OCEANOGRAPHIC DATA AND INFORMATION NETWORK FOR AFRICA

ODINAFRICA-III

FINAL REPORT 2004-2009

Intergovernmental Oceanographic Commission
(of UNESCO)

Government of Flanders

Contact: Executive Secretary
Intergovernmental Oceanographic Commission of UNESCO
1 rue Miollis
75732 Paris cedex 15
France
Tel: [33] 1 45681000
Fax: [33] 1 45685812
Email: p.bernal@unesco.org

(IOC/INF-1271)
English only

FINAL REPORT

OCEAN DATA AND INFORMATION NETWORK – PHASE III.

Project Title: Ocean Data and Information Network for Africa *(ODINAfrica-III)*

Target Country or Region: AFRICA

Budget code: 513RAF2003

Contract number:

Funding sources: FUST and in-kind contributions from implementing institutions and UNESCO/IOC

Total Budget approved: US$2,530,000

Reporting Period: 2004 - 2009.

Executing Agency: UNESCO/IOC

Implementing partners: UNESCO/IOC and participating institutions in Algeria, Angola, Benin, Cameroon, Comores, Congo, Cote d'Ivoire, Egypt, Gabon, Ghana, Guinea, Kenya, Madagascar, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Nigeria, Senegal, Seychelles, South Africa, United Republic of Tanzania, Togo, and Tunisia.

Project starting date: July 2004

Project completion date: planned 31/12/2007
Revised 28 February 2009.

Responsible Sector: SC/IOC

Name of Person completing Report: Mika Odido

I. Summary and Background

The Ocean Data and Information Network for Africa (ODINAFRICA) brings together marine related institutions from twenty five (25) Member States of the Intergovernmental Oceanographic Commission of UNESCO from Africa.

The earlier phases of development of ODINAFRICA aimed at enabling member states from Africa to get access to data available in other data centres, develop skills for manipulation of data and preparation of data and information products, and develop infrastructure for archival, analysis and dissemination of the data and information products. The focus was on preparing databases, and data and information products for integrated management of the coastal environments and resources, and in particular enabling the Member States to be able to address the key issues identified in the African Process: (i) coastal erosion, (ii) management of key ecosystems and habitats, (iii) pollution, (iv) sustainable use ofliving resources, and (v) tourism. Each of the participating institutions has developed a suite of data and information products that have been quality controlled, merged and availed through project website *(www.odinafrica.org).* These include: Directories of marine and freshwater professionals, Catalogues of marine related data sets, Marine Species data bases, library catalogues, catalogue of marine related publications from/about Africa.

The goal of the current phase of ODINAFRICA is to improve data flows into the national oceanographic data and information centres in the participating countries, develop data and information products required for integrated management of the coastal areas of Africa, and increase the delivery of services to end users.

The following are the thematic work packages being implemented in the current phase of ODINAFRICA:

Coastal Ocean Observing System: focuses on upgrading and expanding African network for insitu measurements and monitoring of ocean variables especially sea level, provision of near real-time observations of ocean variables, and building adequate capacity for collection, analysis and management of sea-state variables. ODINAFRICA will install/upgrade at least 12 tide stations. An additional 20 stations will be installed/upgraded by other organisations such as the - Global Sea Level Observing System and the Indian Ocean Tsunami Early Warning and Mitigation System - GLOSS/IOTWS, the Benguela Current Large Marine Ecosytem project BCLME and the French Service Hydrographique et Oceanographique de la Marine - SHOM, bring the number of operational stations along the African coastline to over forty (40).

Data and Information Management: 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 data steams into NODC systems, Building capacity for data and information managers for new NODCs established as part of this project, and Rescue of historical data.

Product Development and end user communication and information delivery: 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 NODe. Marine Biodiversity databases have been developed covering mollusks, sponges and decapods, and an African Marine Atlas providing access to a wide range of datasets and products for management of the marine and coastal areas of Africa.

II. Description of project activities undertaken during the contract period

2.1 MANAGEMENT AND COORDINATION

The implementation of ODINAFRICA-III commenced in July 2004 with the establishment of the Project Steering Committee (PSC) comprising the Chairs of IOCEA and IOCWIO, Chair of GOOS Africa, and representatives of IOC/IODE, IOC/GOOS Africa, IOC/GLOSS, IOC/CB and IOC/ICAM, and the designation of the Project Manager. IOC/IODE, which is responsible for the administration of ODINAFRICA at IOC, also represents the donor representative on the Steering Committee. NEPAD/COSMAR was invited to participate in meetings of the PSC as an observer. The Chairs of IOCEA and IOCWIO are the co-chairs of the PSC.

The first meeting of the PSC was held at the UNESCO Regional Office for Science and Technology in Nairobi, Kenya in 12-14 July 2004. Other meetings have been held in June 2005 (Paris, France), April 2006 (Oostende, Belgium), and November 2007 (Oostende, Belgium).

Regional Coordination: The first meeting of the Project Steering Committee designated the following as Regional Coordinators for the work packages: Dr Angora Aman (WP2), Dr Desiderius Masalu (WP3A – Data Management), Mrs Arame Keita (WP3B – Information Management), and Mr Ayaa K. Armah (WP4 - Products Development and Dissemination). Together with the Project Manager they for**med** the Project Management Committee (PMC) which has held meetings in November 2004 (Accra, Ghana), June 2005 (Paris, France), January 2006 (Oostende, Belgium), February 2007 (Nairobi, Kenya), and November 2007 (Oostende, Belgium).

The ODINAFRICA Regional Coordinators for Coastal Observing System and Products development had few opportunities to meet the respective national work package coordinators, unlike those for Data and Information management who were able to meet the respective national coordinators at IODE, IAMSLIC, ASFA Advisory board meetings, and even at the ODINAFRICA Seminars.

