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**INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION**  
(of UNESCO)

**ODINAFRICA PROJECT STEERING COMMITTEE MEETING.**

IOC Project Office for IODE, Ostend, Belgium  
26-28 April 2006

**SUMMARY REPORT**

## TABLE OF CONTENTS

1. OPENING OF THE MEETING.....	1
2. ADMINISTRATIVE ARRANGEMENTS.....	1
3. COASTAL OBSERVING SYSTEMS.....	1
4. DATA MANAGEMENT.....	4
5. INFORMATION MANAGEMENT.....	8
6. PRODUCTS DEVELOPMENT AND DISSEMINATION.....	12
7. THIRD ODINAFRICA SEMINAR.....	14
8. REVISED WORK PLAN AND BUDGETS.....	15
9. BEYOND ODINAFRICA –III.....	15
10. CLOSING OF THE SESSION.....	16

### **ANNEXES**

ANNEX I:	DETAILED REVISED BUDGETS FOR ODINAFRICA –III
ANNEX II:	PROJECT STEERING COMMITTEE MEETING AGENDA
ANNEX III:	LIST OF PARTICIPANTS
ANNEX IV:	Draft Performance Benchmarks for NODCs and DNAs in the IODE Program (IODE)
ANNEX V:	REVISED ODINAFRICA LIST OF MARINE ATLAS PARAMETERS

## 1. OPENING OF THE MEETING

The ODINAFRICA Project Manager, Mr Mika Odido, welcomed the participants to the third session of the ODINAFRICA Project Steering Committee meeting. He informed the participants that the session would consider recommendations of the Second ODINAFRICA Seminar held 24-26 April 2006, the third session of the Project Management Committee and the reports of the Regional Coordinators in order to develop a work plan and budget for the remaining project period, and provide guidance for development of proposals for a possible next phase of ODINAFRICA.

The List of Participants for the Session is given in **Annex III**.

## 2. ADMINISTRATIVE ARRANGEMENTS

The participants designated the Chair of IOCEA Mr Julius Wellens Mensah as the Chair of the session. The Project Manager informed the session that the Chair of IOCWIO Dr Antonio Hogue would not be able to attend the session due to other pressing commitments and had conveyed his apologies.

The provisional agenda was adopted with minor amendments (Annex II).

## 3. COASTAL OBSERVING SYSTEMS.

The objectives of this work package is to upgrade and expand the present African network for in-situ measurements and monitoring of ocean variables, provide near real-time observations of ocean variables and build adequate capacity for collection, analysis and management of sea-state variables. The focus is on installation of new tide gauge stations and upgrading existing stations. Additional oceanographic sensors would be installed at selected locations. Training on installation and maintenance of equipment, as well as analysis and interpretation of data would be provided to technicians and scientists.

The Regional Coordinator for Coastal Observing Systems, Dr Angora Aman, gave an overview of implementation status of planned activities. ODINAFRICA had initially planned to improve the African network of sea level stations by installing/upgrading tide gauges at 19 locations. Following consultations with other partners, a total of 33 locations where tide gauges would be installed/upgraded along the African coastline were identified. ODINAFRICA will install/upgrade tide gauges at 12 of these locations as follows: Nouakchott (Mauritania), Dakar (Senegal), Takoradi (Ghana), Limbe (Cameroon), Pointe Noire (Congo), Nosy Be and Fort Dauphin (Madagascar), Moroni (Comoros), Djibouti (Djibouti), Alexandria (Egypt), Cap Bon (Tunisia) and Agadir (Morocco). The actual site for installation of tide gauges will these countries will be determined following visits of technicians.

Additional tide gauges will be installed by other partners at the following locations:

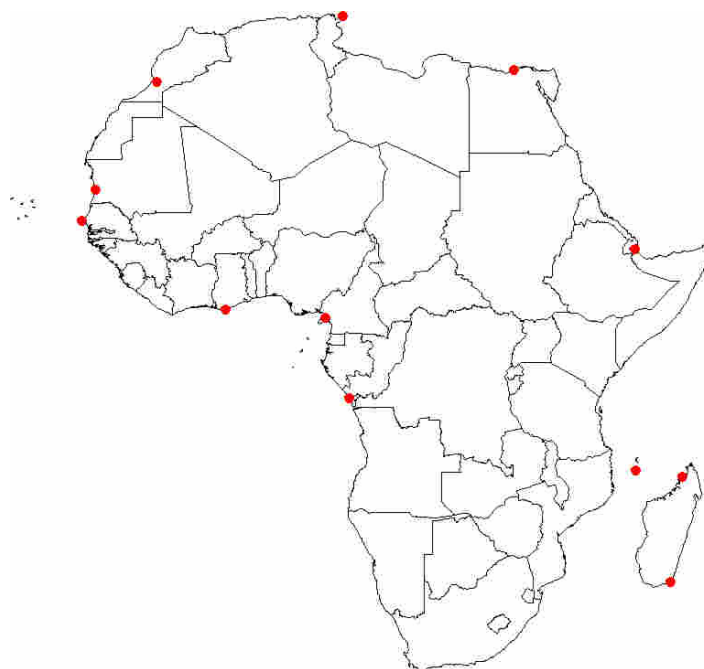
**IOTWS/GLOSS:** has already upgraded stations located at Port Louis and Rodrigues (Mauritius), and will also do the same for Mombasa and Lamu (Kenya), Zanzibar (Tanzania), and Pointe de la Rue (Seychelles) in 2006.

GLOSS will also install satellite transmitters at Simonstown, Port Elizabeth and Durban (South Africa)

**BCLME:** plans to install gauges at Lamberts Bay (South Africa), Luderitz and Walvis Bay (Namibia), and Namibe and Luanda (Angola).

**SHOM (France):** plans to instal gauges at Point des Galets-La Reunion, Dzaoudzi- Mayotte (France), and Tamatave (Madagascar).

**NATIONAL ORGANISATIONS:** Malindi (Kenya), Lagos (Nigeria)



*Location of tide gauges to be installed by ODINAFRICA in the period 2006-2007*

Technician visits have already been organised to Mauritania, Cameroon and Congo (October 2005), and Comoros and Madagascar (April/May 2006). The Djibouti site will be assessed by technicians from SHOM during a cruise planned in the area in May 2006. Technician visits to Egypt, Tunisia and Morocco will be planned for the second/third quarter of 2006.

The Steering Committee re-emphasised the need for the countries receiving the tide gauges to provide the following:

- tide gauge house
- electricity at site
- telephone at site
- free and unrestricted access to the data collected by the equipment
- assistance in facilitating the installation.

The agreement with the local institutions responsible for the tide gauges should outline the provisions for long term sustainability of the tide gauges. Training on maintenance of the equipment (based on GLOSS training courses content) will be provided to local technician (s) during installation. Manuals for routine maintenance should be provided to the local technicians. The Committee encouraged participating countries to install gauges at other locations not already covered.

The Committee noted that though ODINAFRICA could assist countries to repair or install gauges that have been acquired through other means, the focus should be on installation and maintenance of the tide gauges at the 12 selected locations. Similarly the installation of other sensors should not be a priority at this stage. This will ensure that there is a robust observing system in place by the end of the current phase of ODINAFRICA.

