Dominica have staff and training inadequacies, which seriously limit their ability to collect,
and process environmental spatial data. Barbados and Cuba lie in the middle of the spectrum. However
for Cuba the limitation to their spatial data management capacity is mainly related to issues with
networking infrastructure rather than lack of human capacity or training. For all countries human
capacity and training were cited as areas which needed to be improved to ensure more effective coastal
area and marine data management. In addition, the perennial problem of access to data in other
institutions was also echoed by most of the participants. One suggestion for addressing staffing
limitations made by the representative from Trinidad was to involve the UWI in the development
efforts for the CMA and the national atlases, thereby leveraging existing and operational expertise in
computer programming, database management and website design. Most important to the context of the
meeting however was that none of the countries had active national atlas committees, although
some participants indicated that these committees could be (re)-established fairly quickly. When asked
about the formality of the Barbados national committee, Mr. Roach indicated that his was an informal
grouping of committed persons, and thus allowed for the process to grow and develop without many
of the administrative hassles of a formal, state designated committee.
<table>
<thead>
<tr>
<th>National Coordinator</th>
<th>IOC National Focal Point</th>
<th>National Coordinator for Data Management</th>
<th>National Coordinator for Information Management</th>
<th>NODC Established</th>
<th>National Marine Library</th>
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<tr>
<td>Barbados</td>
<td>Dr. Lorna Inniss</td>
<td>Ramon Roach</td>
<td>None</td>
<td>No</td>
<td>Coastal Zone Management Unit Library</td>
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<tr>
<td>Cuba</td>
<td>Dr. Guillermo Garcia</td>
<td>Derrick Theophile</td>
<td>Mr. Riviere Sebastian</td>
<td>No</td>
<td>Library of the Fisheries Division keeps some records, efforts underway to integrate with national library</td>
</tr>
<tr>
<td>Dominica</td>
<td>Mr. Riviere Sebastian</td>
<td>???</td>
<td>Mr. Riviere Sebastian</td>
<td>No, but Centre for Marine Sciences (UWI) a candidate</td>
<td>No</td>
</tr>
<tr>
<td>Jamaica</td>
<td>Mr. Anthony McKenzie</td>
<td>??</td>
<td>??</td>
<td>No, Hope to have by late 2011</td>
<td>No</td>
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<tr>
<td>Trinidad and Tobago</td>
<td>Institute of Marine Affairs (IMA)</td>
<td>Sean Padmanabahn IMA</td>
<td>Maurisa Connell</td>
<td>No</td>
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<tr>
<td>Saint Lucia</td>
<td>Unsure</td>
<td>None designated</td>
<td>None designated</td>
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<td>Institution</td>
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<td>Dominica</td>
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<tr>
<td>Contact person: Lic.</td>
<td></td>
<td></td>
<td>Contact person: Lic. Enma Fonseca Address: 5ta avenida y 246 Santa</td>
<td>Contact person: Lic. Enma Fonseca Address: 5ta avenida y 246 Santa Fe. CP</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fe. CP 17100 La Habana, Cuba <a href="mailto:enma@cip.telemar.cu">enma@cip.telemar.cu</a>, <a href="mailto:enmAFonseca@yahoo.es">enmAFonseca@yahoo.es</a>.</td>
<td>Phone: (537) 209-8966</td>
<td></td>
</tr>
<tr>
<td>Reason for</td>
<td>Experience within coastal zone and marine</td>
<td>Integrated marine/coastal area management mandate Monitoring, GIS and RS</td>
<td>Integrated marine/coastal area management mandate Monitoring, GIS and RS</td>
<td>Position as a steward of the marine environment for Dominica GIS capabilities already</td>
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<td>institution’s</td>
<td>management fields</td>
<td>activities Established stakeholder base Specialist team to work with</td>
<td>activities Established stakeholder base Specialist team to work with</td>
<td>existing in the institution</td>
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<td>selection to take</td>
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<td>CMA and on national atlas Involved in many regional environmental</td>
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<td>part in CMA</td>
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<td></td>
<td>programmes</td>
<td>Position as a steward of the marine environment for Dominica GIS capabilities already</td>
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<tr>
<td>Details of</td>
<td>Coastal Zone Management Unit Bay Street</td>
<td>Centro de Investigaciones de Ecosistemas Costeros Cayo Coco, Morón,</td>
<td>Fisheries Division, Roseau Fisheries Complex, Dame M. E. Charles Blvd.,</td>
<td>Mr. Anthony McKenzie National Environment and Planning Agency (NEPA)</td>
<td></td>
</tr>
<tr>
<td>institution</td>
<td>St. Michael Barbados</td>
<td>Ciego de Ávila, CUBA, CP 69400 Phone: 53-33301151, 53-33301161</td>
<td>Roseau, Commonwealth of Dominica</td>
<td>10 &amp; 11 Caledonia Avenue Kingston 5 Tel: 876-754-7540 Fax: 876-754-7595/6</td>
<td></td>
</tr>
<tr>
<td>Specific</td>
<td>Director: Dr. Leo Brewster</td>
<td>Director: Dr. Adán Zúñiga Ríos</td>
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<td>legislation related</td>
<td>Coastal Zone Management Act Marine Pollution</td>
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<td>to the management of</td>
<td>Control Act</td>
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<td>Law Decree 212/2000 Coastal Zone Management</td>
<td>Law Decree 201/1999 Regulations concerning marine reserves, mooring</td>
<td>Regulations concerning marine reserves, mooring areas, designated fish</td>
<td>Natural Resources Conservation Act Beach Control Act National Oceans and</td>
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<td>Law Decree 212/2000 Coastal Zone Management</td>
<td>Law Decree 201/1999 Regulations concerning marine reserves, mooring</td>
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<td>Natural Resources Conservation Act Beach Control Act National Oceans and</td>
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<td>Law Decree 201/1999 Legal sources</td>
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<td></td>
<td></td>
<td>Regulations concerning marine reserves, mooring areas, designated fish landing</td>
<td>Regulations concerning marine reserves, mooring areas, designated fish landing</td>
<td>Regulations concerning marine reserves, mooring areas, designated fish landing</td>
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<tr>
<td>Barbados</td>
<td>Cayman Islands</td>
<td>Cuba</td>
<td>Dominica</td>
<td>Jamaica</td>
<td>Trinidad and Tobago</td>
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<tr>
<td><strong>the marine environment</strong></td>
<td>Town and Country Planning Act Fisheries Act and regulations</td>
<td>National Protected Areas System Law Decree 164/1996 Regulation of fisheries and others</td>
<td>sites and partitioning of the marine space for various user groups and activities</td>
<td>Coastal Zone Management Policy (2002) Beach Policy (Draft: 1997-present) and others</td>
<td>some bearing on the marine environment Signatories to regional/ international conventions</td>
</tr>
<tr>
<td><strong>Coastal management plan or other management plan which informs activities</strong></td>
<td>Coastal Zone Management Plan</td>
<td>National Program for the declaration of zones under regimen of Integrated coastal/ marine management</td>
<td>None currently, efforts ongoing</td>
<td>Natural Resources Conservation Act Beach Control Act</td>
<td>No current national coastal plan. Plans for specific sites, e.g. Buccoo Reef Management Plan</td>
</tr>
<tr>
<td><strong>Does/do the plan(s) consider the marine environment/oceans</strong></td>
<td>Yes, nearshore (up to ~1km from land)</td>
<td>Some zones established or involved in current management declaration process are marine Synergy with projects considering the marine environment</td>
<td>Will when established</td>
<td>Yes</td>
<td>Not at a national level</td>
</tr>
<tr>
<td><strong>National priority issues identified in the plan(s)</strong></td>
<td>Coastal development control Land-based sources of marine pollution</td>
<td>Conservation of the coastal marine biodiversity Conflict resolution related to the use of the natural resources Adaptation to the climate change and natural disasters Declaration of coastal/ marine protected areas as zones under Integrated Coastal management regime Improve the national and local structures for coastal/marine</td>
<td>Formation of a coastal zone management authority Education of stakeholders on the importance of coastal management</td>
<td>Evaluation of the status of coastal resources Development of policies and guidelines for coastal resource management</td>
<td>None officially, but the IMA is considering: Climate variability, watershed management, coastal stability, offshore resource management</td>
</tr>
<tr>
<td>Role of institution in coastal zone management framework</td>
<td>Barbados</td>
<td>Cayman Islands</td>
<td>Cuba</td>
<td>Dominica</td>
<td>Jamaica</td>
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<tr>
<td>Enforce setback guidelines Monitor beaches, reefs and water quality</td>
<td></td>
<td></td>
<td>Stakeholder conflict resolution and management programme design Survey and monitoring of biological, physical and chemical information for integrated coastal/ marine management programmes Contribute environmental information to the process of decision making To advise/lead all phases of management and inform stakeholders how coastal marine ecosystems work Improve capacity in coastal area management</td>
<td>Resource monitoring/ assessment Coordination of fisheries activities Issuance of permits</td>
<td>Monitoring of the nations natural resources Management of the permitting process for development projects Preparation of town and parish development plans, development orders, development strategies, action plans Enforcement of planning parameters in areas covered by development orders Development of environmental and land use database systems Comprehensive public education initiatives</td>
</tr>
<tr>
<td>Personal role in institution</td>
<td>Water Quality Analyst GIS Analyst</td>
<td>Principal specialist and adviser of Integrated Coastal Zone Management Focal point for Cuba for the project “Planning and Integrated Coastal Zone Management in Venezuela” Principal coordinator of</td>
<td>Data collection Management and reporting Monitoring and research</td>
<td>Coordinator: Marine Ecosystems Management Branch of NEPA</td>
<td>Provide spatial and/or analytical information</td>
</tr>
<tr>
<td>Barbados</td>
<td>Cayman Islands</td>
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<td>Dominica</td>
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**National priority issues being addressed by institution**

- **Development control**
  - Conflict resolution related to the use of the natural resources
  - Adaptation to the climate change and natural disasters
  - Declaration of primarily coastal/marine protected areas as zones under Integrated Coastal Management regime

- **Habitat degradation**
  - Food security
  - Development of alternative livelihoods strategies

- **Natural resource management**
  - Environmental policy development

- **Areas considered priority by the IMA that they provide information on:**
  - Climate change, coastal stability, LBS, fisheries management, watershed management

- **Development and/or implementation of appropriate planning frameworks to guide the management and development of Saint Lucia’s coastal zone**
  - Development of pollution control and waste management mechanisms
  - Managing the use of coastal and marine resources and their associated habitats

**Policies used to address national priorities**

- **Setback policy**
  - Erosion control policy
  - Marine environmental water quality standards
  - Establishment of

- **Production of material to communicate environmental information to stakeholders/decision makers**
  - ICZM project design
  - Creation of an office to

- **Limited/indistinct**

- **Promotion of sustainable development**
  - Conservation of ocean and coastal resources and ecosystems
  - Baseline data

- **Specific MOUs with organizations mandated to address the priority areas**
  - Regional/ international agreements (e.g. CEP, UNESCO)