During the missions undertaken as part of the FUST evaluation there were proposals for (i) expansion of the Project Management Committee to include representatives of all countries, and (ii) sub-regional coordination structures. The costs of holding such PMC meetings would be prohibitive. However it is important that National Coordinators are always informed of all the activities that are implemented. To this end communication between the Regional Coordinators and the Work Package Coordinators at national level should be copied to the National Coordinators. The reports of the Regional Coordinators should also be circulated to all national WP coordinators, even where they are not implementing an activity in the country.

The Project Manager visited some of the countries that had experienced challenges in implementing planned activities to explore how these can be addressed. This included Angola, Cameroon, Congo and Gabon. Recommendations were made on how some of these challenges could be addressed. It will also be important to have an assessment of the implementation of planned activities in all the NODCs participating in ODINAFRICA. This could be implemented as part of ODINAFRICA-IV.

Sub-regional activities should be encouraged, especially in the Eastern Atlantic and Mediterranean sub-regions, to build on the success of such initiatives already implemented in Western Indian Ocean.

ODINAFRICA worked closely with the different IOC programmes (eg GOOS, GLOSS, ICAM, CD), and also collaborated with other organizations and programmes such as WIOMSA, ACEP, NEPAD/COSMAR, UNEP/WIOLab, and BCLME in implementation of activities. The co-option of NEPAD/COSMAR into the PSC has provided useful linkages to these and other programmes/projects, as well as opportunities for collaboration.

National Coordination: Each of the countries participating in ODINAFRICA was expected to establish a National Project Management Committee (NPMC), comprising not more that 10 people including: (i) National Coordinators for work packages (WP 2,3,4); (ii) Representative of National IOC Committee and/or National Commission for UNESCO; (iii) National GOOS-AFRICA Committee representative; (iv) Representative of the national ODINAFRICA focal institution; (v) A selection of national experts in appropriate fields; and (v) a representative of Stakeholders.

This was an expanded structure, compared to the previous phase where we had only the national coordinator. However the resources availed at national level reduced, and the national WP coordinators did have resources allocated to them to implement clearly defined activities.

Not all the participating countries implemented this structure. While some established active national project management committees, in other countries the committees were never established and the management was totally dependent on the ODINAFRICA National Coordinator.

In many of the countries only one meeting was organised at national level (for consultation on ICAM products and services) and this impacted on dissemination of information on ODINAFRICA activities at the national level. National workshops provide an opportunity for the different national WP coordinators to meet and exchange views. However these were few in the current phase of ODINAFRICA. Communication with regional coordinators has been through emails, contacts at workshops/seminars, and few visits to the institutions. National WP coordinators did not have an opportunity to meet with their counterparts in other countries.

For the next phase, the structure adopted should vary from country to country, taking into account specificity. However guidelines should be provided. Two options were suggested:

- National coordinator, based at the NODC, working with a national coordination committee with a separate chair. National coordination committee serves as an oversight mechanism for national coordinator (this ensures group commitment).
- Institution as a focal point coordinating action (this ensures sustainability). The institution designates the national coordinator.

2.2 COASTAL OBSERVING SYSTEMS

The objectives of this work package were to upgrade and expand the African network for *insitu* measurements and monitoring of ocean variables (e.g. sea level, temperature, salinity, winds, currents e.t,c); provide near real-time observations of ocean variables; and build adequate capacity for collection, analysis and management of sea-state variables. The original plan envisaged the installation of tide gauges at 19 locations, ten of which would also have oceanographic stations to collect measurements of other parameters.

The first session of the Project Steering Committee, meeting at the UNESCO Regional Office for Science and Technology in Africa, Nairobi, Kenya in July 2004 decide to focus on sea level and defer other parameters to a possible next phase. The implementation was also impacted on by the Indian Ocean tsunami of 26 December 2004, which resulted in efforts

aimed at development of a tsunami early warning and mitigation system in the Indian Ocean. Sea level observations form a core element of the system. The implementation of the Coastal Observing System (WP2) benefited greatly from this. ODINAFRICA established collaboration with the Permanent Service for Mean Sea Level, Indian Ocean Tsunami Warning and Mitigation System, SHOM and Benguela Current LME project to ensure that there is a more comprehensive network of evenly spaced sea level stations, providing data near real-time, and addressing the key oceanographic phenomena along the African coastline. The number of gauges that will have been installed or upgraded during the project period will therefore increase from the initial 19 envisaged to a total of 37, due to installations/upgrades by partner projects/programmes.

The achievements of the Coastal Observing Systems work package are reviewed below.

Objective: Upgrade and expand the present African network for *insitu* measurements and monitoring of ocean variables e.g. sea-level, temperature, salinity, currents, winds, etc	
	Tasks: (i) Installation of new tide gauge stations. (ii) Equip existing stations with additional sensors for measuring oceanographic and meteorological variables. (iii) Establish coastal moorings or floats at suitable locations in Africa if funding permits. **Deliverables** (i) A comprehensive network of sea level and other ocean measurements and monitoring stations

Taking into account the decision of the Project Steering Committee to focus on sea level observations, good progress has been made in achieving this objective. The implementation commenced with a survey of the status of the network in early 2005 in order to select potential locations for installation of tide gauges, and also to assess which existing equipment required upgrade. This was done on the basis of a questionnaire sent to national contacts, as well as reports from previous surveys (GLOSS and GOOS Africa). The surveys revealed the existence of at least 40 operational stations spread unevenly along the African coastline and island states. Large stretches of coastline did not have any operational gauges. There were gauges at eight (8) locations, which were not working. Only two stations in the entire network met the specifications for tsunami early warning system (Rodrigues and Port Louis, both in Mauritius).