Dr Thorkild Aarup presented the report of an ad-hoc working group set up during the Second ODINAFRICA Seminar to look into issues related to Data Quality Assurance and Sustaining the Tide Gauge Network for ODINAFRICA. He noted that the sea level data would be useful for preparation of derived products for port operations, safe navigation, tide tables, forecasts, coastal zone management products, assimilation and modelling, and where relevant contribution to IOTWS. The typical contact person in the organisations owning or maintaining the tide gauges is a Port Captain or Director of Harbour. These organisations employ a tide gauge operator who will be responsible for all operational requirements e.g. provision of metadata, weekly tide staff readings and communication of the readings to sea level centres such as PSMSL and the ODINAFRICA Sea level data facility at Ostende, annual levelling, routine inspection of equipment, and communication with ODINAFRICA and other relevant programmes. The payment of a honorarium to the tide staff reader (on submission provision of tide staff readings) was proposed. Similar model has been used successfully by other organizations maintaining large networks of gauges (eg UHSLC/Australia/UK). The ad-hoc working group proposed that an annual technician visit be organised to all the tide gauge sites to check on the status of the tide gauges, and also confirm that the tide gauge operators/tide staff readers carry out assignments to GLOSS standards. During these visits the local staff would be assisted with levelling, local training, data quality issues etc. The group also recommended the establishment of a technical node to provide telephone/email support for maintenance of the tide gauges.

The Committee welcomed the proposals for development of an ODINAFRICA Data Facility at the IODE Project Office in Ostend, Belgium (IOC/INF-1227) with the following roles:

- Data capture via GTS and archive in relational database as an OdinAfrica backup to national and GLOSS data centers
- Web-display (incl. plots and raw data provision) and tide gauge operator alert
- semi-automatic data quality control
- communication with technical node

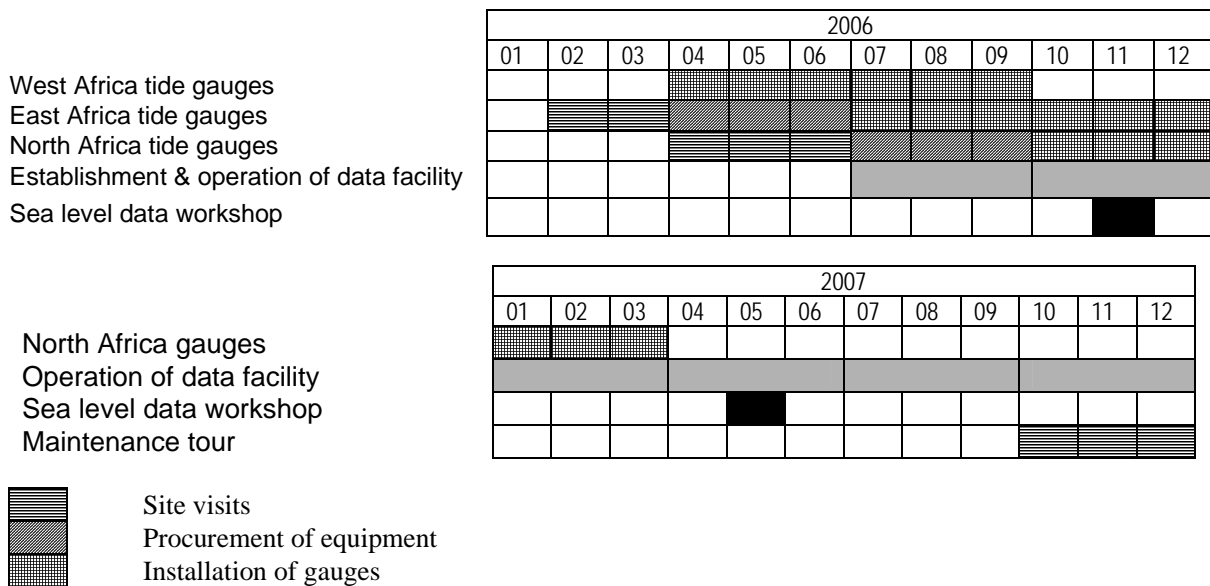
The facility should be built in a transplantable format with a view to having it mirrored at a location in Africa. This will ensure redundancy which is essential for such a facility. The Committee also recommended that the data be mirrored on the respective ODINAFRICA NODC website ([www.nodc-countryname.org](http://www.nodc-countryname.org)).

The Committee also welcomed the proposal for a sea level metadata web service demonstrator project (IOC/INF-1226), and noted that this would provide an alternative

communication routing. The Committee emphasised that output from the tidetool should be in a format compatible with requirements for the GLOSS courses.

An email working group should identify the products in greater detail and what needs to be done to get them on-line. The Committee noted that the level of training to enable usage and participation in the development of the system should be available in the ODINAFRICA institutions.

The Committee endorsed the arrangements and contents for the two sea level training courses (November 2006 and May 2007). Selection of participants should be based on academic qualifications, and participation in sea level related activities. Priority will be given to young scientists and engineers who are likely to use the skills acquired in their institution for reasonable time after the training. The Head's of institution should commit themselves to use the persons trained for the tasks for a minimum period of time. Training notes should be prepared in advance and translated into French. The Committee also noted the need for higher training course for products development going beyond the GLOSS programme.



The Committee welcomed the close collaboration that had been established between ODINAFRICA, Permanent Service for Mean Sea Level, Indian Ocean Tsunami Warning and Mitigation System, SHOM and Benguela Current LME project in the implementation of this work package, and encouraged the Project Manager to explore collaboration with other organisations such as NOAA and the other LME projects being implemented along the African coastline.

#### 4. DATA MANAGEMENT

This work package focuses on further development and strengthening of National Oceanographic Data Centres (NODC) to manage data streams from the coastal ocean observing network, upgrading infrastructure in the NODCs (including internet access and computer systems), integrating biogeographic and hydrological data streams into NODC

systems, training of data and information managers for new NODCs established as part of this project, and rescue of historical data (especially sea level data).

The Regional Coordinator for Data Management, Dr Desiderius Masalu, reported on progress made in implementation of activities.

Surveys were undertaken on the following:

- Status of capacity of ODINAFRICA NODCs (done in 2004/2005 – report is available).
- Status, availability and accessibility of marine biodiversity data in ODINAFRICA countries (done in 2004/2005 – report is available)
- Status, availability and accessibility of hydrological data in ODINAFRICA countries (questionnaire distributed in December 2005 - only Benin, Cote d Ivoire, Egypt, Mauritania, Mauritius, Mozambique, and Togo have responded)
- Existence of any ocean data that needs to be rescued in ODINAFRICA countries is ongoing. All Data Centres were contacted by email in December, 2005 and requested to indicate any existence including amounts and time range of data that needs to be rescued. Only Cote d Ivoire, Egypt, and Mozambique have responded.

Two training workshops on biological/biodiversity data management for French and English speaking countries took place in Oostende, Belgium, in April 2005 and Grand Baie, Mauritius in August 2005, respectively. Congo, Mozambique and South Africa did not attend. As a follow-up to these training courses, the first small group workshop for marine biodiversity data entry took place at Oostende, Belgium in March 2006. It focused on the molluscs.

Training workshop on basic ocean data management for the new Data Managers from Algeria, Angola, Congo, Egypt and Namibia was held in Oostende, Belgium, from 10-30 April 2005. In addition, the old data managers that needed remedial training joined this course. Development of a MEDI Africa product was completed in mid of April, 2005 and the product will soon be available online at the ODINAFRICA webpage. Training workshop on Webpage Development took place from 5th – 9th December 2005 in Oostende, Belgium, for the old ODINAFRICA data centres. ODINAFRICA Data Managers from Mozambique and Ghana participated in a refresher/advanced data management course for ODINCARSA in November 2005.