- **Coastal Zone Management Advisory Committee which is responsible for identifying coastal management and development issues**
<table>
<thead>
<tr>
<th>Barbados</th>
<th>Cayman Islands</th>
<th>Cuba</th>
<th>Dominica</th>
<th>Jamaica</th>
<th>Trinidad and Tobago</th>
<th>Saint Lucia</th>
</tr>
</thead>
<tbody>
<tr>
<td>marine parks</td>
<td></td>
<td>manage ICZM programmes</td>
<td>Augmentation of lab facilities for environmental</td>
<td>collection and research</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>monitoring</td>
<td>Utilizing the role of science and traditional</td>
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<td>ecological knowledge for integrated coastal</td>
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<td>area management</td>
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<td>Providing the conditions of governance required</td>
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<td>for effective integrated coastal area management</td>
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<tr>
<td>Indicators used</td>
<td>Beach width</td>
<td>The zones involved in the management processes use the DPSIR</td>
<td>Reef health Fish production records Changes</td>
<td>Coral Reef Health Beach Erosion Water Quality</td>
<td>Beach profiling</td>
<td>Knowledge of CZM</td>
</tr>
<tr>
<td>to monitor and</td>
<td>Coral health</td>
<td>framework (Drivers, Pressures, State, Impacts</td>
<td>to current patterns and intensities General</td>
<td>Extent of existing wetlands</td>
<td>Coastal habitat</td>
<td>issues by the</td>
</tr>
<tr>
<td>assess policy</td>
<td>indicators</td>
<td>and Responses) Every zone has particular</td>
<td>meteorological and weather patterns</td>
<td></td>
<td>monitoring</td>
<td>general public</td>
</tr>
<tr>
<td>effectiveness</td>
<td>Water quality</td>
<td>indicators of governance performance, ecology</td>
<td></td>
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<td>Fish age and growth</td>
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<td></td>
<td>parameters</td>
<td>and socioeconomics</td>
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<td>Water quality</td>
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<td></td>
<td></td>
<td>monitoring</td>
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<tr>
<td>Policy gaps</td>
<td>Inter- and</td>
<td>Inadequate data about resources Lack of</td>
<td>Stakeholder education Limited data Inadequate</td>
<td>Information Enforcement Capacity</td>
<td>Lack of overall</td>
<td>Information</td>
</tr>
<tr>
<td></td>
<td>intradepartmental</td>
<td>capacity to collect information given the</td>
<td>legal framework Lack of a land use plan Inadequate</td>
<td></td>
<td>management policy</td>
<td>Enforcement</td>
</tr>
<tr>
<td></td>
<td>data sharing</td>
<td>size of the coastal/ marine area</td>
<td>research and monitoring</td>
<td></td>
<td>or cohesive</td>
<td>Capacity</td>
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<td></td>
<td>for decision</td>
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<td>legislation</td>
<td>Administration</td>
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<td>making</td>
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<td>Ineffective use of</td>
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<td>Communication</td>
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<td>data and information</td>
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<td>information and</td>
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<td>by decision-makers</td>
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<td>management</td>
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<td>decisions to</td>
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<td></td>
<td>stakeholders</td>
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<tr>
<td>Ways online</td>
<td>Streamline data</td>
<td>Reduce extent of national and local efforts</td>
<td>N/A*</td>
<td>Impetus to develop National Ocean Data Center</td>
<td>Allow for more</td>
<td>Acquisition of</td>
</tr>
<tr>
<td>marine atlases</td>
<td>access and data</td>
<td>saving money and time,</td>
<td></td>
<td>via</td>
<td>collaboration</td>
<td>the required data</td>
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<tr>
<td>would improve</td>
<td>sharing</td>
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<td>between</td>
<td>and the establish-</td>
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<td>responsible</td>
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<td>parties</td>
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<tr>
<td>Effectiveness</td>
<td>Barbados</td>
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<td>Dominica</td>
<td>Jamaica</td>
<td>Trinidad and Tobago</td>
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<td></td>
<td>Improve long term access to data and information Distribution point for products and services for stakeholders</td>
<td>mainly during survey and environmental assessment stages Better organization of national and local coastal/marine data series Better holistic vision about relations between local and regional issues Tool for determining management effectiveness Improve the quality of environmental analyses and evaluate the effectiveness of decision making by local management structures</td>
<td>partnership with the CMS and others Easy access to information for development projects Easy access to information for regulatory agencies Archiving of marine data</td>
<td></td>
<td>Higher standards of analysis results Greater efficiency and effectiveness managing key issues</td>
<td>a data protocol on sharing data within and between government departments</td>
</tr>
<tr>
<td>National atlas committee</td>
<td>Established but inactive</td>
<td>No</td>
<td>N/A*</td>
<td>No</td>
<td>No</td>
<td>No, potential partners have been identified and approached</td>
</tr>
<tr>
<td>Resources needed to better address national coastal management priority issues</td>
<td>Computer hardware Advanced training in spatial data analysis, management and database management Additional staff</td>
<td>Improved internet connectivity Better lab equipment with improved analytic capacity Terrestrial transport facilities Specialist training in spatial analyses techniques</td>
<td>Increased training Equipment Financial and technical support</td>
<td>Servers, storage</td>
<td>Organizational buy-in Legislative support Training, human resources, technical resources</td>
<td>Human Technical Financial</td>
</tr>
</tbody>
</table>
3. RESULTS OF THE CMA STRATEGIC PLANNING AND INSTITUTIONAL CLIENT ONLINE SURVEYS

The CMA project has at its core the concepts of capacity building and technology transfer. As a result, the principles and technical proficiency obtained during the CMA development process will only be of maximum utility if they are applied in a local context as well. This principle is the driving force behind the development of the national marine atlas programmes, and requires that a national atlas is moulded to the requirements of various stakeholders in each country. Different countries may have different areas of focus when it comes to the management and distribution of information related to the coastal/marine environment. Some states may focus on fisheries management whereby catch effort, habitats and stock distribution data and the tools to assess all the above would be critical. Other states may consider hazard management to be the priority and thus be more interested in impact model results and socioeconomic data, requiring tools to ensure effective response and management-related decision making. This presents a dilemma however, as the investment in time and resources required to produce several unique atlases is considerable. However as the nations involved in the project are primarily SIDS with similar coastal issues, some synergies may be possible in terms of application development and tool requirement. Thus an improved understanding of the function, activities, data analysis, and data/product delivery needs of the respective national institutions spear-heading their national marine atlas programmes is required.

In February 2010 regional participants in the CMA project were directed to a pair of online surveys developed by the Regional Coordinator, with input from Ned Dwyer of the Marine Irish Digital Atlas (MIDA). The first survey (The Caribbean Marine Atlas Planning Survey) was designed to obtain specific information regarding the function, basic policy framework and general operation of the institutions represented by the regional participants as they relate to marine data. The second survey (The Institutional Client Survey) was distributed by the participants to the national institutions to which their organizations provide environmental data and information. The goal of this survey was to identify the types of spatial data, products and services that the respective agencies provide to their institutional clients, as well as any shortcomings of these arrangements, in terms of -among other things- the ease of access to the data and the frequency of updates.

The regional coordinator Mr. Roach conveyed the results of the surveys to the participants via powerpoint presentation, and the report document is also available as Annex IV The main conclusions from the surveys were as follows:

- **CMA Planning Survey**
  - Focus on atlas development and maintenance training (OpenLayers, GeoNetwork, advanced spatial data and DB management)
  - National-level spatial data infrastructures need to improve for national atlases to be effective

- **Institutional Client Survey**
  - Client needs fairly similar (require a range of products and services)
  - Data and service delivery lacking in some areas

- **Overall Conclusions**
  - Urgent need for cost-effective and streamlined spatial data management solutions in the region
  - A simplified mechanism is required for both local and regional spatial data and metadata discovery and distribution
  - Additional training and possibly staff are required to improve regional spatial data management capacity
  - The national and regional atlas development process will provide tangible and long-term benefits
The discussion after the presentation also provided useful feedback. The participants agreed that the surveys were a useful tool and provided valuable information, but suggested that the survey be repeated in the future to increase the sample size of institutional client respondents. Another suggestion was that the survey be provided as a link on the CMA website so that users can provide feedback and the atlas editors can identify any changes necessary to make the atlas more user-friendly.

4. COASTAL ATLAS EXAMPLES

On the second day of the conference, participants received a presentation on several examples of coastal atlases (including their functionality and usability) from Dr. Marcia Berman of the Center for Coastal Resources Management, Virginia Institute of Marine Science, College of William and Mary; and also representing ICAN. The speaker began by focusing on the definition of a “coastal web atlas”:

![What is a Coastal Web Atlas?](image)

Ms. Berman indicated that the definition highlights the fact that a coastal web atlas is not just about geographic data, but also about the information (pictures, documents, illustrations, graphs) encompassing a certain data theme. The definition also underscores the provision of tools and functionality to interrogate the geographic data and information via a web interface. The speaker then described examples of coastal web atlases from both the east and west coasts of the US, as well as atlases from Ireland and Belgium. The reviewed atlases were:

- Oregon State University coastal atlas: [www.coastalatlas.net](http://www.coastalatlas.net)
- Virginia Coastal GEMS: [http://www.deq.state.va.us/coastal/coastalgems.html](http://www.deq.state.va.us/coastal/coastalgems.html)
- The coastal atlas of Belgium: [http://www.kustatlas.be](http://www.kustatlas.be)

While the atlas examples demonstrated the power of an online mapping and information system to provide high quality data for decision making, they also highlighted some of the potential pitfalls for such systems if they are poorly designed. Some of the atlases took a long time to display newly selected layers, and others didn’t display information at all due to incompatibility with some browsers.
Others provided few tools for manipulating or accessing additional information, or had complicated user interfaces and a lack of help documentation. Ms. Berman noted that as a result, several considerations have to be factored into the design of a coastal web atlas if they are to be useful, effective and successful in achieving their goals. The speaker noted the considerations as follows:

- **Know your target audience**
  - Environmental managers for government
  - NGOs
  - Researchers
  - Private citizens

- **Consider the usability of the atlas**
  - Simple/familiar design of navigation tools, query tools, etc
  - Don’t overload the user with information
  - Provide a comprehensive information platform around selected topics
  - The site is able to handle updated/augmented information well

- **Consider the usefulness of the tools information contained in the atlas**
  - Obtain user feedback
  - Monitor use patterns
  - Conduct workshops

- **Establish key partnerships to ensure sustainability**
  - Data providers
  - Technology providers
  - Funding sources
  - User groups

- **Develop a robust, highly available online atlas application**
  - Consider the most appropriate institutional stakeholder to manage the system
  - Plan for upgrades and updates
  - Consider speed and ease of use
  - Maintain metadata
  - Design the system for interoperability

These topics and others were ample fodder for the discussions that followed the presentation. Ms. Berman reiterated that atlases must have a clearly defined purpose based on the potential audience or user-base; and that the data, tools and functionality you include in the atlas need to be defined in those terms. Furthermore if tools are provided, they need to work simply and be reliable. She also noted that tools can be very effective in resolving use conflicts. Ms. Berman and Mr. Pissierssens also noted that help resources for inexperienced users need to be provided and be easy to find on the site to mitigate against user frustration. Another aspect related to diverse user bases was the provision of static map resources for users who just require generic, pre-built map products.

One note of concern from Pauline Simpson was the issue of promoting buy-in and generating sustained interest in a national atlas programme. Ms. Berman responded that a national atlas could at least initially be geared towards a particularly important industry such as tourism, and could bring onboard and energize key stakeholders. Again on the subject of buy-in, Ms. Laverne Walker of Saint Lucia noted that there would likely be high-level resistance to the concept of open access to some datasets and issues to do with confidentiality of some datasets. Mr. Roach and others responded that a clear and comprehensive data sharing and distribution policy would have to be developed for the country if one had not been already. Such a policy would identify what data can be distributed, how it can be delivered and to who.