Technical visits were undertaken to inspect the sites proposed for the installations in Cameroon, Comoros, Congo, Egypt, Madagascar, Mauritania, Morocco and Senegal. The reports of these, and earlier GLOSS missions to Egypt, Sudan and Djibouti are available at www.iode.org/glossafrica. Detailed site information has also been provided by local agencies in the countries that were not visited (Cote d'Ivoire, Djibouti, Ghana, and Tanzania). The selection of stations to be installed was based on these reports.

The maps below show the stations that have been installed, or are planned by various organizations and programmes and the timelines for installation.

Installed Stations:

The following stations have been installed by ODINAFRICA:

(i) Nouakchott - Mauritania (December 2006)

(ii) Takoradi – Ghana (December 2006)

(iii) Djibouti – Djibouti (February 2007)

(iv) Pointe Noire – Congo (April 2007)

(v) Limbe - Cameroon (June, 2008)

Partner programmes and organizations installed/upgraded stations at the following locations:

(i) Port Louis and Rodrigues in Mauritius by UHSLC/IOTWS (March 2005)

(ii) Mombasa and Lamu in Kenya by UHSLC/IOTWS (May 2006)

(iii) Pointe de LaRue in Seychelles by UHSLC/IOTWS (2006)

(iv) Zanzibar in Tanzania by UHSLC/IOTWS (2006)

(v) Dakar in Senegal by UHSLC (November 2007)

(vi) Inhambane and Pemba in Mozambique by GLOSS (2006)

(vii) Malindi and Shimoni in Kenya by Kenya Meteorological Department (2007)

(viii) Lagos in Nigeria by Nigerian Institute of Oceanography and Marine Science (ongoing)

(ix) Durban, Simonstown, and Port Elizabeth by GLOSS (2007)

(x) Agadir and Tan Tan in Morocco by the Service Hydrographie & Océanographie (Ministère de l'Equipement et du Transport, Direction des Ports et du Domaine Public Maritime)

Planned Stations: The following stations are planned by ODINAFRICA and other programmes/organizations this year (2009):

(i) Alexandria in Egypt and Casablanca in Morocco. The tide gauges to be installed at these locations have already been purchased by ODINAFRICA

(ii) Mtwara in Tanzania by GLOSS

(iii) BCLME: planned to install gauges, Luderitz and Walvis Bay (Namibia), and Namibe and Lobito (Angola). One station in each of the countries will be equipped with satellite transmitters. Saldana Bay (South Africa) will also be upgraded, but without satellite transmitter. All these stations will be based on OTT Kaelesto, similar to those installed at the ODINAFRICA stations. However as at the end of June 2008 it was unclear whether these stations would still be installed.

SHOM –France (3): plans to instal gauges at Point des Galets-La Reunion, Dzaoudzi-Mayottee (France), and Tamatave (Madagascar).

Stations deferred by ODINAFRICA: The installation of the following stations has been deferred due to various reasons:

(i) Nosy Be in Madagascar (the repairs of the jetty which was destroyed during a storm was not completed on time

(ii) Fort Dauphin in Madagascar (location unsuitable for installation)

(iii) Sfax in Tunsia (local arrangements for maintenance unresolved)

(iv) Moroni in Comoros (suitable site not identified)

The Proudman Oceanographic Laboratory –POL (which also hosts the Permanent Service for Mean Sea Level) assisted with the purchase and configuration of tide gauges to be installed within the framework of ODINAFRICA. The configuration consists of (i) A Kalesto radar gauge; (ii) two pressure sensors; (iii) a Logosens-2 datalogger; and (iv) an OTT HDR DCP satellite transmitter for the Meteosat. The data is transmitted via the Meteosat-5 on to the Global Telecommunication System (GTS).

African Sea Level Network website (www.iode.org/glossafrica): has been developed by ODINAFRICA in collaboration with GLOSS to provide information on the status of the African Sea Level Network. Information available on the site includes:

- Details of planned and installed stations
- Access to sea level data from various sources
- Equipment types and suppliers
- Reports on installation of sea level stations
- Reports on assessment of potential sea level station locations
- Workshop and training course reports
- National sea level status reports

Collocation of GPS stations: ODINAFRICA collaborated with the Instituto Geofísico D. Luís (IDL), Lisbon, Portugal to collocate Global Navigations Satellite Systems – GNSS receivers at the sea level stations in Takoradi (Ghana), and Inhambane and Pemba (Mozambique). The selection of the three locations was based on the following:

- Mozambique: GNSS stations at Pemba and Inhambane will be very important to better define the geodynamic features of the plate boundary between Nubia and Somalia and to quantify their relative motions. They are located on the Somalian plate, which still lacks a sufficient dense network. In addition, these stations can integrate the current efforts sponsored by IOC towards the establishment of the IOTWS by providing near real-time monitoring of site displacements. Finally, these stations can be part of the core AFREF network, which is being implemented to provide a unified reference frame for Africa.
- Ghana: the GNSS receiver in Takoradi will also contribute to better understanding of the kinematics of the Nubian plate by providing a fundamental point in a region also still lacking a dense coverage. In this sense, it is a core AFREF station. This region is more stable from a tectonic point of view. Nevertheless, this station can also be eventually used to monitor and quantify far-field seismic events in the Atlantic Ocean.

The installation of the GNSS stations near tide gauges provides the connection between the horizontal and the vertical datum at these locations. The tidal and GNSS observation together allows one to monitor crustal motions at the tide gauge locations in order to derive absolute or climate related signals in mean sea level from the tide records.