Representatives of Tanzania, Tunisia, Senegal, Madagascar, and Mozambique participated in the eighteenth session of the International Oceanographic Data Exchange (IODE-XVIII), 26 – 30 April 2005 in Ostend, Belgium.

Planned activities include:

- Advance Data Management Training course is planned to be held from 25-29 September 2006. This course is intended to be a refresher to the old Data Managers but also to expose them to the new developments in data management.
- Second and third small group workshops for marine biodiversity data entry/assimilation. These workshops planned to take place in November 2006 and in 2007 each to focus on a different taxonomic group of interest.
- Second training workshop on Webpage Development. This training course is planned for 2-6 October 2006 and will be conducted in collaboration with Work Package 4.
- Development of marine atlas. This activity will be implemented under the coordination of WP4.

All other routine activities related to data management will continue to be implemented.

Dr Masalu highlighted several challenges and problems that have been encountered that need to be considered carefully. These include:

- Data managers not having access to PCs and internet connection.
- Frequent changing/movement of Data Managers e.g., Mozambique
- Aging equipment such as PCs and others
- Poor communication in some countries e.g. Comoro, Gabon
- Unstable location of some Data Centres
- Need to encourage Data Managers to train other staff
- How do we balance our focus between the functioning of the Data Centres and their problems, and the implementation of the project activities
- Need to focus on outcome rather than output
- Poor selection (process) of trainees e.g., Cameroon, Congo, Egypt, Guinea
- How do we make full utilization of ODINAFRICA trainees?
- How do we collaborate with South Africa?

He concluded that though there are some challenges, the implementation of Data Management work package of ODINAFRICA-III project is progressing well. All planned activities are being implemented in a timely manner and successfully.

The Committee reiterated that the NODC should be the national focal point for all data types. It is at the NODC that all marine environmental data will be archived and QC performed. The development of products will be guided by the requirements of WP4 (ICAM). The Committee stressed the importance of the national coordination group that promotes collaboration and networking between national institutions active in the coastal and marine areas, and urged countries to either establish or strengthen the functioning of this coordination group.

Existing national structures responsible for sea level data collection should be maintained and strengthened through WP2. However formal arrangements should be made to make available processed sea level data to the NODCs to enable the development of products that will serve ICAM- WP4. WP2, and the relevant national institution responsible for WP2, should provide guidance on the role of the NODC in sea level data management or archival. Depending on the responsibilities attributed to the NODC related to sea level data management, NODC staff may require some training in this area. [the kind of training will depend upon the national arrangements for sea level station management]

Concerning Marine Biodiversity data management, the Committee recommended that in the cases where OBIS nodes are not established within the NODC host institution relevant formal agreements should be established (related to access to data by NODC)

The Committee welcomed the proposal for a training course on buoy and fixed-platform data management (submitted by DBCP) and recommended that this course be organized as soon as possible. Noting that some of the ODINAFRICA institutions are already accessing PIRATA buoy data indirectly (delayed mode), the Committee urged the organizers to invite ODINAFRICA NODCs to the course. The course could assist countries to access the data in real-time.



The Committee requested all countries to respond to the questionnaire on data archaeology as soon as possible to enable the development of a good plan for implementing the activity.

Noting that the deadline for the definition of the continental shelf and criteria for the establishment of its outer limits is 2009 (Article 76 Law of the Sea Convention), the Committee recommended cooperation by ODINAFRICA NODCs but requested that this matter be studied in more detail to identify how NODCs can contribute, either through their data holdings (or access to other institutions' data holdings) or through providing data management expertise.

The Committee requested the IOC secretariat to contact the ongoing Programmes/ Projects in Africa, with a view to establishing close collaboration between them and ODINAFRICA, especially on issues related to collection, processing and archival of data. The Committee recommended that where no permanent (long-term) arrangements are planned in programmes then data should preferably be transferred to ODINAFRICA NODCs for permanent archival. The Committee recommended that donor agencies, programmes or projects that issue research grants to researchers, include a requirement to provide collected data to their ODINAFRICA NODC. The Committee encouraged the programmes to put on their web site data reports and other relevant documents, and recommended that the programmes utilize IODE standard methods for data management and quality control. The Committee also requested the Project Manager to discuss with SADC the possibility of establishing collaboration.

The Committee welcomed the draft "performance standards for IODE NODCs and DNAs" (**Annex III**) but concluded that it was not possible to comment in detail. The group recommended that this document be discussed by email, moderated by the WP3A coordinator and Dr Murray Brown.

The Committee recommended stronger focus on "training of trainers". However there has to be closer monitoring on whether the trained staff actually train other colleagues. In this regard it was recommended that trainees receive a "trainers guide" and organize a course for colleagues immediately upon their return. This will also help in addressing the need for data management training in other national institutions, and thus strengthen the position of the NODC. Ways and means must be identified to promote ODINAFRICA data managers at the international scene and ensure that they are involved in cutting-edge data management. This could be through internships, participation in international conferences, membership of international technical groups, exchange of expertise between the ODINAFRICA NODCs etc.

The Committee requested the IOC Capacity Building Coordinator to address the possibility of getting "academic certification" after participation in the ODINAFRICA/IODE training courses rather than a "certificate of attendance".

The Committee concluded that the problem of staff turnover cannot be fully resolved but can be approached through a mixture of optimizing conditions and continuous training of other NODC staff. This implies however that the institution assures a "critical mass" of staff (at the required technical/academic level) in the NODC.

The Committee emphasized the importance of integrating the NODC activities in the regular programme of the host institution to ensure sustainability beyond the project period. External funding will only be "invested" when there is a solid resource foundation present. It is therefore essential that the NODC host institution ensures this solid foundation in terms of staffing and infrastructure.

The Committee emphasised the need for data managers to promote themselves and their centres through publications, proposal development, presentation at scientific conferences.

The Committee recommended the compilation of success stories from the ODINAFRICA NODCs which can act as a catalyst for other ODINAFRICA NODCs. This should include a “toolkit” of good ideas that have been internally successful in raising the profile of the NODCs. These can be put in the form of good quality pdf files on the ODINAFRICA web site.