Another issue raised during the discussion was of the need to convince high-level decision makers of the importance of the timely sharing of data between government departments, and making it available...
to the wider stakeholder community free of charge. Mr. Pissierssens and Ms. Berman both indicated that baseline data itself is not particularly valuable, but that the products and services developed using the data have to potential to provide both direct and indirect revenue streams, as value is added to them and they are used in a business environment.

Overall the presentation and the discussions provided valuable information as to how the CMA and national atlas programmes can work towards atlas systems and supporting data management infrastructure that have the potential to become effective, integrated and sustainable tools in the framework of marine and coastal area management policy.

5. NATIONAL ATLAS DEVELOPMENT CONSIDERATIONS

The main focus of the remainder of the workshop was the national atlas development process. However before any national plan is put into motion, an initial exercise identifying key parameters (such as the theme, potential users and data sources) is required. This was the purpose of the National Atlas Goals group exercise conducted on the second day of the workshop. Performing the exercise not only allowed participants to form a clear conceptual picture of what roles their respective national atlases would fulfil and which organizations would be involved in their development, but as the exercise was performed as a group, participants could benefit from their colleague’s inputs and insights. As tasks for the exercise, the CMA national representatives were asked to:

- Identify users
- Identify a lead agency
- Identify partner agencies/institutions
- Determine area or areas of focus
- Identify data themes
- Identify data sources
- Indicate local capacity/ability to manage the hardware/software systems
- Suggest what functions the atlas should perform

The results of the exercise are shown in the table below. Under the “identify data themes” task, participants were asked to not only show which themes or datasets they would like in their respective atlases, but also to identify those datasets which they currently have or know to exist nationally (in bold), versus those they know are lacking. In addition, the majority of the items under both the “other data sources” and “atlas functions” tasks apply to or were requested by all participants.

<table>
<thead>
<tr>
<th>Identify users</th>
<th>Barbados</th>
<th>Cayman Islands</th>
<th>Cuba</th>
<th>Jamaica</th>
<th>Trinidad and Tobago</th>
<th>Saint Lucia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal planners</td>
<td>Environmental managers</td>
<td>NGOs</td>
<td>Planners (national to local level)</td>
<td>Planners Environmental agencies</td>
<td>Students Regional environmental organizations</td>
<td>Coastal and marine gov and non-gov agencies</td>
</tr>
<tr>
<td>Environmental managers</td>
<td>Researchers</td>
<td>Private citizens Researchers</td>
<td>Tourism</td>
<td>Developers</td>
<td>National environmental management agencies</td>
<td>Planners</td>
</tr>
<tr>
<td>Researchers</td>
<td>UK gov Other gov Deps. without GIS capability</td>
<td>Agriculture Research</td>
<td>Fisheries</td>
<td>Developers</td>
<td>Developers</td>
<td>Developers</td>
</tr>
<tr>
<td>Regional environmental</td>
<td>Tourism</td>
<td>Institutes</td>
<td>Research Institutes</td>
<td>Disaster management</td>
<td>Hoteliers/tourism sector</td>
<td>Hoteliers/tourism sector</td>
</tr>
<tr>
<td>management agencies</td>
<td></td>
<td>Disaster management</td>
<td>Students</td>
<td>Researchers</td>
<td>SLNT</td>
<td>SLNT</td>
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<tr>
<td>Researchers</td>
<td></td>
<td>Students</td>
<td>General public</td>
<td>Developers</td>
<td>SMMA</td>
<td>SMMA</td>
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<tr>
<td>Students</td>
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<td>Researchers</td>
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<td>Foreign Affairs</td>
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<td>General public</td>
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<tr>
<td>Identify lead agency</td>
<td>CZMU</td>
<td>Dept of Env</td>
<td>Environmental agency from Min Sci, Tech and Env</td>
<td>NEPA</td>
<td>IMA</td>
<td>Min of Physical Development and Environment</td>
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<tr>
<td>Identify partner agencies/institutions</td>
<td>Town and Country Planning, Environmental Protection Dept Water Authority UWI, Bellairs Research Institute Fisheries, Lands and Surveys, Private individuals</td>
<td>Planning, Agriculture, Lands and Surveys, Water Authority, Tourism, Central Caribbean Marine Institute, National Trust Port Authority</td>
<td>Coastal Ecosystem Research Centre, Tropical Geographic Institute, Oceanology Institute, Meteorologic Institute, National Protected Area System, GeoCuba, Local centers for Env Studies, Local centers for capacity bldg in coastal management, Local dependencies of tourism, agriculture, fisheries</td>
<td>UWI MONA Fisheries Div, Planning Inst. of Jamaica, Office of Disaster preparedness STATIN, MONA Geo-Informatics National Lands Agency</td>
<td>UWI Water Resources Agency, WASA, Min of Works, Min of Planning, Min of Agriculture, Min of Information, Min of Energy, Min of Education, Min of Science, CEP, WRI, GRID ARENDAL, IMO, Private consultants and companies Cropper Foundation, Tobago House of Assembly, Buccoo Reef Trust, Env Tobago</td>
<td>Fisheries, SLNT, SMMA, Statistics Dept, SLASPA, Min of Phys Dev, Min of Health, NEMO</td>
</tr>
<tr>
<td>Area or areas of focus</td>
<td>Coastal planning, Coastal resource conservation, Coral reef protection, Hazard management, Marine recreation</td>
<td>Coastal/marine conservation, Tourism, Coastal Planning, Climate change adaptation</td>
<td>Coastal management, Climate change adaptation, Disaster management, Coastal Planning, Protected areas, Tourism development</td>
<td>Coastal management, Disaster management, Tourism Planning</td>
<td>Integrated CZ management, Fisheries management, Watershed management, Submerged cultural resources, Climate change adaptation</td>
<td>Coastal resources management, Disaster management, Integrated coastal zone management, Watershed management, Fisheries management</td>
</tr>
<tr>
<td>Identify data themes</td>
<td>Cadastral, Coastal planning, Coastal and marine habitats, Water quality, Bathymetry, Topography, Hydrology, Coastal processes, Socioeconomic, Land use, Physical oceanography</td>
<td>Coastal infrastructure, Recreation/Tourism, MPAs, Terrestrial/coastal/marine habitat, Biodiversity, Land use, Hydrology, Water quality, Habitat threats, Cadastral</td>
<td>Topography, Bathymetry, Morphology, Geology, Soils, Coastal habitat, Biodiversity, Socioeconomic, Infrastructure, Management, Coastal erosion, Hazard and vulnerability</td>
<td>Coastal resources, Coastal erosion, Coastal hazards, Water quality, Marine protected areas, Tourism, Oceanographic data, Fisheries, Infrastructure, Watershed and hydrology, Nearshore</td>
<td>Coastal habitats, Marine habitats, Bathymetry, Coastal processes, Watershed, Elevation, Development, Land Use</td>
<td>Fisheries data, Marine recreation, Bathymetric, Coastal habitat, Water quality, Hazard and vulnerability data, Coastal processes, Watershed, Hydrology, Infrastructure, Buildings and...</td>
</tr>
</tbody>
</table>
The results of the exercise highlighted several positive factors with respect to the national atlas development process. Firstly it appears that all of the partner countries involved have a wide-ranging potential user base, including other government departments, research institutions, NGOs and the general public. This portends well for the effort, as the more sectors that find a national atlas to be essential, the more likely it is that efforts to support its maintenance and growth will be successful. Furthermore, all participants identified a large number of partner agencies, some or all of which would ideally be part of their respective national atlas committees. This not only means that for each country the development process would benefit from a range of skill sets and areas of expertise, but also that access to data held within the separate agencies should be easier and multiagency buy-in and support from both an administrative and technical level should be less tentative. Next, all of the participants identified a large number of data themes which they knew to exist at a national level, meaning that there is a great potential for the national atlases to provide a comprehensive array of data and information around a particular environmental topic such as nearshore habitats or coastal vulnerability,
satisfying one of the requirements identified by Marcia Berman as being an essential component of an effective coastal web atlas.

There were some areas of concern. For instance in the case of Saint Lucia there were several identified data themes (bathymetry, coastal processes, land use) identified as being important components of their national atlases, but which are not known to exist nationally. Furthermore, while it is commendable that many countries have identified a range of themes to address as part of their national atlases, having too many themes may slow the development process, as more data needs to be collected and processed. In response to the first issue, Mr. Roach indicated that one of the functional benefits of a national marine data repository like an atlas was the ability to perform gap analysis and focus research efforts and funding requests to address these gaps. In terms of the large number of atlas themes, Sean Padmanabhan from Trinidad recommended that each country initially focus on one thematic area to get their national atlases published quickly, with the intention of including additional thematic areas over time. Mr. Roach added to this comment by indicating that efforts should also be focused on the collection and processing of data and information that are already in digital or GIS formats, and not seeking to undertake a large digitization process, reducing both the time and effort required to populate an atlas with information. Participants also agreed within this forum that a standardized MOU form should be developed for formalizing agreements with potential data providers, and that a data and metadata policy should be developed based upon the IOC Oceanographic data exchange policy.

Overall the exercise was a beneficial one, and should provide national representatives with a good starting point for organizing their national committees and commencing their national atlas programmes.

6. COOPERATION AND INTERACTION OF THE CMA WITH OTHER PROJECTS

Day three of the workshop consisted mainly of presentations by regional and international agencies or groups that the CMA could interact with in the future. The CMA has the potential to not only be a repository for regional-scale data and information, but to also be the archive for spatial data collected as part of coastal/marine-related regional projects and programmes. As a result the mechanism by which the CMA can interact with such groups needs to be carefully considered and developed. The invitation and subsequent discussions with representatives from different regional and international bodies is just the first step towards promoting the CMA as an essential component for long term coastal/marine environmental data management.

6.1 International Coastal Atlas Network (ICAN)

Ms. Berman began her second presentation of the workshop by recounting the origins of ICAN. Administrators from two coastal atlases (MIDA and the Oregon Coastal Atlas) recognized the emergence of coastal web atlases across the globe and determined that the field would benefit from a governance structure, a mechanism to disseminate best practices and a coordinated approach to finding solutions to common problems. In July of 2006, the above understanding prompted the first meeting of the group of coastal web atlas developers that would become the core component of ICAN. The workshop brought together representatives from the UK, Ireland, other European countries and North America with the goals of strengthening the relationships between experts in marine and coastal mapping, as well as to identify state of the art approaches to coastal mapping and informatics. The workshop made several recommendations, both local in scope (updating and cataloguing improvements, better integration with environmental policy development) and at a global coordination level (distribution of best practices, promotion of efforts, implementation of ontologies). Ms. Berman explained that ontologies specified the ways keywords describing data are mapped to one another. For
example one atlas may use the term seabed and another use the term sea floor, but they both describe the same physical feature. In a larger context, this means that if any data is going to be shared or compared between atlases, there has to be a way to equate descriptive terms with each other. This is where ontologies have their value, and are the primary tool in ensuring interoperability between different atlases frameworks. They also provide for a more uniform and pleasant user experience.

Figure 3: Participants in the first “ICAN” workshop

The speaker noted that interoperability was such a high priority for the effort that it was chosen as the theme of the second ICAN workshop in July 2007. The workshop covered topics such as the marine metadata interoperability, the transformation of metadata to ontologies, and the demonstration of an interoperability prototype (allowing for a combined search of the MIDA and Oregon Coastal Atlas databases) which relied on ontological relationships.