Objective: Provide near real-time observations of ocean variables	
	Tasks: (i) Develop databases of near real-time ocean variables (with WP3) **Deliverables:** (i) Established dynamic database of ocean variables (ii) Enhanced contribution by Africa to GOOS through global sea level database e.g. UHSLC, PSMSL

ODINAFRICA collaborated with the Indian Ocean Tsunami Early Warning and Mitigation System (IOTWS), the Global Sea Level Observing System, and the Flanders Marine Institute to develop the sea level data facility (www.sealevelstation.net) which provides near real time access to sea level data from equipped stations along the African coastline. The roles of the facility are: (i) Data capture via GTS and archive in relational database as backup to national and GLOSS data centres, (ii) Web-display, including plots and provision of raw data as well as tide-gauge operator alert in case of equipment mal-function, and (iii) semi-automatic data quality control.

The facility receives sea level data in real time directly via GTS. The GTS link has been made possibly thanks to the kind cooperation of the World Meteorological Organisation.

The expanded African sea level network has led to a significant increase in contribution by Africa to global sea level databases (UHSLC and PSMSL).

Other activities that need to be implemented include availing sea level data on national websites, and establishment of a mirror of the Sea level data facility at an ODINAFRICA institution.

Objective: Build adequate capacity for collection, analysis and management of sea-state variables through training and procurement of equipment	
	Tasks: (i) Train local technicians, through regional workshops and distant learning, on tide gauge, buoys and float installation, maintenance and tide gauge benchmark levelling. (ii) Train scientists, through regional workshops and distant learning, on data analysis, interpretation and quality control. **Deliverables:** (i) Strengthened scientific and technical capacity in Africa (ii) Tide tables (iii) Improve contribution of data to enable early warning system for extreme events such as storm surge, HAB.

The first ODINAFRICA/GLOSS training course on sea level measurement and data interpretation and related fields was held from 13-23 November 2006 at the IODE Project Office, Oostende, Belgium. Fifteen trainees from Angola, Cameroon, Congo, Cote d'Ivoire, Djibouti, Ghana, Kenya, Mauritania, Mozambique, Nigeria, Seychelles and Tanzania attended the course which included topics such as:

- Introduction to tidal theory;
- Analysis of tide gauge data;
- Introduction to harmonic analysis;
- Introduction to tidal analysis software package;
- Use of data within local and regional 'operational oceanography
- Tide predictions.

The training course provided an opportunity to brief the technicians from the institutions receiving the tide gauges on the preparations necessary to ensure that the installations proceed smoothly. The participants should be able to assist in the installation and maintenance of the tide gauges after this training course.

The training workshop was supplemented by training on installation and maintenance of the equipment provided to local technicians during the installation of the tide gauges. Experts from ODINAFRICA institutions have also benefited from Sea Level Fellowships offered within the framework of the Indian Ocean Tsunami Early Warning and Mitigation System (IOTWS).

ODINAFRICA collaborated with the Western Indian Ocean Marine Science Association (WIOMSA) in an initiative to analyse data from selected stations and prepare tidal predictions. The predictions are available through the ODINAFRICA and GLOSS Africa websites.

"FUST Small Scale Activity" funding for maintenance of the sea level stations in 2008: ODINAFRICA applied for, and received funds (USD33,000) for maintenance/levelling assistance for ODINAFRICA installed sea level gauges in Cameroon, Congo, Djibouti, Egypt, Ghana, and Morocco. Periodic preventive maintenance and check of tide gauge calibration/levelling to geodetic benchmarks are needed to establish high quality sea level

observation time series. Regular maintenance/levelling assistance visits every 12 months or so is recommended for each station until the local authorities are in a position to fully take over these tasks. The maintenance/levelling visits will ensure that the tide gauges are operational, and the local technicians are provided with refresher training to enable them to continue maintaining the equipment.

DBCP users and technology workshop (March 2006): the objective of this workshop was to establish better links between drifting buoy data users on one hand (e.g. NWP, Ocean modelling, science), and buoy operators, manufacturers, and satellite data telecommunication providers on the other hand. The goal is to design drifting buoys in such a way that they last longer and still meet user requirements. Several ODINAFRICA data managers participated in this workshop and a follow-up training course on deployment of drifting buoys, organized by ODINAFRICA in collaboration with IODE and GOOS/JCOMM at the IODE Project Office in June 2007.

2.3 DATA AND INFORMATION MANAGEMENT

The current phase in the development of the national oceanographic data and information centres established within the framework of ODINAFRICA focusses on using the facilities and expertise that have been developed to generate products for effective management of the coastal and marine areas of Africa. The NODCs already established would be strengthened through upgrade of equipment and software as well as provision of additional training targeted at development of data and information products. The ultimate goal is for the participating NODCs to develop an integrated data management system that will cover the entire data management cycle, from the initial collection of marine observations to the development of value-added data products required by a wide range of end users. This included the mainstreaming of new data variables not previously managed by the NODCs, such as near real-time tidal data, biogeographic data and hydrological data.

<table>
<tr><td colspan="2">Objective
(i) Further develop and strengthen regional NODCs to manage data streams from the coastal ocean-observing network.
(ii) Further develop and strengthen regional NODCs to obtain, analyse and disseminate operational insitu measurements from global programs (e.g. Argo and ships-of-opportunity).
(iii) Support continued delivery of selected CD-ROM databases to member States, as they are published by international research and archiving programs.
(iv) Upgrade internet access to all NODCs using VSAT and other available technologies
(v) Upgrade computer systems in NODCs</td></tr>
<tr><td></td><td>Tasks:
▪ Support the operations of NODCs/DNAs to manage delayed mode and near real time data streams.
▪ Upgrade existing internet access to VSAT or similar technology
▪ Upgrade computer systems in NODCs
Deliverables
▪ A comprehensive network of sea level and other ocean measurements and monitoring stations.</td></tr>
</table>

	▪ Strengthened capacity in management of operational *insitu* data. ▪ National marine database collections ▪ Established dynamic database of ocean variables ▪ Enhanced contribution by Africa to GOOS through global sea-level database e.g. UHSLC, PSMSL. ▪ Updated date data management computing systems.