## 5. INFORMATION MANAGEMENT

The Regional Coordinator for Information Management reported on activities implemented in the work package. These include:

- Development of new ODINAFRICA Information Centers (IC) and strengthening of established Information Centers - three new ODINAFRICA information centers /libraries established in Egypt, Gabon and Namibia. INMAGIC software for integrated library management was provided and installed for each new centres. PC's were provided to the Information Centres in Egypt and Namibia;
- Organization of Marine Information Management training courses – six new information managers from Egypt, Gabon, Kenya, Madagascar, Namibia and Nigeria were trained in Marine information management at the IODE Project Office, Ostende, Belgium from 14 August to 3 September 2005;
- Development and updating of information products (databases and directories) and services: 18 library databases created in ODINAFRICA II were quality controlled, and compiled for merging to AFRILIB. A web interface has been developed to enable on-line access to the database through <http://www.odinafrica.org/afriblib/>;



- Development of OdinPubAfrica. OdinPubAfrica is the ODINAFRICA e-Print service which provides a growing database of full text literature from Marine Science and Oceanographic institutes in Africa. The initiative is funded with additional resources through the Flanders UNESCO Science Trust fund (FUST). Training has been provided to 15 ODINAFRICA librarians to enable them assist in the development of the repository which is available at <http://iodeweb1.vliz.be/odin/>



- AFRIDIR: *The African Directory for Marine and Freshwater professionals*. Has more than 900 Marine and Freshwater professionals from 33 African countries.
- ASFA: *Aquatic Sciences and Fisheries Abstract Database*: Two additional ODINAFRICA Information Centres (Mauritania and Senegal) have been designated as ASFA Input centers, bring the total to eight. Most of the ODINAFRICA institutions now access the ASFA database either as input centres or through an initiative to provide free access to Low Income Food Deficient Countries supported by the UN – ASFA co-sponsors (FAO and IOC), and the publisher – CSA.
- IAMSLIC: *International Association of Aquatic and Marine Science Libraries and Information Centers*. 2 years subscription to IAMSLIC was paid for all ODINAFRICA information centres. This enables them to access the IAMSLIC Z39-50 Distributed library, share resources through the interlibrary loan services, and participate in email list discussion with other aquatic and marine science libraries world-wide.
- INASP, PERI and AGORA: Several ODINAFRICA Information centres participate in these programmes which provide free access to e-journals.

- Representatives of ODINAFRICA Information Centres participated actively in meetings such as IODE-VXIII (April, 2005 Ostend, Belgium), ASFA Board meeting (September 2005, Rome, Italy), IAMSLIC Conference (September 2005, Rome, Italy), and the IAMSLIC Conference (September 2005, Accra, Ghana).
- National information products and services developed in 2005 include: 6676 records in library catalog (Tunisia), Library webpage with online catalogue; [www.gilchrist.gov.za](http://www.gilchrist.gov.za) (South Africa), Library webpage through NODC website: [http://www.ioc.unesco.org/odinafrica\\_sites/senegal/ressources\\_sn.htm](http://www.ioc.unesco.org/odinafrica_sites/senegal/ressources_sn.htm) (Senegal), inclusion of KMFRI library catalogue in the IAMSLIC libraries database (Kenya), publication of newsletters to publise library and NODC activities in Mauritania and Togo.

However challenges have been experienced in implementing marine information management activities in some of the countries as follows:

- (i) *Morocco*: information manager changed and Information Centre from Universite Mohammed V in Rabat to Ibn Zohr Universite in Agadir. A new Information Manager has consequently been appointment who may require training;
- (ii) *Guinee*: information manager changed and new person has not been trained;
- (iii) *Comoros*: slow development of library catalogue;
- (iv) *Benin*: slow development of library catalogue;
- (v) *Cameroon*: No information manager, no IM activities;
- (vi) *Algeria*: did not participate in information management training;
- (vii) *Angola*: did not participate in information management training;
- (viii) *Congo*: did not participate in information management training;

Cote d'Ivoire, Gabon and Madagascar which participated in ODINAFRICA-II has had new Information Managers trained during the current phase of ODINAFRICA. They are expected to continue the development of Marine Information management activities in these countries.

The Committee decided that the focus for the remaining period will be:

- Updating and publise the facilities and services available in the national Information centres in the web
- Develop a mechanism for Document Delivery System with possibility to combine mix of IAMSLIC facilities, E-journal
- Further development and quality control and dissemination of databases such as AFRILIB, AFRIDIR, ODINPUBAFRICA through the internet

The Committee made the following recommendations:

1. **AFRILIB**: The ODINAFRICA logo should appear on the homepage of the AFRILIB web interface, and the catalogue renamed ODINAFRICA-AFRILB. A one page brochure on how to use AFRLIB should be prepared and circulated widely. The Loan request system should be improved and linked to ODINPUBAFRICA. Regular quality checks should be made on records in the database, and AFRILIB should be compatible with other marine databases such as the IAMSLIC Z39-50. There should be close collaboration between the IT experts working on the AFRILIB web interface and the Coordinator for Information Management.

2. AFRIDIR: There should be more visibility for AFRIDIR in OceanExpert. The AFRIDIR records should be quality controlled, and Information Managers should be given permission to update records from their respective countries.
3. ODINPUBAFRICA: The close collaboration with this project should continue. Participants should be encouraged to increase the submission of documents. The internet accessibility problem in some of the countries should be addressed. Collection of ICAM Manuals and Guidelines should be included in the ODINPUB as recommended by the PMC of January 2006. The possibility of strengthening the capacity at two locations (provision of better scanners) should be explored to improve the rate of submission of documents.
4. Document Delivery: In order to improve access to primary documents from local library, the following strategy was proposed during the ODINAFRICA seminar and endorsed by the Committee:
  - Strategy 1: use AFRILIB request system for delivery – with improvements suggested earlier
  - Strategy 2: union lists of Journals from information centres should be finalised and made available through IAMSLIC – (it was noted that Seychelles and Kenya have already availed their journals list)
  - Strategy 3: training in methodology for utilizing open access programs as AGORA, and INASP-PERI. ODINAFRICA should explore the possibility of paying subscription for those countries not entitled to free access.
  - Strategy 4: develop new ASFA input centres and collaborate with IAMSLIC and ASFA in the development of the Aquatic Commons Repository
  - Strategy 5: linkage of AFRILIB with OdinPubAfrica
5. INMAGIC updates: The Committee noted that a number of licenses purchased for the institution were not in use. It is likely that the project may have to pay for new licenses since the update period had already passed. The Committee decided that an update would not be essential during the current phase of the project. The centres should focus on using the available version of INMAGIC to finalise and ensure quality of their respective databases.
6. The Committee decided that there should be no separate training course on web development for librarians. The Information Managers will be encouraged to apply for participation in the courses organized within the framework of the ODINAFRICA Websites Improvement Project (OWIP). In view of this decision, there are no sufficient justifications for holding a meeting of ODINAFRICA librarians back-to-back with the ASFA Board meeting in September 2006 at the IODE Project Office in Ostende, Belgium.
7. The Committee noted that Algeria, Angola, Cameroon and Congo have not participated in the Information Management training courses, while the people who were trained in Guinea and Morocco departed from the institution without succession arrangements being put in place. The Committee therefore decided that there was no need to provide funds for information management to the institutions participating in ODINAFRICA in these countries.

## 6. PRODUCTS DEVELOPMENT AND DISSEMINATION (ICAM).

This work package focuses on identification of end users of marine/coastal data/information products and their requirements, identification and development of set of core products to be prepared by each NODC, development of Regional and National Marine Atlases, improvement of atmospheric and oceanic monitoring databases, promotion and dissemination of outputs of the project to all stakeholders, and assessment of the impacts of products on the end-user.

The Regional Coordinator Mr A.K. Armah reported on activities implemented within the framework of the work package, and on the recommendations made during the ODINAFRICA seminar.

The working group set up during the ODINAFRICA seminar noted that three types of products have been identified by the national consultation workshops, and endorsed by the PMC. These are (a) databases/atlasses, (b) trends (eg population of cities along the coastline, fisheries, or evolution of shorelines), and (c) scenario development (e.g. impact of a 20cm rise in sea level, impact of oil spill, impact of reduction in flow of main rivers on coastal areas). There is a need to focus on a limited number of products and services, and develop capacity that will be required to prepare and disseminate them, rather than stretching the limited resources available. The products developed should respond to management objectives. NODCs should provide the linkages between the different ICAM players in their respective countries. This will require the development of an inventory of the institutions dealing with ICAM in each country, mandates of each institution, what (data and products) it requires to achieve its mandate, and what major projects/initiatives they participate in.