The third workshop in Copenhagen in July of 2008 provided a forum for additional discussions with regard to interoperability, but had as its core focus the development of strategic goals for ICAN and the establishment of a governance structure. One of the key outputs of the workshop was the definition of goals defining the mission of ICAN, namely:

- to be a global reference for the development of Coastal Web Atlases (CWAs)
- to develop technical and policy guidelines to assist coastal web atlas developers
- to encourage and facilitate global-level operational interoperability
- to facilitate the exchange of knowledge and experience among atlas developers in order to find common solutions for the development of CWAs
- Inform regional decision- and policy-making across themes: examples: climate change, marine spatial planning, population pressures, coastal governance

This focus on governance continued into the fourth workshop in Italy in 2009, where aspects of the governance structure of ICAN were refined and impacts to sustainability of the project and coastal atlases in general were addressed. Ms. Berman noted that this workshop also brought attention to issues regarding usability of atlases and the provision of analysis tools. Interoperability was also an important topic, with the participants continuing the development of an ontology and interoperability “cookbook” for CWAs.

Ms. Berman ended her presentation by noting that ICAN now encompassed more than 30 institutions from 14 nations and continues to expand. The network is also an invaluable resource for web atlas development, being host not only to a large number of technical resources and guideline documents on the atlas development process, but also providing a directory of experts in the field of online mapping and informatics. She assured the participants that ICAN stood ready to assist the CMA in any way they could, particularly in the areas of technical support and the application of best practices.
6.2 UNEP CARIBBEAN ENVIRONMENT PROGRAMME: GIS CAPACITY BUILDING INITIATIVE

The second presentation of the day was made by Mr. Marko Tosic of the UNEP Caribbean Environment Programme (CEP). Mr. Tosic began his presentation by outlining the background of UNEP CEP as a constituent of the UNEP Regional Seas Programme, with the mission to promote regional co-operation for the protection and development of the Wider Caribbean Region. The programme is also the operational extension of the Cartagena Convention. The speaker continued by describing the implementation of UNEP CEP through several sub-programmes such as the Specially Protected Areas and Wildlife (SPAW) programme and the Assessment and Management of Environmental Pollution (AMEP) programme, the latter hosting both the Oil Spill and land Based Sources of Marine Pollution (LBS) protocols. Mr. Tosic explained that it is the goal of the AMEP programme to control, prevent and reduce pollution of the coastal & marine environment from land and marine-based sources & activities; thereby enabling countries of the WCR to meet their obligations under the Land Based Sources of Marine Pollution & Oil Spills Protocols. As part of this process UNEP CEP has determined that the development of GIS capacity within the region will improve the ability of states to effectively manage watersheds, land-based sources of pollution and environmental resources such as coral reefs. This prompted the organization to partner with CiMAB (Centro de Ingenieria y Manejo Ambiental de Bahias y Costas) in Cuba and CATHALAC (Centro del Agua del Trópico Humedo para America Latina y el Caribe) in Panama to conduct several training workshops as case studies in the application of GIS technology to the management of watersheds where such techniques had been lacking, with topics including basic GIS training and the modeling of non-point sources of pollution.

![Figure 4](image_url)

**Figure 4:** Map of the Wider Caribbean Region indicating the vulnerability of coral reefs to a variety of threats.
The speaker praised the success of the workshops, but noted that more needed to be done throughout the region to improve GIS capacity. According to Mr. Tosic, recommendations coming out of the Global Environment Facility (GEF) Integrating Watershed and Coastal Area Management (IWCAM) project have stressed the need for additional training in basic and advanced GIS techniques, the promotion of GIS as an important tool in developing data products and services as well as for monitoring and evaluation of resources, and the development of robust standards for geographic data distribution (metadata, best practices).

To fulfil these requirements, UNEP CEP is planning a series of training activities in areas such as basic GIS, spatial analysis for watershed management, database management and bridging to science/policy interface. Another component of the plan is to develop guidelines for GIS database management (including metadata) and to compile case studies on the application of advanced spatial analysis to characterize terrestrial and marine ecosystems. The speaker noted however that the plan was still without funding (US$ 200,000 est.), and that UNEP was having some difficulty in acquiring the necessary financial support. However, he also noted that since there are a number of GIS initiatives ongoing in the region, there may be an opportunity for collaboration and thus the maximal use of scarce resources. Mr. Tosic then proceeded to demonstrate IPAM (Interactive Project and Activity Map), a simple web map application developed by UNEP CEP in cooperation with CATHALAC for the display and querying of information related to regional environmental projects and programmes. The application has some of the structure of a CWA, but does not have the visualization or distribution of environmental datasets as its core function, and is mostly limited to the input of point data types. It also uses the Google Maps API as its rendering engine. The speaker also showed images of the GEF REPCar coastal monitoring system (ARGOS) and from the in-development GEF-IWCAM project atlas.

Mr. Tosic completed his talk by reiterating the need for collaboration between regional GIS projects, and called for the development of data sharing standards so that the various efforts could exchange data with one another. The last point is especially important, as building interoperability into systems early can reduce much of the workload required to integrate online GIS platforms. During the post-presentation discussion, the comment was made by Marcia Creary that while it was often difficult for government agencies to obtain data from other government departments or IGOs, UNEP seemed to have little trouble obtaining the information. Mr. Tosic responded by noting that all of the data UNEP had collected was through the various regional environmental projects, and that it may be able to act as an intermediary for data discovery and exchange.

6.3 The Caribbean Coastal Data Centre (CCDC)

The last presentation of the workshop was made by Ms. Marcia Creary, Environmental Data Manager of the Caribbean Coastal Data Centre. She began by discussing the evolution of the CCDC from a centre responsible for managing the data emanating from the CARICOMP and CPACC projects, to an institution serving the marine data management needs of the Centre for Marine Sciences of the University of the West Indies Mona campus. Ms. Creary continued by suggesting that considering the mission statement of the CCDC, namely “...providing a data archiving facility, with important, accurate and reliable data on national and regional research, monitoring and other projects implemented within the coastal zone”, the CCDC has the potential to become a key component in any regional marine data management framework. The speaker then detailed the current functions of the CCDC, including:

- To provide data archival support to various regional and international marine monitoring programs, including data entry, error-checking and quality control.
- To design and develop appropriate databases to facilitate easy retrieval of data and the exploration of relationships in the datasets.
- To disseminate data, reports and summaries as required by the monitoring programmes.
To act as a focal point for communication, facilitating discussion between CARICOMP Site Directors and the Steering Committee as well as other individuals and agencies.

To act as the coordinator of the Northern Caribbean and Atlantic node of the Global Coral Reef Monitoring Network (GCRMN).

To act as the focal point for the local Jamaica Coral Reef Monitoring Network (JCRMN).

The speaker noted that the role of the CCDC in managing data for so many regional projects has fostered good working relations and linkages with not only the projects and organizations highlighted previously, but also with programmes like Mainstreaming Adaptation to Climate Change (MACC), REEF CHECK and the Atlantic and Gulf Reef Rapid Assessment (AGGRA) project. She indicated that the CCDC also has mature relationships with governmental, NGO and international agencies from NEPA in Jamaica, to The Nature Conservancy and NOAA in the United States.

Next Ms. Creary discussed the future plans of the CCDC, namely the re-establishment of their online data delivery programme (halted due to a lack of funding), the provision of data management services, the development of data products and the authoring of publications. The speaker concluded her talk by stating that the CCDC was uniquely placed to be a major player or even an official data centre for regional marine data, given the reach of the UWI (16 Caribbean countries), the activities and linkages it has with other data collection/management organizations, its access to researchers and graduate students through the UWI system, and its expertise and infrastructure for the management of large volumes of marine data. She also noted that the above would make the CCDC a good candidate to be Jamaica’s NODC.

All of the above would indeed make the CCDC a key data partner with the CMA, possibly even the permanent home for the management of the CMA if the organizational structure of the centre was to be expanded (currently only one staff member dedicated to the running of the CCDC). However, there were some questions as to the potential role of the CCDC. Mr. Pissierssens enquired as to whether the CCDC could be authorized to act as a regional data centre, considering their association with the UWI rather than having a mandate from a body such as CARICOM, which is truly regional in scope. Ms. Creary indicated that she would discuss the matter with the Director of the CMS. Another question directed at Ms. Creary was from Ms. Simpson. She enquired as to the nature of the data sharing agreements between the CCDC and its data providers such as CARICOMP. Ms. Creary indicated that while there was an agreement to share data after a 2 year hold, there had been issues in the past with regard to citation of the project in scientific literature which led to the cessation of sharing of that dataset through the CCDC. This incident highlights the necessity of a robust data sharing policy for the CMA and any similar regional data sharing initiatives.

7. COMPONENTS FOR THE DEVELOPMENT OF A NATIONAL MARINE ATLAS

The final exercise of the workshop was the development of a timeline for the implementation of the national marine atlases for the participating countries, based upon a set of ten activities or components that, in conjunction with additional training, would lead to the realization of a robust atlas product. The list of activities were proposed by the Regional Coordinator and later agreed upon by all of the regional participants. The results of the exercise are shown below, and establish a tentative timeline for the development of the national atlases.
National Atlas Development Checklist Questions

### Administrative activity

- **Component 1**
  - Plan and implement a national stakeholder meeting
- **Component 2**
  - Establish or restart a national atlas committee
- **Component 3**
  - Have the national committee select a national area of focus/main theme for the atlas
- **Component 4**
  - Determine what data related to the area of focus is available nationally for inclusion in the atlas
- **Component 6**
  - Obtain high-level agreement on what type(s) of data can be made available and how

### Concurrent technical activity

- **Component 5**
  - Develop formal or informal data sharing agreements with identified data partners
- **Component 7**
  - Collect and/or access the available data
- **Component 8**
  - Format the data for inclusion in the atlas, focus being on data currently in GIS formats
- **Component 9**
  - The collection and formatting of auxiliary data and information (e.g. pictures, documents, etc)
- **Component 10**
  - Delivery of the data and information to the national atlas developers/editors

*The time needed to accomplish this activity is heavily dependent on the area of focus chosen. If it is in line with area of focus and data housed within the implementing institution, the timeline could be considerably shorter.*

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Of particular importance is the extreme difference in completion dates estimated by the national representatives, ranging from early 2011 for Trinidad and Tobago to mid 2013 for the Cayman Islands. However it is expected that as states begin the process of atlas development, the timelines will be adjusted downwards due to the division of labour as a result of the formation of the national committees. Furthermore, Component 4 (the determination of the national data available related to the selected area of focus) is heavily dependent on the focus area selected. If the selected focus area is directly related to the function of the implementing agency, then it is likely that the majority of data and information is located in-house; reducing or eliminating the need to acquire data from other agencies or institutions, and dramatically reducing the time required to complete the activity. The Regional Coordinator stressed that efforts should be focused on the collection and processing of data that is already in GIS format to reduce the workload required to develop a working product. He added that additional data could always be added later. The participants were also urged by the regional coordinator to submit revised timelines as required. In addition, Mr. Pissierssens indicated that ideally participants should be aiming to have a functional atlas product ready by late 2011.