ODINAFRICA has continued to provide support to institutions hosting the NODCs to enable them develop a core set of data and information products. These include but not limited to: library catalogues, catalogues of national data sets and data sources (meta databases), directories of marine and freshwater professionals, directories of marine related institutions, marine data archives and marine biodiversity databases. The funds provided covered: purchase of consumables, communications (including internet access), publishing costs, public awareness, local travel, workshop facilitation, software, and equipment upgrade and hardware maintenance. A total of 21 participating countries have benefited during the current phase. The experience we had with installation of VSAT connections under the FUST Small Scale projects initiative was that the maintenance costs for the connection was prohibitive for most of the institutions.

Though the network of sea level stations is now in place, and training on management and use of the data has been provided, the flow of the sea level data to the NODCs is not yet streamlined. The availability of data from ARGO floats is still not well publisized in the ODINAFRICA institutions. Links to these datasets were included in the ODINAFRICA websites in order to address this. It would be useful to organize a workshop on utilization of ARGO float data so expand their use in the region.

Several ODINAFRICA NODCs have published their National Marine Database collections on CD-ROMs. The information on available national databases will be collated and availed on the ODINAFRICA website.

The development of the NODCs progressed at varying rates in different countries. Whereas good progress was made in a majority of countries, there is need for closer support to enable some of the institutions lagging behind to catch up.

Information management activities were not implemented in Algeria, Cameroon, Congo, Gabon, Guinea, and Morocco. Recent training organized locally for Angola has enabled them to commence work on their literature databases. Staff changes in Madagascar, Mauritania, and Seychelles may affect the maintenance of products already developed. Countries that have not submitted work plans in the current phase include Algeria, Seychelles and South Africa. Very good progress has been noted in Benin, Egypt, Ghana, Kenya, Mauritius, Senegal, Tanzania, and Tunisia.

Advanced Data Management training course: This training course (held at the IODE Project Office 25-29 September 2006), was a refresher course to introduce data centre managers to upgrades and changes in the Ocean Teacher software since the data course in 2003. Participants included the heads of data centres in Benin, Ghana, Mauritius, Mauritania, and Senegal. Other centres attended a training course held in April 2005 for new NODCs. The participants all gave a summary report on the progress that has been made in developing their respective data centres.

They emphasized that data centre activities should be mainstreamed into the host institutions to ensure sustainability. The NODCs should also explore the possibility of collaboration with other NODCs more aggressively. Arrangements should also be made for training of a new group of data managers. The participants were certified as Instructors for OceanTeacher.

The IODE Project Office allocated slots for ODINAFRICA at an End to End Data Management (E2EDM) training course for the ODINBlackSea region in Oostende, Belgium from 22-25 October 2007. The objectives of the E2EDM training course were: (i) To provide the trainees with basic information on the E2EDM technology and with knowledge necessary for a constriction of the E2E-based distributed data systems for the IODE ODIN's; (ii) To prepare the trainees to the preliminary phase of the construction of the distributed data system for ODINBlackSea.

Objective: Further develop and strengthen regional NODCs to obtain, analyse and disseminate Level 3 satellite imagery/analyses to the local/national community	
	Tasks: Support the operations of NODCs/DNAs to manage delayed mode and near real time data streams. **Deliverables** Strengthened capacity in management satellite imagery data.

The ODINAFRICA data management course, attended by all data managers provides information on how to access and analyse satellite data.

A regional training course on Application of Satellite Altimetry to Oceanography for IOCWIO region was held at the San Marco Research Centre *(also known as Luigi Broglio Space Center), Malindi,Kenya*) from 6-17 September 2004. Eight trainees attended the course, mainly from ODINAFRICA institutions in Kenya, Madagascar, Mauritius, Mozambique, and Tanzania. The course was organized in collaboration with WIOMSA, the Italian Space Agency and the IOC Capacity Development programme.

Participants at the ODINAFRICA Advanced Data Management training course (September 2006, Oostende, Belgium) pointed out that the increasing availability of Level-3 remote sensing data provides an opportunity for the data centres to prepare useful products for their user communities. ODINAFRICA NODCs should make an effort to make use of these datasets, together with Level-2 where possible. The focus should be on archive, quality control, and generation of products of economic benefit. They should aim at creating a library of images and improve on materials and skills that they have acquired during the training courses.

ODINAFRICA experts attended a training course on application of GIS and remote sensing to coastal management was organized by IODE and IOI at the IODE Project Office in September 2006.

The African Marine Atlas provides an avenue for dissemination of the satellite data to the communities.

Objective: Support continued cataloguing of unpublished (or newly identified) datasets within the MEDI system	
	Tasks: Support the operations of NODCs/DNAs to manage delayed mode and near real time data streams. **Deliverables** African component of MEDI.

In an initiative to improve the quality of meta databases developed by ODINAFRICA data centres, two managers of data centres were commissioned to assess the quality of the databases. The aim of the initiative was to: (i) Review the metadata records collected from ODINAFRICA Data centers in both electronic and hard copy format; (ii) Reformat, quality control, and enter the metadata records into the MEDI Africa database, and (iii) Advise on any additional information that may be required from the ODINAFRICA national Data centers to ensure that the records submitted are complete.

The total number of records in MEDI Africa at the end of the exercise was 286, an increase of 55%. The records per country were: Angola (4), Benin (21), Comoros (2), Cote d'ivoire (1), Gabon (7), Ghana (19), Guinea (44), Kenya (30), Madagascar (19), Mauritania (17), Mauritius (11), Mozambique (9), Namibia (1), Nigeria (22), Senegal (27), Tanzania (18), Togo (18), Tunisia (16)

Data managers from ODINAFRICA institutions also participated in the J*COMM/OCG workshop on the establishment of a pilot project to collect in real-time metadata from SST and temperature profile data (March 2006).* The purpose of the workshop was tto establish a Pilot Project for real-time distribution of metadata regarding SST and sub-surface temperature profile data. This followed recommendations by the Ocean Observing Panel for Climate (OOPC).