The group agreed that the focus should be on two products: (i) Marine Atlas for Africa, and (ii) Marine Biodiversity Databases.

They then considered the:

- Atlas parameters, scope (geographic, subject and temporal), and usage;
- Biodiversity databases to be developed,
- Other training required and how they can be implemented (GIS, RS, DBCP, Vulnerability)
- Development of National and project websites
- Other publicity options
- Third project Seminar

The list of parameters discussed during the PMC was considered and amended as in **Annex IV**. This will be further streamlined during the data mining and atlas assembly workshops.

The usage of the atlas must be defined before embarking on its development. The following potential usage was identified during the ODINAFRICA Seminar:

- (i) Library of environmental and social information for planning & decision –making
- (ii) Environmental assessment
- (iii) Resource management
- (iv) Baseline for assessing environmental & social change
- (v) Providing overall picture of marine environmental and social issues in Africa for the international community.
- (vi) Allowing the identification of gaps for future work

The Committee (PSC) endorsed these recommendations and decided that the Marine Atlases cover the entire African Coastline (and not three separate regional atlases as originally proposed by the PMC), with the possibility of extracting subsets for specific geographic regions as required. The Atlas will incorporate existing geo-referenced datasets available in the public domain (but tailored to meet specific scope requirements), and also data products created from national and international marine data collections by scientists participating in the ODINAFRICA program of capacity building projects. The Atlas project will be conducted in three phases: (1) Data mining to gather global, continental and national data according to an agreed-upon scope of topics, geographic limits and temporal considerations; (2) Conversion of the collected datasets into GIS-compatible forms and products; and (3) Documentation and compilation of the GIS resources into three well-organized, user-friendly digital Atlases that can be distributed as stand-alone resources within the wider community of marine and coastal scientists on the African continent. The specific activities to be implemented are:

1. The **Data Mining Workshop** will be held at the IODE Project Office (Ostend, Belgium) June 6-16, 2006. The participants will be three ODINAFRICA data managers who have been trained in GIS methods, IODE Project Office trainers, and invited specialists from other atlas programs (for whom funding is available). The purpose is to attempt to obtain quality datasets (and related metadata files) for the topics covered in Attachment B. The data managers attending this workshop will be identified below as OMAP Team Leaders, with either geographic or topical leadership responsibilities, to be determined.
2. The Atlas **Coordination and Protocols Workshop** will be held at the same venue, June 19-23, 2006. The participants of the above workshop will be joined in this case by up to three invited data managers (with various levels of GIS experience). The purpose is to establish guidelines and methods for all necessary data manipulations, analyses and GIS file creation, and to put as much order into the metadata sets as possible. The entire group of ODINAFRICA data managers will have the bulk of the summer and fall (i.e. until November 27) to complete this work.
3. The Atlases **Data Assembly Workshop** will be held at the same venue, November 27-December 1, 2006. The purpose is to combine all the data and metadata elements with a browser interface, and to make final edits or corrections to the metadata. The attendees will include the Team Leaders, plus most, if not all, of the other OMAP team members, and possibly the ODINAFRICA Websites Improvement Project (OWIP) instructor (for assistance with the browser interface).

The Committee noted that the Atlas project, if properly implemented would greatly raise the profile of ODINAFRICA.

The Committee welcomed the offer of NEPAD/COSMAR to publish hard copies of the Marine Atlas. Further details on how this will be implemented should be finalised with the project manager and circulated to the PSC for approval.

The working group had agreed with the recommendations of participants in the Marine Biodiversity Data management courses held in Ostend, Belgium (April 2005), and Mauritius (August 2005) that each National marine biodiversity node would immediately commence preparation of inventories of experts datasets, institutions, and species lists. The Marine

Biodiversity databases must operate within the framework of the National Oceanography Data and Information Centres (NODCs) and will not be provided with funds/equipment outside this framework. The focus at the project (pan-African) level would be on Marine Biodiversity Data mobilization workshops for five priority taxa: mollusks, polychaetes, echinoderms, sponges, stony corals. The data should be formatted in such a way that they can be included in the Marine Atlas.

The Committee approved the recommendation, and in particular the selection of Asha Poonyth (Mauritius) and Malika Bel Hassen (Tunisia) as coordinators for Eastern/Southern Africa and Western/Northern Africa respectively and the organisation of the five data mobilization workshops, each lasting 2-weeks. However in view of the budgetary limitations only three of the workshops were included in the budgets for 2006/2007. The Project Manager was requested to explore the possibility of organising the remaining two in collaboration with other partners.

The Committee noted that GIS, remote sensing and modelling had been identified as important tools development of products for ICAM for which capacity building is required in many ODINAFRICA institution. The Committee emphasised the importance of linking training to specific products and requested the Project manager to discuss with other partners (IOC/ICAM, IOC/TEMA, LMEs , GOOS Africa etc) on the possibility of collaboration in developing capacity in these fields.

The Committee endorsed the proposals for publicizing the project activities through: national stakeholders workshops, publication of newsletters (WINDOW and COSMAR News), brochures and flyers, and maintenance and publicity of both the project websites and the ODINAFRICA NODC websites. Performance indicators should be developed for these products to define whether they are having an impact.

The Committee noted the progress made in development of the national websites and commended Dr El Ouizgani for the efforts in training and follow-up provided to trainees. Efforts must be made to ensure that all the ODINAFRICA NODCs have websites by the end of 2006.

## **7. THIRD ODINAFRICA SEMINAR.**

The Committee agreed that the third ODINAFRICA Seminar should ideally be held back-to-back with a high profile event which brings together key players in the marine field in Africa. Several options were considered:

- i) GEF International Waters Conference planned for August 2007 in Cape Town, South Africa,
- ii) Joint Session of the Conference of Parties to the Nairobi and Abidjan Convention organised by NEPAD and UNEP Regional Seas Programme (July/August 2007),
- iii) Session of African Ministers of Environment –AMCEN, planned for Brazzaville, Congo (June 2007).

The Committee decided that the most appropriate event to link with the third seminar is the Joint session of COP for Abidjan and Nairobi Conventions. The conference will be held at the Cape Town Convention Centre. The committee proposed that the seminar be held at the University of Cape Town Graduate School of Business. Prof G. Brundrit was requested to assist with making the necessary contacts to check on this.



## 8. REVISED WORK PLANS AND BUDGET

The Committee decided that the end date for the project be set for 30 June 2008. This is in view of the late start of the project. The revised budget is summarised below, with detailed breakdown on the next page.

Work Package	2004	2005	2006	2007	TOTAL
WP1. Project Management and Coordination	49,600	115,300	108,700	108,700	382,300
WP2. The Coastal Observing System	-	92,000	312,000	139,000	543,000
WP3. Data and Information Management	80,540	454,560	166,000	86,000	787,100
WP4. Product Development, End-user Communication and Information Delivery	33,800	62,800	361,000	130,000	587,600
<b>SUB-TOTAL</b>	163,940	724,660	947,700	463,700	2,300,000
<b>Overhead UNESCO (10%)</b>	16,394	72,466	94,770	46,370	230,000
<b>GRAND TOTAL</b>	180,334	797,126	1,042,470	510,070	2,530,000

The Committee welcomed the offer of collaboration by all the projects, programmes, and organisations that had been represented at the ODINAFRICA Seminar, and requested the Project Manager to follow-up with each of them to discuss specific proposals for collaboration.