The participants were also convinced of the potential for stakeholder events to energize national partners and future users of a national atlas. Cuba and Jamaica were particularly keen to have events similar to the upcoming Saint Lucia stakeholder workshop occur in their respective countries. During the session, Jamaica indicated that they would like the next national stakeholder event to occur there. However, given the timelines decided for the development components (see above) Cuba may be the first to host a stakeholder event after Saint Lucia. Additional consultation with the participating states, as well as an analysis of the results of the Saint Lucia workshop will determine the order and format of future stakeholder events.

Ms. St. Catherine of Saint Lucia also indicated that some types of data like road networks had standard colour schemes and other attributes used in traditional mapping, and that these should be adhered to for all of the national platforms to provide a more uniform user experience.

It was also during this part of the workshop that training needs were articulated, with the following topics identified as being essential for the development process of both the CMA and the national atlases:

- Provision of data management tools to participants (Ocean Teacher)
- Metadata management training (GeoNetwork)
- Opensource programming (OpenLayers)
- Database management (for CMA datasets)
- Ocean data management
  - Basic GIS training with special attention to data processing for atlas management
  - Database design and management (for institutional data management)

The timeline for these training sessions will be specified upon consultation with the requisite tutors or training organizations, and will run in sync with the timelines for the various national atlas component activities.

8. CLOSING OF THE PLANNING AND REVIEW WORKSHOP

The Regional Coordinator brought the workshop to a close by briefly reviewing the major achievements of the three-day session. Along with the re-engagement of regional experts and the re-invigoration of the CMA programme, participants:
1. Received a review of the progress of the atlas and were given a demonstration of the atlas prototype;
2. Gained a better understanding of the challenges, benefits and goals of web atlases and environmental data dissemination platforms in general;
3. Identified the necessary inputs (area of focus, data partners, themes, functionality) for the development of their respective national atlases;
4. Determined the steps required to implement a national atlas (workplan) and developed a tentative timeline (schedule);
5. Would the following day take part in a national stakeholder event which would promote the atlas concept, show the benefits of coastal web atlases, encourage stakeholder buy-in and identify national atlas partners

Mr. Roach then thanked the participants for taking part in the seminar and providing such valuable input to the project. He challenged them to stay engaged in the process and to work diligently to complete the steps necessary to implement their respective national atlas. He concluded that while a national marine atlas was a useful tool, it must be a component of a larger national framework for spatial data management for it to be sustainable and truly effective.

Next Mr. Pissierssens gave his closing remarks to the group. He began by thanking Ms. St. Catherine for her and her team’s hard work in coordinating the meeting and noted that the needs of all of the participants had been ably attended to. He then called upon participants to remember that the entire purpose of the project was to provide tools and platforms to improve sustainable coastal zone management in the region. And that while there may be many hurdles to overcome, the potential benefits to environmental managers and states as a whole made the effort worthwhile. He also noted that for a national atlas programme to be effective, inputs were required from multiple stakeholders, and that the sum of these inputs would provide benefits for all atlas users and serve the national interest. Mr. Pissierssens finished by suggesting that ways in which some administrative hurdles could be overcome and momentum for a national project gained would be to involve the designated IOC Action Addresses and UNESCO contacts for each country early in the process. In this way more weight would be placed upon requests for inter-departmental data sharing and cooperation. He then thanked all of the participants for attending the meeting and for their continued involvement in the CMA project.
9. SAINT LUCIA NATIONAL STAKEHOLDER EVENT

The inaugural stakeholder meeting in Saint Lucia was the first in a planned series of national stakeholder events aimed at sensitizing the local marine and coastal zone stakeholder community to the national marine atlas project and its progress, receive feedback and identify potential partners. The event was well attended, with representatives from government (Fisheries Division, Tourism and Civil Aviation, Marine Police, Survey Department, Physical Planning Unit, Crown Lands Division), private sector stakeholders (Saint Lucia Air and Seaports Authority, Soufriere Marine Management Authority, Watercraft Committee, Rodney Bay and Marigot Bay Marinas, Saint Lucia National Trust) and international governmental organizations (UNEP CEP, Caribbean Environmental Health Institute, Organization of Eastern Caribbean States).

9.1 Opening of the Meeting

Mr. Peter Felix, Chief Surveyor of the Ministry of Physical Development launched the inaugural meeting by thanking the participants for attending at fairly short notice and appreciating the importance of the event. In his opening remarks, Mr. Felix stressed the importance of access to data that describes coastal habitats for effective coastal management, noting that the tourism industry had much to gain by supporting efforts to better characterize the coastal zone of Saint Lucia. The speaker then articulated the necessity of full participation by all stakeholders in activities aimed at protecting and conserving water and coastal resources. Mr. Felix concluded by urging participants to contribute to the success of the meeting, the CMA and the national atlas projects by providing useful feedback and remaining committed to the process.

The Regional Coordinator for the CMA, Mr. Roach then took to the podium and thanked Mr. Felix for his words of encouragement. He then thanked the participants for coming to the stakeholder meeting and contributing to the success of the project. He then introduced the concept of the CMA as an online atlas of coastal and marine data available to the general public, but noted that while this project was underway and would become an important component of a regional marine data management framework, the current meeting was devoted to the implementation of Saint Lucia’s national marine atlas. Mr. Roach then echoed the comments of Mr. Felix encouraging the stakeholder group to have a highly constructive meeting and get the national atlas effort in Saint Lucia off the ground. The Regional Coordinator then asked the participants to introduce themselves and indicate the agency or organization they represented.
The meeting itself was divided into two sections; presentations on the importance, usefulness and potential of CWAs and spatial data management frameworks to improve coastal zone management; and a breakout group session where participants were tasked with answering a series of questions on local priority issues in coastal zone management as well as aspects of the national atlas project.

9.2 Introduction to the IOC and IODE

The first presentation was delivered by Mr. Peter Pissierssiens, Programme Coordinator of the International Oceanographic Data and Information Exchange (IODE) of the Intergovernmental Oceanographic Commission of UNESCO (IOC). He began by discussing the institutional and administrative structure of the IOC, including its compliment of 138 member states, Secretariat and field offices. The speaker then described the mandate given to the IOC upon its creation in 1960, i.e.

“…to promote international cooperation and coordinate programmes in research, sustainable development, protection of the marine environment, capacity-building for improved management, and decision-making.”

Mr. Pissiersens noted that it has been these guiding principles which have kept the organization at the forefront of efforts to effectively manage the marine environment across the globe, and be keenly involved in more recent efforts to ensure the prevention and reduction of the impacts of natural hazards, the mitigation of the impacts and adaptation to climate change and variability, safeguarding the health of ocean ecosystems, and the development of management procedures and policies leading to the sustainability of coastal and ocean environment and resources. Operationally, the IOC implements its policies via 4 main programmes: Ocean Sciences (including the Harmful Algal Bloom and Integrating Watersheds and Coastal Areas Management programmes), Ocean Observation and Services (including the Global Ocean Observing System and the IODE), the Tsunami Coordinating Unit and a Capacity Building Unit.

The speaker then turned his focus to the operations of the IODE, noting that the body was founded immediately after the IOC in 1961, with the mandate:

“...to enhance marine research, exploitation and development by facilitating the exchange of oceanographic data and information between participating Member States and by meeting the needs of users for data and information products.”

He added that the IODE had as its core principles the empowerment of states to better manage their marine data, the facilitation and championing of data exchange, the promotion of the use of international data standards, the improvement of capacity and the support of international scientific marine programmes. Adding that as members of the organization, states were required to provide timely, free and unrestricted access to all data collected under the auspices of IOC programmes. Mr. Pissierssens then briefly described some of the achievements and ongoing projects of the IODE.
Mr. Pissierssens also discussed the rationale behind the IODE’s Ocean Data and Information Network (ODIN) strategy as a means to address the divide between countries with advanced ocean research programmes and those with limited capacity to participate in the analysis of global environmental issues such as climate change. He noted that the strength of the ODIN programmes (Africa, the Caribbean, Europe, Asia, the Pacific) comes from their regional-level focus on training activities and capacity building, and the linking of these activities with equipment and operational support for the development of data products and services. The efforts also have a multi-stakeholder approach, a strong focus on institutional networking and the make provision for the efficient dissemination of data and information to institutional clients.

Mr. Pissierssens concluded his talk by reviewing the training activities that had been conducted by the IODE over the years and noted that IODE was contemplating the establishment of regional training centres in order to make training workshops available to a wider audience on a more frequent basis.

9.3 Marine Data Management in the Caribbean

The next presentation was by Sean Padmanabhan of the Institute for Marine Affairs (IMA) in Trinidad. Mr. Padmanabhan informed the participants that the purpose of his presentation was not to provide an exhaustive analysis of data management practices in the region, but to describe the potential benefits an integrated approach to environmental data management and data delivery can bestow upon the fields of marine and coastal areas management. He described how the countries of the Caribbean region were heavily dependent on their coastal zones for their economic growth and sustainable livelihoods, but that the myriads of competing uses for the space (shipping, tourism, industry, agriculture, housing, etc) and vulnerability to natural and anthropogenic threats (storms, inundation, climate change, over-exploitation, pollution, etc) makes the effective management of the coastal zone in a sustainable way extremely complex and multi-sectoral in nature. The speaker then noted that access to environmental data and supporting information was critical to ensuring that the right decisions were being made with respect to resource conflicts and environmental stewardship.

According to Mr. Padmanabhan, there has been a fair amount of work undertaken by various entities in the region (governments, NGOs, IGOs, private sector) to assess and monitor coastal resources. He noted however that the region as a whole suffers from several shortcomings which impede the ability of states to use environmental data for decision-making, including:

- Limited/inconsistent human resources & expertise (availability, knowledge, etc.) for environmental assessment and monitoring
- Limited knowledge of and/or experience with indicators of environmental quality
- Lack of standards (data collection, formats, storage, management, use policies, etc.)
- Limited access/sharing of data
- Limited time series
- Limited data analysis
- Limited use of tools and techniques for best available products
- Slow delivery of outputs to users (managers, decision-makers, etc.)
- Data loss
- Data aging
- Spatial and temporal gaps in data

Mr. Padmanabhan then described the way a well-designed data management strategy could address many of these issues. He began with the definition of data management:
“Data management is a group of activities relating to the planning, development, implementation and administration of systems for the acquisition, storage, security, retrieval, dissemination and archiving of data.”

The speaker continued by stating that the first step towards effective data management as an organization and indeed at the state level was the development of a robust data policy. He noted that such a policy must consider:

- Data protection – Archiving, backups, avoiding corruption, access restriction
- Data Ownership – Which department/agency is responsible for what data types, who is the source of the official version of a particular dataset
- Metadata Management – The creation and maintenance of accurate, informative metadata for all datasets
- Data Lifecycle Control – Specifying where and how data is stored, phasing out of old datasets, update frequency
- Data Quality Control – Error checking, data coherence, specifying scale and usage criteria
- Data Access and Dissemination – How, by who and how long data can be accessed or distributed, data formatting, data compilation

Mr. Padmanabhan described that the implementation of an effective data policy (and the improvements in access to data it would allow) would provide far reaching direct and indirect benefits, such as:

- **Direct benefits**
  - Improved understanding of local and regional environmental processes and issues (e.g. species vulnerability, atmospheric processes, climate variation)
  - Improved decision-making
  - Smarter resource allocation to fill data/understanding gaps

- **Indirect benefits**
  - Improved interoperability between agencies/data management systems
  - A coordinated spatial data infrastructure
  - The development of descriptive indices (environmental, socioeconomic, etc) based on a combination of various data themes

The speaker then advised those assembled that the implementation of a data policy also requires the review/development of data standards, use guidelines and the reform or redesign of national legislation governing data and information. He also noted however, that this process has been performed many times in other parts of the world and that documentation on the process is freely available.