Objective: Integrate biogeographic and hydrological data steams into NODC systems	
	Tasks: Identify national and regional biogeographic and hydrological datasets **Deliverables:** Integrated biogeographic and hydrological data streams.

The planning workshop for ODINAFRICA-III recognised the importance of broadening the scope of the NODCs to include more data types so as to have a wider user base. The workshop in particular recommended the inclusion of biogeographic and hydrological data sets. In addition to this a programme of data archaeology was proposed in order to establish a database of historical sea level information from all the ODINAFRICA partner countries.

It was agreed right from the outset that the biogeographic data streams would link existing systems such as OBIS.

OBIS provides global geo-referenced information on accurately identified marine species and is developing on-line tools for visualizing relationships among species and their environment. Linkages would also be established to MASDEA (the Marine Species Database for Eastern

Africa) developed in the earlier phase of ODINAFRICA, which is a comprehensive species register for the Western Indian Ocean region and contains species records that have been published in peer-refereed publications. Substantial progress has been made, with two marine biodiversity data management training workshops organized (18-22 April 2005, Ostend, Belgium; 22-26 August 2005, Grand Baie, Mauritius). Participants emphasised the need to immediately commence preparation of inventories of experts, datasets, institutions, and species lists. Five workshops, each lasting 2-weeks were proposed for compilation of input for the OBIS system on taxonomic groups of particular importance. Three data compilation workshops for three taxa (molluscs, sponges and decapods) were subsequently held in the period 2006 - 2007. These are discussed in detail in other parts of this report. The pace of integrating the biogeographic data streams into the NODCs has differed from country to country, with some of the countries reporting excellent progress. Mauritius has already availed its marine biodiversity database online, while Kenya has also made good progress. Some of the NODCs provided input to the AfrOBIS node at the Southern Africa Data Center for Oceanography (SADCO) in South Africa.

There has been little progress in mainstreaming of hydrological data sets into the NODCs. Hydrological data types include some of the climatological data types such as precipitation (rainfall), evapotranspiration, wind speed, temperature and others. Other data types included are: runoff, stream/river/basin discharge and flow, flow duration, flood frequency, soil moisture and properties, groundwater table, sediment transport and sedimentation, slope, stream/river/basin parameters (width, depth etc) and others. The responses to a questionnaire circulated to the NODCs indicated that few of them currently archive hydrological datasets. In some cases there are Departments of Hydrology in the respective countries that are responsible for the data, whilst in others there are no established structures. It was recommended that contacts be established with all the stakeholders in each country in order to chart the best way forward. The approach may differ from country to country. At the pan African level it is also important to establish contacts with the LOICZ, IHP and the World Hydrological Observation System (WHYCOS).

The Project Steering Committee decided that the mainstreaming of hydrological datasets into the NODCs should focus on main rivers discharging into the ocean. Each NODC will determine the main rivers in their country. Monthly discharge data for the selected rivers at the point closest to the ocean will be entered into the national databases as well as the African Marine Atlas. Possible sources of data include the WMO Runoff database

Objective: Build capacity for data and information managers for new NODCs established as part of this project	
	Tasks: Train data and information managers from the newly established centres **Deliverables:** Strengthened data and information management capacity in the region

NODCs were established or reactivated in all the five (5) IOC member states that joined the network in the current phase (Algeria, Angola, Congo, Egypt, and Namibia). These were provided with equipment, software, training, as well as funding to enable them commence their operations.

Data Management training course for new NODCs: The training course was held at the IODE Project Office from 14-29 April 2005, and attended by data centre managers from the five countries that have joined ODINAFRICA in the current phase, and also those from institutions from the previous phase that required fresh training (Cameroon, Cote d'Ivoire, Gabon, Guinea, Morocco, and Seychelles). The course contents included: (i) Computer basics, (ii) Internet basics, (iii) Information, data and metadata, (iv) Introduction to oceanography, (v) Introduction to ocean data, (vi) Ocean data collection management, and (vii) Ocean data products and synthesis.

The performance of these centres after the training has been mixed. We have had very good progress for data management in Egypt and Namibia, and reasonable progress in Congo. Implementation of planned data management activities in Algeria and Angola is worrying. The trained data manager in Namibia has recently departed from the institution and the training of a new data manager will have to be addressed.

*Marine Information Management (MIM) training course for new NODCs***:** The ODINAFRICA Marine Information Management training course was held at the IODE Project Office from 14 August to 3 September 2005, and attended by participants from Egypt, Gabon, Madagascar, Namibia, Nigeria, and UNESCO Nairobi. Participants from Algeria, Cote d'Ivoire and Guinea were invited but did not attend for various reasons. The course contents included: establishing the needs; information concepts; user services; collection development; cataloging; integrated library catalogs; information seeking in electronic environment; electronic resources (Ocean portal); access to freely available e-journals; presentation skills; information skills training; document management; continuing professional development; and AFRIAMSLIC.

New Information Manager for Cote d'Ivoire was trained together with other librarians from ODINCINDIO. The Information centre in Morocco was re-located from Universite Mohammed V in Rabat to Ibn Zohr Universite in Agadir. A new Information Manager has consequently been appointment that may require training. The Regional Coordinator for Marine Information Management provided training on Marine Information Management at the Instituto Nacional de Investigação Pesqueira in Luanda, Angola during the period April 2007. Algeria and Congo did not participate in the information management-training course.