Noting the importance of collaboration with the GOOS and LME projects, the Committee made provisions for participation of the ODINAFRICA Coordinators in the joint GOOS/LME meetings planned for Cape Town, South Africa in November 2006.

The Committee instructed the Project Manager to explore the possibility of making savings under the different budget lines which could be used to augment the budget for the Third ODINAFRICA Seminar.

The Project Steering Committee recommended that an effort be made to visit all the NODCs before the end of the Project and assess the implementation of activities at the national level. In particular the Project Manager should visit Cameroon, Angola, Congo Gabon, Guinea and Mauritania to evaluate the implementation of activities in these countries. The second lot of priority countries funds permitting should be: Algeria, Comoros, Egypt, Morocco, Namibia, South Africa, Cote d'Ivoire.

## 9. BEYOND ODINAFRICA – III

The Committee decided that in view of the late start of ODINAFRICA-III (July 2004 instead of January 2004) the end of the current phase of ODINAFRICA should be 30 June 2008, so as to enable full implementation of planned activities.

The Committee noted that the drive for ocean based services and industry to sustain an increasing population is gaining momentum. Tourism, maritime transport and emerging oil and gas industry are taking centre stage. Similarly the requirements for Article 76 are xx xx xx xx with the approaching deadline of 2009. Climate change and its possible impact on coastal areas including marine biodiversity, floods/storm surges and droughts is another area of concern. It will therefore important to look at both oceanographic and atmospheric

parameters. Collaboration between the oceanographic and meteorological communities will be important. Models will increasingly be used to address these issues. The models will require good quality measurements for calibration.

ODINAFRICA-IV must position itself to service the greater demands that will be put on it and its NODCs.

The following were considered the possibilities for development of the network beyond the current phase and recommended the following:

- development of a Pan African Geo spatial data clearing house
- increase number of sensors at the tide gauge locations
- what are the tools we have provide?? Can we provide tools for someone to site hotels
- where is the toolbox to show how to site wells or ground water extraction, and other such products
- ODINAFRICA-IV should deal with the four threads that had been identified
- Produce high level interactive, integrated, high profile products,
- Further development and strengthening of the information centres to pro-actively service the needs of users, rather than acting as book stores. The centres will have to focus on development of their communication capacities (digital libraries)

How can the ODINAFRICA NODCs service the needs of the LME programmes, and what are the LMEs already addressing so as to avoid duplication.

The Committee requested Mr Peter Pissierssens to confirm the target dates for submission of proposals for new funding.

The Committee requested the Project Management Committee to develop a proposal for a straddling project to cover the period between the end of ODINAFRICA-III and the start of a possible ODINAFRICA-IV. This would provide for maintenance of the tide gauges, and operations of the NODCs during the transition period.

## **10. CLOSING OF THE SESSION**

The Chair of the session Mr Julius Wellens Mensah thanked the members of the Committee for their active participation, and the frank and cordial manner in which they had addressed the issues raised. He expressed the confidence that the results of this session will improve the implementation of ODINAFRICA in the remaining two years.

On behalf of the participants he thanked the Head of the IODE Project Office Dr Vladimir Vladymyrov and his staff for providing the facilities and excellent support that had enabled the successful organisation of both the ODINAFRICA Project Seminar and the Project Steering Committee meetings.

The Session was closed by the Chair on Friday 28 April at 13h45.

**ANNEX I: DETAILED REVISED BUDGETS FOR ODINAFRICA-III**

	2004/5	2005/6	2006/7	2007/8
<b>WORK PACKAGE 1- MAANGEMENT &amp; COORDINATION</b>				
Project Manager & Regional Coordinators	18,500	61,200	61,200	61,200
ODINAFRICA PMC & PSC meetings	21,100	28,700	20,000	20,000
Management costs PM and RCs	4,000	7,500	7,500	7,500
Management costs IOC	3,700	10,000	10,000	10,000
Occasional travel PM	2,300	7,900	10,000	10,000
<b>SUB-TOTALS</b>	<b>49,600</b>	<b>115,300</b>	<b>108,700</b>	<b>108,700</b>
<b>WORK PACKAGE 2- COASTAL OBSERVING SYSTEM</b>				
Procurement and configuration of tide gauges		80,000	160,000	-
Technician assessment visits (site selection)		12,000	27,000	-
Installation of tide gauges (including site visits)		-	70,000	14,000
Maintenance of tide gauges (including technician visit)			-	40,000
Oceanographic sensors (at selected sites)			-	-
Data transmission costs			6,000	12,000
Establishment sea level data centre and develop tide tool.			15,000	15,000
Spares and miscellenous			-	20,000
Sea level stations operational costs			3,000	7,000
Sea level training workshops (Nov 2006, and May 2007)			31,000	31,000
<b>SUB-TOTALS</b>		<b>92,000</b>	<b>312,000</b>	<b>139,000</b>
<b>WORK PACKAGE 3 DATA AND INFORMATION MANAGEMENT</b>				
Operational expenses data centres	12,800	37,000	39,000	33,000
Obtaining hydrological data sets	7,040	9,600	-	-
Equipment upgrade NODCs	12,800	13,300	-	-
Operational expenses information centres	12,000	37,000	35,000	26,000
Equipment upgrade information centres	12,800	13,300	-	-
Internet access	7,200	23,200	26,000	22,000
Mainstreaming OBIS	-	20,400	-	-
OBIS data management training course	-	102,500	-	-
Projects/Programmes databases (SEACAM)	-	3,000	-	-
Data management training course	-	81,500	40,000	-
PC equipment new countries and RCs	-	55,960	-	-
INMAGIC upgrades + new	15,900	9,600	-	-
MIM training course	-	30,400	-	-
Information Man Follow-up(AFRILIB-7K, QC – 3K , IAMSLIC-1K)	-	7,800	11,000	-
Data Man. Follow-up(LODE-XVIII, MEDI, ATLAS)	-	7,000	10,000	-
Interlibrary loan service/journals (AGORA-provisional)	-	3,000	5,000	5,000
<b>SUB-TOTALS</b>	<b>80,540</b>	<b>454,560</b>	<b>166,000</b>	<b>86,000</b>
<b>WORK PACKAGE 4 PRODUCTS DEVELOPMENT &amp; DISSEMINATION</b>				
National ICAM Consultations	28,000	9,000	-	-
WP4 rewriting workshop	-	-	20,000	-
Improvement of ODINAFRICA Websites (window, .ODIN.ORG)	5,800	10,500	15,000	5,000
Collaboration (ABELOS, WIOMSA, IOTWS)	-	31,300	-	-
Leadership workshop support	-	12,000	-	-
Project Seminar (24-26 April 2006), 2007/8	-	-	114,000	80,000
Data mining workshop (5-16 June 2006)	-	-	20,000	-
Regional Atlas Consultation/protocols workshop	-	-	45,000	-
Regional Atlas Assembly workshop (27 nov-1 Dec06)	-	-	45,000	-
GIS distance course(ITC)	-	-	4,000	-
Atlas on line (3 data miners)- June 2007	--	-	-	10,000
Atlas published on CD, DVD- Feb 2007	-	-	-	-
Biodiversity workshop (Mar 2006, Oct.2006, Feb2007)	-	-	40,000	20,000
Biodiversity workshop 4. (May 2007, Oct 2007)	-	-	-	-
Publication/publicity materials	-	-	-	15,000
GOOS meetings	-	-	18,000	-
Second Websites workshop (Sep 2006).	-	-	40,000	-
Support Leadership workshop (???- USD10,000)	-	-	-	-
<b>SUB-TOTALS</b>	<b>33,800</b>	<b>62,800</b>	<b>361,000</b>	<b>130,000</b>