Mr. Padmanabhan concluded his talk by reiterating that data and information are critical to informed decision-making regarding sustainable development and adaptive management of environmental resources. As a result, an efficient and effective information infrastructure that capitalizes on appropriate technologies for data acquisition, integration, management dissemination and analysis is required; and one component of such a system is an online atlas of marine data and information like the CMA and its national atlas offshoots.

The discussion following the presentation by Mr. Padmanabhan became quite heated at one point. The representative from the Environment and Sustainable Development Unit indicated that in Saint Lucia their Coastal Management Unit consisted of one individual (Laverne Walker) and that they did not have the personnel or financial resources of an organization such as the IMA in Trinidad (a sentiment echoed by the representative of the OECS as applicable to most OECS states). He also indicated that
nationally there was an abundance of terrestrial data, but few marine/coastal datasets. With regard to the first point, Mr. Padmanabhan informed the representative that a data management initiative can be quite focused on a particular area of investigation, and as a result require less staff and training overhead. Mr. Roach added that one of the benefits of a national effort such as the CMA or a new data management policy is that you can leverage the skills resident in other departments to make data and information products more easily available across government, so that not every department needs to invest in GIS training or database management necessarily. He added that there may be national marine data available, but resident in international organizations or private entities; and that a national effort should uncover these sources.

9.4 Applications of Coastal Web Atlases

The final presentation before the break was delivered by Marcia Berman, representing ICAN. Her presentation mostly followed the format and presented the information contained within her presentation to the CMA working group earlier in the week (See 4 above), but with some specific discussion items. Ms. Berman described that the development of a CWA would provide:

- An enhanced capacity to make decisions
- Access to tools and products
- Improved access to geospatial data
- Rapid access to this and other kinds of data
- Increased efficiency in data transfers

She then described who would benefit from the development of such a system, namely:

- Local and regional land use planners
- Natural resource management specialist
- Regulators/marine enforcement officers
- Transportation planners
- Industry: Tourism, exploration, aquaculture

The speaker then illustrated many of the CWA examples she described in her presentation earlier in the week, highlighting their various abilities to present spatial information in an easy to understand manner to the end user, and the potential of similar types of functionality to be used better understand environmental resource issues in a local or regional context in the Caribbean.

Next she explained what was needed to develop a system such as the ones she had described, indicating that it required:

- Relatively little money
- Interest on the part of stakeholders to collaborate and be part of the process
- A willingness to share and contribute data freely
- Communication of benefits to policy makers
- Where required, policies that encourage the free exchange of digital information

She concluded by informing the participants of the key take-home points. Firstly that unlike traditional atlases, CWAs were not static and should evolve as new data, tools, and technologies become available. Next, she stated that there was no one size fits all approach to web atlases and that they vary in content and sophistication based on the needs of general or specific target audiences. And finally and most importantly they can provide non-GIS users with access to spatial information, enabling better decision-making.
9.5 The Caribbean Marine Atlas Project

This presentation was almost identical to that given by the Regional Coordinator to the planning and review workshop participants earlier in the week (see 1.1). As such, Mr. Roach described the importance of access to marine data for decision-making; described the origins and evolution of the CMA project, including the stakeholder meeting and training workshops; described the results of the project thus far, i.e. the development of a regional network of marine data managers and the production of a CMA prototype (www.caribbeanmarineatlas.net); and discussed the future plans for the CMA project, including the further development of the CMA itself, and the implementation of the national marine atlas programmes. Mr. Roach also demonstrated the national atlas prototype and indicated some of the functionality which would be added in the near future, all of which would be made available to the planned national atlases.

The Regional coordinator concluded his talk by describing the importance of web atlases as useful tools, noting that they:

- Improve data sharing
- Provide products and services
- Allow for or enhance decision support mechanisms
- Increase awareness on environmental issues

However, he also stressed that for them to be successful and sustainable, national atlases need to be part of a larger national spatial data management framework, such as a national spatial data infrastructure as discussed by Mr. Padmanabhan or a national GIS programme, as is being instituted in Jamaica and in the planning stages in Saint Lucia. He concluded that with these principles in mind, states would be able to benefit from improved data quality and more effective, scientifically robust decision-making with regards to coastal zone management.

One comment made during the discussion was that the Physical Planning Unit was highly supportive of the project as would be a replacement for the ArcGIS platform and provide a significant cost savings. However, Mr. Roach informed the representative that unfortunately the atlas was a data discovery and delivery platform and could not perform the advanced GIS analysis that is available in ArcGIS.

9.6 Group Exercise – Coastal Resource Issues and Data Management

The final phase of the stakeholder meeting involved the separation of the attendees into groups based upon the sector of the marine data stakeholder community they represented (Private Sector, Government, Intergovernmental Organizations). In addition, each group contained participants from the planning and review workshop to provide additional information if required, and to help moderate the discussions. The groups were then directed to answer the following questions:
After about an hour, each group was asked to present their findings to the plenary. The responses of the groups are summarized in the table below.

<table>
<thead>
<tr>
<th>Group 1 (Private Sector)</th>
<th>Group 2 (Government)</th>
<th>Group 3 (Intergovernmental Organization)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What are the marine/coastal environmental issues that you face/deal with and how could an Atlas contribute to their management/mitigation?</strong></td>
<td><strong>Coastal degradation</strong>&lt;br&gt;Over exploitation of coastal resources&lt;br&gt;Lack of knowledge of available and state resources (marine reserves, etc.) leading to improper allocation and use of those resources (planned development)&lt;br&gt;Determining the sustainability of resource use; resource conservation vs. development&lt;br&gt;Lack of baseline data for informed management decisions and detect trends</td>
<td><strong>Water pollution</strong>&lt;br&gt;Coastal disasters/Risk mitigation&lt;br&gt;Climate change&lt;br&gt;<strong>An atlas will:</strong>&lt;br&gt;- Allow data to be viewed in a spatial perspective&lt;br&gt;- Provide the ability to super-position data in space&lt;br&gt;- Have a decision support capacity&lt;br&gt;- Show land use patterns in relation to geography&lt;br&gt;- Define areas of risk</td>
</tr>
<tr>
<td>Land-based sources of marine pollution&lt;br&gt;- Water quality&lt;br&gt;- Sedimentation&lt;br&gt;- Chemical Pollution&lt;br&gt;Coral reef degradation&lt;br&gt;Adequate enforcement of policy &amp; legislation&lt;br&gt;User conflicts&lt;br&gt;Natural disasters&lt;br&gt;Land use impacts&lt;br&gt;Shipping&lt;br&gt;- Pollution&lt;br&gt;- Anchorage</td>
<td><strong>An atlas will:</strong>&lt;br&gt;- Spur the development of a national data management policy</td>
<td></td>
</tr>
<tr>
<td>An atlas will:&lt;br&gt;- Aid in identifying sources of LBS&lt;br&gt;- Inform policy &amp; legislative reform&lt;br&gt;- Aid in resource mapping</td>
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<tr>
<td><strong>What are the resource issues (bold) you face and suggest how could they be resolved?</strong></td>
<td><strong>Insufficient human resources capability and capacity</strong>&lt;br&gt;Resolution:&lt;br&gt;- Establishment of a central body to coordinate the management of data&lt;br&gt;- Appropriate resource application</td>
<td><strong>Limited human and financial resources</strong>&lt;br&gt;Resolution:&lt;br&gt;- Develop partnerships with other organizations</td>
</tr>
<tr>
<td>Limited human resources Resolution:&lt;br&gt;- Inter island &amp; intra agency collaboration&lt;br&gt;- Training&lt;br&gt;- Assignment of experts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Limited financial resources
Resolution:
- Project fund raising
- The packaging and sale of information (e.g. St. Lucia Marine Mapping Ltd)

Data availability & management
Resolution:
- National data inventory
- Data management policies & protocols
- Hardware & software upgrades
- HR inputs

Software and hardware limitations
- Training to help manipulate data as well as ensuring compatibility with existing software

Cost recovery - re: gathering data
- Making data/maps available to developers at a cost, however policy change is required to review fee structure

Are you willing/able to freely share your data with the national Atlas partners or are there issues that need to be addressed in this regard?

Marina Authorities
- Yes, if data will only be put to its intended use
SMMA, SLASPA
- Yes

Yes, informal arrangements to share data
Formally challenges exists
- Legislative
- Timeliness
- Limits to what information can be distributed or shared
- Copyright issues

Yes, generally
However, challenges exist in areas such as:
- Privacy
- Intellectual property
- Ownership of data

What data do you have available that you can contribute to the national atlas?

Bathymetric data
Wave & climate/wind
Storm Surge data
Geotechnical data
Vessel arrivals and departures
Mangroves
Water quality
Fish Landing maps
Fishing priority areas
Anchorage
Submarine cables

Roads
National trust areas
Points outlining coastal areas
Mangroves
Forest areas
Natural habitats

Water quality monitoring results*
Nutrient levels*
Point sources*
Reports/recommendations*
Contours
Watershed boundaries
Surface water
Coastline
Land use (1996)
Soils
Rainfall gauges

*Pursuant to original data provider/collector/client agreeing to release the data

From the responses it is clear that human resource limitations are a major issue in Saint Lucia, and a hurdle to be overcome if the national atlas and Saint Lucia’s planned national GIS programme are to be successful. However, a positive sign is that there is indeed a fairly large amount of coastal/marine spatial data and related information available nationally, although it may be in private hands or not immediately accessible. In addition, it seems that the private sector is very supportive of the project and could be a major driver for the initiative. Furthermore not only is it clear that an atlas of marine data would be highly useful to many Saint Lucian marine stakeholders, it is also apparent that the national atlas could be a rallying point around which the movement towards a national GIS framework can be organized.

9.7 Closing of the National Stakeholder Event

The Regional Coordinator for the CMA was the first to deliver closing remarks for the session. He thanked the attendants for coming and encouraged them to remain engaged in the national atlas process. He noted that the national stakeholder event had highlighted the existence of a significant amount of coastal/marine sources of data in Saint Lucia, and that if all of the stakeholders worked together that the national effort would be successful and useful.
Next to give remarks was Mr. Pissierssens, the Project Coordinator for IODE. He also thanked the participants for attending and again praised the local organizers for ensuring that the workshop came off without a hitch. He then encouraged the participants to stay positive, even whilst acknowledging their resource challenges. The speaker stressed that the IODE was providing resources for the national project in terms of training and technical support, and asked the attendees to take full advantage of what was available.

And finally, local organizer and CMA working group member Portia St. Catherine delivered her remarks. She echoed earlier comments on the challenges to the national project due to the lack of resources available for national coastal zone management. She did note however that with the implementation of a national GIS policy, many of the administrative hurdles to data sharing and data delivery would be removed, alleviating some of the local data management challenges. She concluded by stating that both the stakeholder event and the planning and review meeting had accomplished their goals but that a lot of work remained to be done. She then thanked the participants for attending the workshop and closed the event.