Objective: GODAR sea level project	
	Tasks: Assess requirements for sea level data archaeology and locate historical datasets **Deliverables:** Archive of historical sea level data

Though several countries (Cote d'Ivoire, Egypt, Mozambique and Tanzania) had indicated that they had sea level data in analogue (eg charts and internal reports) that need to be digitised, it is only Tanzania that responded to an offer to assist in digitizing the data. The data for Dar es Salaam, covering the period 1998 – 2001 will be digitized with assistance of the Institute of Marine Sciences (Tanzania) and the Western Indian Ocean Marine Science Association. This will facilitate electronic access, back up for data security, as well as quality control and data analysis.

2.4 PRODUCTS DEVELOPMENT, END-USER COMMUNICATION AND INFORMATION DELIVERY.

The goal of the work package is to ensure that the data and information centres utilise the facilities and expertise developed to generate products for effective management of the coastal and marine areas of Africa. In particular the centres should: (i) identify the users of the services and products offered by the ODINAFRICA data centres and their requirements, (ii) develop a programme of services and products that would serve these requirements, and (iii) develop the mechanisms to disseminate the outputs of the project to target groups. Some of the products that were identified during the ODINAFRICA-3 planning were: tidal forecasts for ports and harbours, storm surge forecasts, maps of sea surface temperatures, forecasts of changing oceanic and atmospheric conditions on a variety of time scales. The importance of forging partnerships with other organisations at the national and regional levels to develop these products was emphasised.

The work package had to be revised early in the implementation of the project due to the many activities that had been included. The Project Steering Committee decided that the current phase would focus on development of the African Marine Atlas, marine biodiversity databases, national websites, and publicity materials such as posters, newsletters and brochures. Good progress has been made in implementing all these.

Objective: Identify and develop ICAM related products.	
	Tasks: (i) Identify data centres and research teams interested in participation in ICAM at the national level, including national consultation. (ii) Identify data and information on local species distributions. (iii) Identify regional biodiversity hotspots and nursery grounds for commercially important species, to assist in planning for marine protected areas. (iv) Identify information, data, and products requirement for the development of national/local ICAM plans. (v) Build capacity in the development of coastal sensitivity mapping, with special focus on erosion and marine pollution through GIS applications. (vi) Develop capacity in environmental reporting with special focus on coastal ecosystem change through the establishment of an Environment Information System **(vii)** Develop Risk and Vulnerability Index to Extreme Events in Coastal Zones. **Deliverables:** (i) List of centres, parameters and interests at the national level. (ii) National and regional species lists produced; contribution to OBIS. (iii) National Environmental Action Plans created/updated. (iv) National Assessment Report produced. (v) Training courses organised at regional level, (b) A set of Atlas published as a pilot project. (vi) National State of Coast Reports produced, including shoreline changes profiles, (b) Set of indicators for specific issues developed (C Erosion, etc). (vii) (a) Methodology developed and disseminated to develop vulnerably index for coastal areas, (b) Mitigation strategies identified.

Funds were provided to the countries participating in ODINAFRICA-3 to hold national consultation workshops on data and information products necessary for ICAM. The reports of national consultation meetings were collated to identify priority themes that should be addressed by the participating institutions jointly. The priority themes that recurred in many of the national reports included: (i) Shoreline changes, (ii) Critical habitats, (iii) Storm Surges and Coastal flooding, and (iv) Biodiversity. These are very similar to the core themes identified during the Africa Process for the Development and Conservation of the Coastal Areas which was implemented by 11 countries with technical support from UNESCO/IOC. These were: (i) Coastal erosion, (ii) management of key ecosystems and habitats, (iii) pollution, (iv) sustainable use of living resources (especially fisheries), and (v) tourism., which have also been incorporated as the basis for the NEPAD Coastal and Marine sub-theme.

Three types of products have been identified by the national consultation workshops. These are (a) databases/atlases, (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). It is important 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 ODINAFRICA Project Steering Committee decided that the focus for the current phase would be on:

(i) development of marine biodiversity databases for the five taxa identified (mollusks, polychaetes, echinoderms, sponges, stony corals). ODINAFRICA will organise data compilation workshops to cover three taxa, while collaboration with other partners will be sought for the other two.

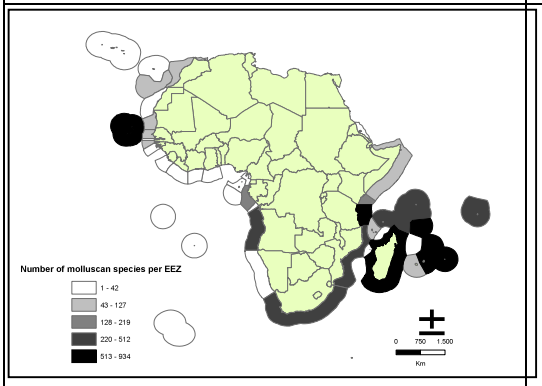
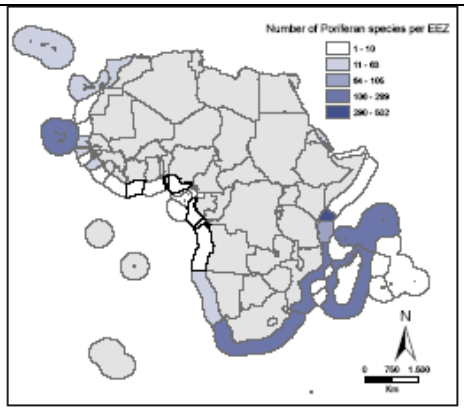
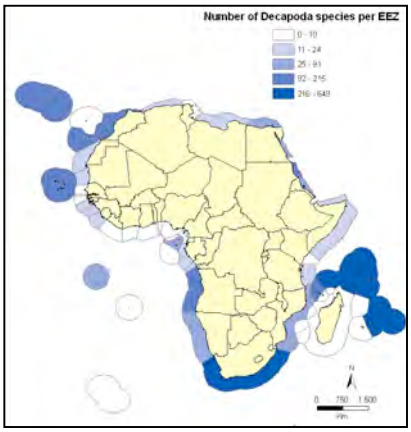
(ii) Development of the Marine Atlas

(iii) Development of national NODC websites and the ODINAFRICA websites

(iv) Quality control and availing of databases, directories, catalogues and other products through the websites.