ANNEX II

**AGENDA**

**Thursday, 27 April 2006**

09:45 Welcome

PRESENTATION AND REVIEW OF SEMINAR RECOMMENDATIONS

09:45 - 10:30 COASTAL OBSERVING SYSTEMS

10:30 - 11:15 DATA MANAGEMENT

11:15 - 11:45 Tea/Coffee break

11:45 - 12:30 INFORMATION MANAGEMENT

12:30 - 13:15 ICAM (PRODUCTS DEVELOPMENT, DISSEMINATION)

13:15 - 14:30 Lunch Break

14:30 - 15:15 MANAGEMENT AND COORDINATION

15:15 - 16:00 PLANS FOR THIRD ODINAFRICA SEMINAR

16:00 - 16:30 Tea/Coffee break

16:30 - 17:30 PMC Members (Regional Coordinators and Project Manager) prepare reports

**Friday, 28 April 2006**

09:30 - 11:00 Beyond ODINAFRICA-III

11:00 - 11:30 Tea/Coffee break

11:30 - 13:00 Finalisation of work plan 2006/2007  
Closure.

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## **ANNEX IV: Draft Performance Benchmarks for National Oceanographic Data Centers (NODCs) and Designated National Agencies (DNAs) in the International Oceanographic Data and Information Exchange Program (IODE)**

[April 18, 2006]

This list of activities and characteristics is not meant to be met by every NODC/DNA. There are some items that some would consider to be mandatory or highly desirable; others might be viewed as simply nice to do. The physical and organizational constraints, funding and staffing of each NODC/DNA will determine what functions it pursues and the products and services it provides. These benchmarks are just meant to be used along with common sense and knowledge of local priorities to manage the national program activity.

1. Official Status
  - a. State is a member of IOC
  - b. State is a member of IODE
  - c. State has designated an IOC representative
  - d. State has designated an IODE National Contact
  - e. Formally designated as an NODC or DNA within the IODE
  - f. Head of NODC/DNA has been designated
2. Data Collection
  - a. The NODC/DNA has determined its geographic Area of Interest after consultation with other agencies and individuals
  - b. The NODC/DNA has surveyed the data needs of national marine agencies and “customer” and “client” groups, to incorporate additional materials into the national data collection
  - c. The NODC/DNA has created a national data collection, consisting of the following components, as a minimum:
    - i. Traditional ocean station data
    - ii. Ocean moorings data
    - iii. Coastal stations data (e.g. sea level)
    - iv. Operational data from contemporary sources
    - v. Satellite data (only Levels 3 or 4 necessary)
    - vi. Ocean and atmosphere climatological products
    - vii. GIS-compatible files of the above data and base map materials
    - viii. All other data required and requested by “customer” and “client” groups
  - d. The NODC/DNA can rapidly provide automated or semi-automated inventories of all data in the above categories
  - e. NODC/DNA has identified and collected historical (usually hard-copy) datasets
  - f. The NODC/DNA has digitized these historical data and included them in the national data collection
  - g. NODC/DNA has cataloged the national data collection with (DIF) metadata records, as produced by the MEDI software, or MEDI-Lite records produced by Excel.
  - h. All MEDI/MEDI-Lite records contain appropriate measures of data quantity (e.g. number of stations/samples/parameters, length of record, number of specimens, etc.) to determine how much data is included.
3. Public Presence
  - a. Website specifically for the NODC/DNA has been published<sup>1</sup>
  - b. Website includes logo-links to major other IODE resources and sites
  - c. Website includes links to major related agencies, institutions, organizations and data resources, national and international
  - d. Website includes concise, comprehensive description of the IODE

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<sup>1</sup> May be an easily identifiable sub-web within an institutional web, as long as the home page uniquely identifies the NODC or DNA as a special activity center.

- e. Website includes concise, comprehensive description of the NODC/DNA itself on the homepage, including a specific statement of the types of data in the national data collection
  - f. Website includes descriptions of all services provided by the NODC/DNA
  - g. Website includes catalog or listing of all data resources (i.e. files and sets of files) held by the NODC/DNA
  - h. Website includes simple links or dynamic access to the data files of the national collection
  - i. Website includes data products and publications derived from these datasets
    - i. Maps of station locations for selected major hydrographic parameters; annually, seasonally or monthly, as appropriate
    - ii. Gridded and contoured major hydrographic parameters at standard depths; annually, seasonally or monthly, as appropriate
    - iii. Property-property scatter plots of major hydrographic parameters, using standard/classic water mass identification methods
    - iv. Sections plots of selected hydrographic parameters along carefully chosen offshore-trending (or in some cases, longshore-trending) alignments
    - v. Difference plots showing ranges of conditions from ii, above, as appropriate
    - vi. Narrative descriptions of the above analytical figures, their derivation and significance
    - vii. Links to or citations of publications where these analytical figures have been used
  - j. Website includes links to regional or continent-scale joint datasets and products produced cooperatively with other NODCs/DNAs
  - k. NODC/DNA provides a concise, comprehensive paper brochure or pamphlet describing itself, its services and resources
  - l. Both the website and the brochure state that the NODC/DNA makes all its data holdings available to the public at no charge (or for a minimal charge based on the cost of reproduction)
  - m. NODC/DNA has a mailing list of physical addresses for related agencies, institutions and organizations
  - n. NODC/DNA has an email list of related agencies, institutions, and organizations
4. Data Management
- a. The NODC/DNA has written guidelines for general management and data quality control in all of the major data areas of the national collection
  - b. The NODC/DNA demonstrates familiarity with the data and skill in their use by creating accurate, documented analysis products, including as a minimum those demonstrated in OceanTeacher.
5. Capacity Building
- a. The NODC/DNA works to expand its capabilities by sending data managers to classes/workshops offered by the IODE
  - b. The data managers within the NODC/DNA demonstrate their personal capabilities by offering local training in all areas of data management to other workers
6. Infrastructure
- a. The computer equipment of the NODC/DNA is located within the immediate working environment of the NODC/DNA manager
  - b. The NODC/DNA has direct access, through its own computer to the Internet
  - c. The NODC/DNAs Internet access is the fastest baud rate locally available
  - d. NODC/DNA website is located on a high-baud rate local server, or on the IODE Project Office server if no reliable, fast local server is available
  - e. NODC/DNA staff members all have individual (i.e. not joint/institutional) email addresses
  - f. All NODC/DNA computers have external backup devices capable of complete backup of all data
  - g. All NODC/DNA data are backed up at least weekly
  - h. All NODC/DNA computers have up-to-date anti-virus software programs installed and running in all available modes (i.e. including email scanning), and automatic virus definition updating services have been purchased and are active
  - i. All NODC/DNA computers are totally scanned at least bi-weekly for viruses