10. CONCLUSIONS AND RECOMMENDATIONS

In total, both the planning and review workshop and the national stakeholder meeting were useful, informative and achieved their objectives. However, it was also clear that much work needs to be done to further develop the regional atlas and implement the national atlas projects. For the regional initiative, further training is needed in the following areas as described in section 7:

- Ocean data management (basic GIS, data processing and some database aspects)
- Metadata creation and management
- Opensource programming for the regional and national atlas web applications
- Database design and management

In addition there were calls for the provision of tools/methodologies to address issues such as coastal erosion. Another type of tool which has already been used as part of the CMA development process is online surveys. All of the planning and review workshop participants agreed that the surveys were effective in collecting and collating feedback and should be employed in the future.

The stakeholder workshop itself was found to be a highly useful tool in the national atlas development process. Such workshops not only make potential stakeholders aware of the initiative and its goals, but also permit the national coordinators to receive feedback from national atlas users on the types of information and functionality they would like a marine atlas in their country to have, and identify potential data and management partners. Furthermore the events can raise support for the project from multiple sectors and high-level administrators, providing momentum for its development and enhancing the chances that the project will be successful.

In light of the above, the following recommendations are made with respect to the regional and national atlas projects:

- Regional Atlas (CMA)
  - Develop detailed workplan including training programmes in ocean data management, metadata management, open source programming and database management (directly applicable to national atlas projects);
  - Improve the CMA prototype/develop full version;
  - Develop formal linkages with data providers;
  - Develop formal/informal linkages with regional and extra-regional agencies or groups (UNEP, ICAN, etc);
- Continue online surveys to gain additional feedback from stakeholder community;
- Develop a standardized MOU document for agreements with potential data providers;
- Develop a data and metadata policy;

**National Atlas Programmes**
- Plan and implement national stakeholder meetings similar to Saint Lucia’s in each participating country, with IODE financial support where needed;
- Plan and implement follow up stakeholder meetings to achieve specific national atlas requirements/goals;
- Encourage the use of the national atlas component checklist (Section 7) as a preliminary workplan and timeline for the development of the various national atlases;
- Engage stakeholders in each country to promote buy-in for the national projects.
ANNEX I

AGENDA OF THE MEETING

1. Opening of the Meeting – Mr. Peter Felix, Mr. Peter Pissiersssens

2. National Progress Reports
   a. Trinidad and Tobago
   b. Saint Lucia
   c. Barbados
   d. Cuba
   e. Jamaica
   f. Cayman Islands

3. Results of the Online Surveys – Mr. Ramon Roach

4. Examples of Coastal Atlases – Dr. Marcia Berman

5. Review of National Atlas Components and Goals

6. Revision of National and Regional Atlas workplans

7. Training Requirements

8. Cooperation and Interaction with other Projects/Organizations
   a. ICAN
   b. UNEP/CEP
   c. CCDC

9. Summary of Meeting Outcomes – Mr. Ramon Roach

10. Closure of the Meeting - Mr. Peter Pissiersssens, Mr. Ramon Roach
ANNEX II

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ANNEX III

Template for National Reports on CMA Activities

**Aim:** To gain a firm understanding of where countries are with regard to marine data management capacity and spatial data infrastructure in general.

**Report Template**

Questions to be addressed in your report:

- Who is your national IOC focal point?
- Who is your IODE national coordinator for data management?
- Who is your IODE national coordinator for information management?
- Did your country establish an NODC and if so, where and when? (provide full address and contact person)
- Did your country identify a national marine library that will collaborate in IODE, and if so which one (provide full address and contact person)?
- Is there specific legislation related to the management of the coastal/marine environment in your country?
- Do you have a national coastal management plan or other type of management plan which informs your activities?
- Do any of these plans consider the marine environment/oceans?
- If so, what are the national priority issues identified in that plan?
- What is the role of your institution in coastal/marine management in your country?
- What is your personal role in coastal/marine management at your institution?
- What national priority issues does your institution currently address as part of its routine activities?
- What policies does your organization have in place to address these issues?
- What indicators do you currently use to monitor these issues and the effectiveness of policies being implemented to manage them?
- Where do you think there are gaps between the issues to be addressed and the coastal zone/marine management policies which currently address them? Information, enforcement, capacity, administration?
- How do you envisage easier access to data/analytical products via national/regional marine atlases would improve your effectiveness?
- Has a national atlas committee been established? Is it operational?
- What resources would you need to increase your effectiveness at addressing national priority issues?
ANNEX IV

CMA Strategic Planning Survey Report

Ramon Roach – Regional Coordinator for the CMA Project

Background and Purpose of Surveys

The Caribbean Marine Atlas (CMA) project is an initiative of several Caribbean states to develop a web-based data management and manipulation platform allowing for the visualization and downloading of coastal and marine-related datasets by partner countries, organizations and the general public. The project is now entering a new phase involving the publishing of a prototype regional atlas and as importantly, the development and implementation of national marine atlases based on the software platform of the regional atlas. Additionally, the project fully intends to develop these national spin-offs in the expectation that they will be fully utilized on a regular basis by a large cross-section of end-users.

However, not all states in the Caribbean have the same focus when it comes to the collection, analysis and use of marine data in the decision-making process. For example, a state may prioritize the management of its fish stocks, and as a result for a national marine atlas to be relevant it must focus on ecological and human activity data and the tools for analyzing these thematic areas. In contrast, a country or organization with a hazard management focus may be more interested in impact model results and socioeconomic factors, and would require a collection of data and tools to ensure effective, response and management-related decision making. This presents a dilemma, as the investment in time and resources required to produce several unique atlases is considerable. However as the nations involved in the project are primarily SIDS with similar coastal issues, some synergies may be possible in terms of application development and tool requirement. Thus an improved understanding of the function, activities, data analysis, and data/product delivery needs of the respective national institutions spear-heading the CMA programme is required.

As a means to better foster this understanding, two online surveys were made available to the regional participants. The first survey (The Caribbean Marine Atlas Planning Survey) was designed to obtain specific information regarding the function, basic policy framework and general operation of the institutions represented by the regional participants as they relate to marine data. The second survey (The Institutional Client Survey) was distributed by the participants to the national institutions to which their organizations provide environmental data and information. The goal of this survey was to identify the types of spatial data, products and services the respective agencies provide to their institutional clients, as well as any shortcomings of these arrangements, in terms of among other things the ease of access to the data and the frequency of updates. The results of both surveys (presented below) have been used to formulate the strategic plan for the future development of the CMA project.

Results of the Surveys

Survey 1 – CMA and National Atlas Planning

The response rate for the planning survey was quite good (83%), with all of the active regional participants completing the survey with the exception of Adan Rios from Cuba. This is unfortunate, as the potential to implement a useful and regularly used web atlas in Cuba is quite high due to their institutional capacity and strong research focus. We hope that interaction with Adan and Cuba in general will improve in the future.
Questions 3 and 4 focused on the type of training in marine data management the participants thought they or their colleagues would benefit from and subsequently what national projects or programmes the training could be used for.

All of the respondents indicated that training in marine data management (MDM) would be beneficial to coastal planners in their countries. This is likely the result of a perceived or real need for the greater consideration of marine issues in the planning process, and as a result the improvement of decision-making for sustainable development. Over 70% of the participants also agreed that those
directly involved in environmental data collection, data analysis and data management (environmental managers, marine researchers and database managers) could benefit from MDM training. Less than 60% of the respondents indicated that those in more specific occupations such as field inspectors and fisheries officers would benefit from the training. With regard to application of training in MDM in question 4, 85 – 100% of the respondents indicated that the skills obtained would be useful in environmental monitoring activities such as biodiversity, coastal erosion, sea-level and water quality monitoring; programmes that not only benefit from strong data and database management components, but would also promote improved decision-making through the augmentation of the statistical analysis process. Public education was also viewed by over 80% of the respondents as an area which would benefit from MDM training, likely due to the potential for improved data distribution and data product development. Enforcement of environmental policy and planning application evaluation were viewed by more than half of the respondents as specific programmes that could benefit from training. Finally, programmes dealing with coastal and marine infrastructure, navigation and recreation were not considered priority areas to receive training by a majority of participants.

The next set of questions in the survey (Questions 5 – 11) investigated the relevance of national atlases and examined institutional capacity in the areas of GIS, database and web application design for the national agencies represented by the regional participants. As expected, all respondents indicated that an online atlas of marine data would be a useful tool in their marine data management activities. The presence of staff members with an advanced level of GIS training at their institutions was also a universal trend, indicating that this aspect of spatial data management has not been the impediment to improved decision-making, data sharing and data delivery, and need not be a major focus of future CMA training activities.

Over 50% of the respondents indicated that they or their colleagues had an advanced level of database management training, which would be an asset for the development of national atlas services. However, over 85% of the participants also indicated that the level of web application development expertise was basic, suggesting that this could be a key area of focus for future training sessions.
The ESRI GIS software platform was ubiquitous among the institutions, with Autocad also being used at close to 30% of the institutions represented. Furthermore, Microsoft Access was also found to be used by all of the participating agencies, and both proprietary (Oracle, MS SQL) and open source (MySQL) professional database packages were found to be utilized at one or two institutions.

Many of the respondents indicated that mapserver was used in their institutions. However, the question may have been misinterpreted as no live mapserver applications have been reported by any of the national representatives, and the server software is likely hosted locally (i.e. not exposed to the web). ArcServer and ArcIMS were also reported as being in operation by over 15% of respondents, but again no instances of live apps are known. Nearly 30% of those surveyed indicated they had no access to web-based GIS software. The lack of GIS server software at some institutions and the resulting lack of expertise in this area could be a barrier to implementation for the national atlases and would likely require that at least initially, the data and web applications be hosted by the IODE.
Questions 12 - 16 sought to determine the characteristics of the spatial data available at the national level as well as details on the ease of access to this data when it resides at other institutions. All respondents indicated that they host or have access to a variety of physical (e.g. geographic features), topographic (e.g. elevation models) and planning (e.g. cadastre, zoning) datasets. Over 80% of participants indicated that they have access to biological data, and 70% or less indicated access to socioeconomic, human health and management data. This demonstrates a predominance of slow-changing spatial information which may limit the ability of managers to make decisions based on changing environmental and socioeconomic trends or forces, and could signal an opportunity to promote the collection and distribution of more temporally variant data. In terms of data formats, shapefiles were a universal presence. However, over 80% of respondents indicated that spatial data was also in the form of harder to interrogate spreadsheets. Nearly 70% of participants also utilize databases as a source of geographic data which is suggestive the presence of existing capacity in this area which could be leveraged for relatively low-cost intraregional training efforts. About 50% of those surveyed indicated that raster-type data was a component of their spatial libraries, suggesting a possible area of expansion for regional data analysis training and data sourcing.

Over 80% of those surveyed had limited access to spatial information from other national agencies/institutions. One respondent from Saint Lucia indicated that all required data was easily accessible, but this was not mirrored in the comments of the other Saint Lucian participant. With regard to deficiencies in external data needed for decision-making, the top three areas were human health, socioeconomic and planning-related datasets. This indicates that while agencies possess environmental data, they require auxiliary data to place it in context and quantify some of the non-environmental concerns of decision-makers.
In terms of how agencies manage the metadata for their spatial datasets, over 50% of the respondent’s use ESRI ArcCatalog. This should be promoted in the future, as the metadata tools in ArcCatalog are robust and records can be easily exported in the universally accepted XML format. Geo Network was also utilized by one agency, and has the added advantage of being potentially web-visible. Meaning that it could be the backbone of a regional metadata sharing network. Unfortunately more than 20% of the respondents also noted that no metadata management software was in use by their agencies, highlighting a potential focus for future training.

The next question (17) was designed to resolve what possible barriers to implementation may face the developers of effective and functional national atlases. All of the survey participants indicated that both staff capacity and staff training were issues that would need to be addressed for the project to be successful. However it is worth noting that once completed, the atlases will require low to moderate amounts of user input, and as a result not demand large amounts of staff resources either in terms of personnel or time. In addition, it is expected that the atlases will become part of the operational activities of the respective institutions and their data partners, and will as a result be less prone to neglect due to staff changes or diversions of attention. Software was also identified as a possible hurdle, however the online atlas applications themselves are open source and will be designed and implemented to be user friendly for both end-users and editors. It is also hoped that specific tools and automated atlas products will be developed and distributed to the various local atlases in the future. Hardware and networking infrastructure were not identified by the majority of respondents to be major impediments to atlas development.
Questions 18 and 19 investigated the capacity of the institutions to implement their policy mandates, as well as what areas may need strengthening for the development of the respective national atlas projects. In terms of training needs, over 80% of respondents indicated that additional training in spatial data management would be an asset for their daily work. Furthermore, over 60% of respondents indicated that training in spatial data analysis would be beneficial. This indicates that participants are aware that improved environmental decision-making requires the augmentation of these skill sets, and their improvement will make them better environmental managers. With regard to equipment capacity, the vast majority of participants regarded computer hardware (desktops, servers) and networking infrastructure (bandwidth, reliability) as the major impediments to the execution of their mandates. These issues would be partly resolved by the initial hosting of the atlases on the IODE’s servers.
The remainder of the questions in the institutional survey dealt with a variety of topics, including the mandate of the respective institutions, characteristics of the spatial data they provide to other local agencies/institutions, and the expected administrative future of the national atlases. As would be expected, the responses to the question of institutional mandate (Question 20) were varied, but mostly revolved around ensuring sustainable development of the coastline and the provision of environmental data to stakeholders. Mandates like these provide a solid footing upon which to build support for enhanced data management and data provision capacity within the respective organizations. Next, question 21 investigated the types and frequency of service provision by the agencies represented. More than 60% of participants indicated that planning application evaluation, public education and enforcement services were provided on a frequent basis. For the assessment of EIAs, as well as monitoring activities (coral reef, water quality, beach profiles), 50% of respondents indicated that these services were also frequently provided. More than 80% indicated that GIS services were provided occasionally, as were parks management services according to about 50% of the participants. Significantly, more than 80% of those surveyed indicated that fish stock management services were provided seldom or never as part of their operational activities. Parks management services were also rarely provided. Therefore, aside from public education and policy enforcement, it appears that development control (planning application evaluation, EIA assessment) and policy-driven environmental assessment (coral reef, beach profiling, etc) are the major services provided within the environmental management agencies of the region. These data-intensive activities would undoubtedly benefit from strong data management skills which would be developed through the CMA process.

The final question of the planning survey queried the participants on the possible mechanism(s) for the long-term sustainability of the national atlases. Over 80% of the respondents indicated that the financial requirements of their respective national atlases could be incorporated into their institutional expenditure. However, nearly 70% also indicated that the national atlases could be managed by a single regional agency responsible for their upkeep and maintainence. Just over 30%
indicated that the atlases could be supported by CARICOM funding, and one respondent noted that funding could be obtained through partnerships with local or regional projects/programmes.

The response in conjunction with the history of some regional projects would suggest that the incorporation of atlas duties and requirements into institutional operations would be the most prudent course of action. Furthermore, the open and widely-available distribution mechanism combined with user-friendly update and maintenance procedures should minimize the administrative overhead of the atlases.

Survey 2 – Institutional Clients

This survey was distributed by the regional CMA participants to individuals in other local institutions to which they supply coastal/marine data on a continuous basis. Response to this survey was fairly good, with institutional clients representing five Caribbean countries participating. All of the respondents indicated that they received marine spatial data from a variety of local sources, and not just the agency of their respective local CMA representatives. This means that sustained collaborative efforts will be required for the local atlases to function effectively as the designated and/or de facto sources for coastal and marine data in their respective countries.

In terms of the usage of the data provided (Question 4), all respondents indicated that research was a major component. More than 80% indicated that marine data/information supplied to them was used for monitoring purposes, and 60% indicated that planning issues often prompt the need for data. Notably, just over 40% of respondents indicated that they required data or services for visualization/mapping purposes, and even fewer used them for enforcement. This seems to indicate that receiving agencies desire a platform for the storage and retrieval of field data from various sources, i.e. a data repository, rather than an online system for map creation. Furthermore, while the format in which data is received may be heavily dependent on the data distributor, all of the
respondents noted that they received data in spreadsheet format (Question 5), indicating that raw environmental data is a major requirement. PDFs are also a data format received by institutional clients, and is likely the major format in which finished products (maps, reports) are delivered. Most significantly shapefiles were the least delivered of the formats, but this may be due more to a lack of availability than a lack of demand.

The next three questions identified the level of satisfaction of the recipients with the data provided. Nearly 60% of those polled indicated that the data was not sufficiently current for their purposes. Over 85% indicated that the scale of the data was not appropriate for their needs, while over 71% indicated that the data supplied was not easy to manipulate. All of these concerns would require further investigation, but it is clear that there is a content-divide between the data suppliers and data users that needs to be addressed. However with regards to the issue of data manipulation, the feedback received from the respondents highlighted three main areas of concern: data quality/accuracy, data scale and the lack of metadata including projection information. All of these could be addressed via a comprehensive data management policy developed during the startup phase of local marine atlas programmes.
Questions 9-11 of the client survey provided feedback on the characteristics of the data delivery mechanism itself for the various data partners. Over 85% of the respondents indicated that the data they received was required on a regular basis, supporting the current push towards streamlined data delivery mechanisms. Furthermore, when asked about how well the data provision arrangements were working, none of the respondents indicated they were working well, while nearly 60% indicated that they were working poorly. This again highlights the need for improved data management practices and enhanced data availability. Furthermore in each case the lack of availability of data and slow response times were identified by over 70% of participants as reasons for a poorly-functioning data provision system.
The final question of the survey asked the respondents for a wish list of data, products or services they would like to receive from their respective local data providers. According to the response choices provided as part of the survey, over 85% of the participants indicated they would want the ability to download data from a website, with periodic updates of existing maps and pre-processed datasets also being popular with 71% and 57% support respectively. Open-ended responses from the survey participants indicated that they would like to see specific datasets (e.g. cadastral data), data catalogs, access to unprocessed datasets, and assurances of data validity and accuracy to be provided.

Summary and Conclusion

Overall the response from the surveys was good and provided a wealth of information regarding current data management practices, the expected functionality of the national and regional atlases, and the characteristics of existing national data distribution mechanisms. And while not uniform, the different regional participants and their local clients’ responses encapsulate the following major themes:

- There is an urgent need for cost-effective and streamlined spatial data management solutions in the region
- A simplified mechanism is required for both local and regional spatial data and metadata discovery and distribution
- Additional training is required to improve regional spatial data management capacity
- The national and regional atlas development process will provide tangible and long-term benefits to local and regional environmental management, decision-making and sustainable development

The results of the surveys provide a clear message that the CMA programme is both timely and critical to the continued socioeconomic development and environmental stewardship of the region.
## ANNEX V

### List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AGGRA</td>
<td>Atlantic and Gulf Rapid Reef Assessment</td>
</tr>
<tr>
<td>AMEP</td>
<td>Assessment and Management of Environmental Pollution</td>
</tr>
<tr>
<td>API</td>
<td>Application Programming Interface</td>
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<tr>
<td>ARGOS</td>
<td>UNEP-CEP Database and Interactive Map</td>
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<tr>
<td>CARICOM</td>
<td>Caribbean Community</td>
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<tr>
<td>CARICOMP</td>
<td>Caribbean Coastal Marine Productivity Program</td>
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<tr>
<td>CATHALAC</td>
<td>Centro del Agua del Trópico Humedo para America Latina y el Caribe</td>
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<tr>
<td>CCCCCC</td>
<td>Caribbean Community Climate Change Centre</td>
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<td>CCDC</td>
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<tr>
<td>CEP</td>
<td>Caribbean Environment Programme (of UNEP)</td>
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<tr>
<td>CiMAB</td>
<td>Centro de Ingeniería y Manejo Ambiental de Bahías y Costas</td>
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<td>CMA</td>
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<td>Centre for Marine Sciences (UWI, Mona)</td>
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<td>CWA</td>
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<tr>
<td>DB</td>
<td>Database</td>
</tr>
<tr>
<td>DPSIR</td>
<td>Driving Forces, Pressures, State, Impacts, Responses</td>
</tr>
<tr>
<td>ESRI</td>
<td>Environmental Systems Research Institute</td>
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<tr>
<td>GCRMN</td>
<td>Global Coral Reef Monitoring Network</td>
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<td>GEF</td>
<td>Global Environment Facility</td>
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<tr>
<td>GIS</td>
<td>Geographic Information System</td>
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<td>GOOS</td>
<td>Global Ocean Observing System</td>
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<td>Human Resources</td>
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<td>ICAN</td>
<td>International Coastal Atlas Network</td>
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<td>ICZM</td>
<td>Integrated Coastal Zone Management</td>
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<tr>
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<td>Institute of Marine Affairs (Trinidad and Tobago)</td>
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<tr>
<td>IMO</td>
<td>International Maritime Organization</td>
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<td>IOC</td>
<td>Intergovernmental Oceanographic Commission</td>
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<td>IODE</td>
<td>International Oceanographic Data and Information Exchange</td>
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<tr>
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<tr>
<td>ISM</td>
<td>Island System Management</td>
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<td>LBS</td>
<td>Land Based Sources of Marine Pollution</td>
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<td>NEMO</td>
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<td>NEPA</td>
<td>National Environment and Planning Agency</td>
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<td>Non-Governmental Organization</td>
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<td>NOAA</td>
<td>National Oceanographic and Atmospheric Administration</td>
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<td>Acronym</td>
<td>Description</td>
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<td>NODC</td>
<td>National Oceanographic Data Centre</td>
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<td>ODIN</td>
<td>Ocean Data and Information Network</td>
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<td>OECS</td>
<td>Organisation of Eastern Caribbean States</td>
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<tr>
<td>REPCar</td>
<td>Reducing Pesticides to the Caribbean Sea</td>
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<tr>
<td>RS</td>
<td>Remote Sensing</td>
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<td>SIDS</td>
<td>Small Island Developing States</td>
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<td>Saint Lucia Air and Seaports Authority</td>
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<td>Saint Lucia National Trust</td>
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<td>SMMA</td>
<td>Soufriere Marine Management Area</td>
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<td>SPAW</td>
<td>Specially Protected Areas and Wildlife</td>
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<td>Statistical Institute (Jamaica)</td>
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<td>TNC</td>
<td>The Nature Conservancy</td>
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<td>UN</td>
<td>United Nations</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
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<tr>
<td>UWI</td>
<td>University of the West Indies</td>
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<tr>
<td>WASA</td>
<td>Water and Sewerage Authority (Trinidad and Tobago)</td>
</tr>
<tr>
<td>WCR</td>
<td>Wider Caribbean Region</td>
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<td>WRI</td>
<td>World Resources Institute</td>
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<tr>
<td>XML</td>
<td>Extensible Markup Language</td>
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</table>
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