## ANNEX V: REVISED ODINAFRICA LIST OF MARINE ATLAS PARAMETERS

- L = very long-term or static
  - A = annual
  - Q = seasonal
  - M = monthly
  - S = synoptic/episodic
  - T = time series
  - V = vertical distribution
  - P = model predictions
  - D = difference grids
  - 1 = resolution at or coarser than 1 degree
  - 10 = resolution roughly between 1 degree and 1 km
  - 100 = resolution finer than 1 km
1. Base Map
    - a. Coastline (L, S, 100)
    - b. Bathymetry & topography (L, 10)
      - i. Gridded
        1. Classical hydrography
        2. Satellites
      - ii. Vector
    - c. Geo-imagery (S, 100)
      - i. Visible
      - ii. Radar
      - iii. Other
    - d. Gazetteer compilation
  2. Geosphere (L, 10-100)
    - a. Soils
      - i. Basic types
      - ii. Measures of cohesiveness/erosion potential
    - b. Sediments
      - i. Thickness
      - ii. Texture
      - iii. Chemical composition (including pollutants)
      - iv. Lebenspuren, etc.
    - c. Energy Minerals
      - i. Resource potential
      - ii. Active sites
    - d. Non-Energy Minerals
      - i. Resource potential
      - ii. Active sites
    - e. Geohazards
      - i. Faults & plate boundaries
      - ii. Historic events
      - iii. Historic impacts
      - iv. Geotechnical problem areas (slumping etc.)
    - f. Beaches & Dunes (L, S, 100)
      - i. Distribution
      - ii. Erosion
      - iii. Other impacts/problems
  3. Hydrosphere
    - a. Historical surveys (S, T, 10-100)
      - i. Cruises & stations
      - ii. Moorings
      - iii. Existing atlases and products
    - b. Physical oceanography (A, Q, M, T, 1)
      - i. Salinity, temperature, density distributions
        1. In-situ observations & analyses (V)



2. Satellite observations & analyses
  - ii. Currents
    1. Traditional
      - a. Shipdrift
      - b. Moorings
      - c. Littoral drift
    2. Operational
      - a. Drifters & floats
      - b. Satellites
  - iii. Sea level
    1. Traditional
      - a. Tide gauges – tides and mesoscale
    2. Operational
      - a. Satellites - mesoscale
  - iv. Waves
    1. Traditional
      - a. Wave staffs
    2. Operational
      - a. Satellites
      - b. Buoys
  - c. Chemical oceanography (A, Q, M, V, 1)
    - i. Major nutrients & oxygen
      1. Station maps
      2. Climatological analyses
    - ii. Micronutrients
    - iii. "Water quality"
      1. Low O<sub>2</sub>
      2. H<sub>2</sub>S events
      3. Major oil spills
  - d. Optical oceanography (A, V, 1)
    - i. Compilation of statistics for standard measurements
    - ii. Particulates, detritus, scattering
  - e. Limnology (A, Q, M, T, 100)
    - i. Drainage basins
    - ii. Major rivers & estuaries
      1. Locations
      2. Hydrographs (/w extrema)
      3. Impacted ocean shelf areas
    - iii. Coastal wetlands & lagoons
      1. Locations
      2. Seasonal levels & extremes
4. Biosphere
    - a. Coastal (dry) vegetation (A, Q?, S?, 1-10)
      - i. Zones & types
      - ii. Notable areas
    - b. Biological oceanography (A, Q?, S?, 1)
      - i. Pigments (V)
      - ii. Primary production (V)
      - iii. Phytoplankton
      - iv. Zooplankton
      - v. Particulates, detritus, scattering
      - vi. Satellite observations & analyses
      - vii. Upwelling areas
    - c. (Coastal) Marine zoology (A, Q?, S?, 1)
      - i. Distribution & biodiversity
      - ii. Living marine resources
        1. Protected species
          - a. Turtles
          - b. Birds

- c. Marine mammals
        - d. IUCN Red List
      - 2. Other charismatic species
        - a. Coelacanths
      - iii. Reefs – coral and other
        - 1. Die-offs, bleaching and disease
      - iv. Exotic & invasive species
    - d. (Coastal) Marine botany (A, S?, 100)
      - i. Algae & kelp
      - ii. Seagrasses
      - iii. Marshes
      - iv. Mangroves
      - v. Mudflats
      - vi. Exotic & invasive species
    - e. Fisheries (A, T?, 1?)
      - i. Species distributions
      - ii. Critical habitats
      - iii. Catch statistics areas (& ports of record)
      - iv. Catch statistics (areal & temporal)
      - v. Subsistence fishing target species
      - vi. NOTE: This entire section to be stratified according to type (i.e. commercial, artisanal, sportfishing) and also – if possible – by location (i.e. offshore, coastal, nearshore/estuarine, etc.)
- 5. Atmosphere (A, M, 1)
  - a. Weather
    - i. Synoptic weather patterns
    - ii. Extreme event paths, frequencies and impacts
    - iii. Maximum storm conditions
    - iv. Characteristics of the seasons
  - b. Climate (also P, D)
    - i. Temperature
    - ii. Precipitation (rain/snow)
    - iii. Winds
  - c. Air quality – Possible future topic
- 6. Cryosphere (A, Q, M, T?, 10-100)
  - a. Glaciers
    - i. Locations
    - ii. Seasonal areas
  - b. Sea ice
    - i. Historical seasonal limits/extremes
  - c. Icebergs
    - i. Historical seasonal limits/extremes
    - ii. Selected historical paths
- 7. Human Environment
  - a. Geopolitical data (L, 100)
    - i. Land
      - 1. Countries
      - 2. States/internal divisions
      - 3. Municipalities
    - ii. Marine
      - 1. EEZ boundaries
      - 2. Treaty lines
      - 3. Military activity zones
      - 4. Offshore dumping areas
      - 5. Major shipping routes
      - 6. IMO regular activity zones (distance limits)
      - 7. IMO special activity zones
      - 8. Navigational fairways & anchorages
      - 9. Pipelines

- 10. Cables
- 11. Minerals leases & platforms
- iii. Protected areas
  - 1. General marine (MPAs)
  - 2. General land
  - 3. World Network of Biosphere Reserves
- b. Population (S, 10-100)
  - i. Municipal population & densities
  - ii. Rural population & densities
- c. Infrastructure (L, 100)
  - i. Roads
  - ii. Ports & coastal engineering structures
  - iii. Railroads
  - iv. Bridges
  - v. Airports
  - vi. Energy transmission
  - vii. Information transmission
- d. Industry & commerce (L, 10-100)
  - i. Factories and production facilities
  - ii. Discharges
    - 1. Industrial
    - 2. Sewerage
    - 3. General non-point sources
  - iii. Coastal agriculture
  - iv. Coastal forestry
  - v. Mariculture
  - vi. Coastal mining
- e. Hospitality & tourism (L, 10-100)
  - i. Tourist targets
    - 1. Local/national cultural & historical
    - 2. UNESCO cultural & historical
    - 3. Ecological resources of note (see also Protected Areas)
  - ii. Hotels & resorts
  - iii. Diving, sportfishing & surfing locations/areas
- f. Socio-economics (S, 1)
  - i. Employment/unemployment levels
  - ii. Income levels
  - iii. Employment sectors