Profiles of institutions involved in ICAM in each country were prepared and used to update the OceanExperts database, as well as prepare an institutions database jointly with NEPAD/COSMAR.

Development of Marine Biodiversity Databases: ODINARICA is working on the development of an African Register of Marines Species (ARMS) which will comprise all the marine biodiversity information that have been compiled in the series of focused marine biodiversity workshops that have been organized for selected taxa, as well as the information available in the Marine Species Database for Eastern Africa (MASDEA). Three workshops have so far been held at the IODE Project Office in Ostende, Belgium (Molluscs, March 2006; Sponges, November 2006; and Decapods, June 2007). Though the data compiled in these workshops cover the entire African continent they have been temporarily included in MASDEA. A new interface for ARMS will be designed to correct this anomaly. ARMS will be a subset of the World Register of Marine Species (WORMS).

Distribution of species in African EEZ's		
MOLLUSCS	SPONGES	DECAPODS
		
NO OF RECORDS=6,460	NO OF RECORDS=1,883	NO OF RECORDS=3,877

Coastal Sensitivity Mapping: The development of capacity for coastal sensitivity mapping and environmental reporting, as well development of risk and vulnerability indices have not been covered in this phase of ODINAFRICA. Some experts from institutions in the network have participated in relevant training courses organized by the Indian Ocean Tsunami warning and mitigation system.

The development of vulnerability indices, and national state of the coasts reports were deferred to a possible next phase. However it was noted that a number of countries participating in ODINAFRICA have prepared State of the Coast Reports, as well as Coastal Sensitivity maps through other initiatives. Details of these initiatives should be collated, and links should be made to the reports from the national and ODINAFRICA websites, where they are available online

Repository of Marine Related Publications from/about Africa (OceanDocs-Africa, formerly OdinPubAfrica). The program OdinPubAfrica was funded by the government of Flanders for implementation in the period 2004 - 2006. It is focussing on the development of an electronic repository to make publications in marine science from scientists affiliated to ODINAFRICA institutes electronically available. It also helps to preserve those publications. Preliminary results are available at the website: http://iodeweb1.vliz.be/odin/. The first training course on development of Electronic repositories was held at the Hasselt University in February 2005, and a second one in December 2005 at the IODE Project Office. The libraries (and librarians) of institutions participating in ODINAFRICA are playing the lead role in developing the repository.

The repository covers ONLY contents of authors working in an ODINAFRICA affiliated institution, and includes: (i) Articles, scientific reports, technical reports, theses, conference papers, grey literature, and preprints. The program involves librarians, researchers and directors. The creation of a repository for an institute and for each researcher is a very important task in the present world of scientific communication. It is of great importance to the visibility of scientific work of an individual, an institution and hence an entire country.

Development of AFRILIB

The catalogue of library holdings developed by ODINAFRICA librarians were collected and their quality checked. The objective was to identify errors, make necessary corrections, and advise the relevant librarians.

The exercise revealed that cataloguing rules in the "Guidelines for entries to ODINAFRICA Libraries"catalogues were not always followed, in some cases this was because (i) the cataloguing was not done by the information managers themselves, (ii) difficulties in managing the structure of the databases in some institutions (Togo, Tunisia, Cote d'Ivoire), (iii) lack of competence in handling the importing and exporting applications of INMAGIC, and (iv) irregular input into the databases.

Good progress was made in the development of the web interface to enable on-line access to the union catalogue of libraries of ODINAFRICA institutions. This is now available at http://www.odinafrica.org/afrilib/ and http://193.191.134.12.

Notable products finalised by ODINAFRICA Information Centres in this period include: Entry of 6676 records in library catalog of INSTM (Tunisia); completion of the South African library webpage with online catalogue; www.gilchrist.gov.za (South Africa): inclusion of KMFRI library catalogue in the IAMSLIC libraries database (Kenya); publication of newsletters to publise library and NODC activities in Mauritania and Togo; availing of Senegal library webpage as part of the NODC website : http://www.ioc.unesco.org/odinafrica_sites/senegal/ressources_sn.htm.

Development of an African Union lists of Journals from information centers

This has been developed and made available through IAMSLIC. Currently, nearly 800 serial holdings are represented in the African Union List.

The direct address for the African Union List http://library.csumb.edu/iamslic/africa/unionlist/ and it is also accessible via the main Union List page at http://library.csumb.edu/iamslic/unionlist/.

All holdings are also indexed for searching via the Z39.50 Distributed Library. There are now eight AFRIAMSLIC libraries with five (5) from ODINAFRICA in IAMSLIC resources sharing. Many of these serials are local or institutional publications that may not be widely available elsewhere, adding significant breadth to the coverage of the combined IAMSLIC Union List of Marine and Aquatic Serials.

This has reinforced the ODINAFRICA information managers within AFRIAMSLIC and their visibility and participation the IAMSLIC resources sharing program.

Objective: Develop Regional and National Marine Atlases	
	Tasks: Provide support for the development of Regional Marine Atlases for each NODCs **Deliverables:** Regional and National Marine Atlases

The African Marine Atlas (www.africanmarineatlas.net) was officially launched on 23 February 2007 at the IOC Project Office for International Oceanographic Data and Information Exchange (IODE) in Ostend, Belgium.

The Atlas incorporates 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 commenced in June 2006 and, consisted of 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 Atlas that can be distributed as stand-alone resources within the wider community of marine and coastal scientists on the African continent. Six editorial groups were created to mobilize data for different aspects of the atlas. These are: (i) Base Maps, (ii) Geosphere (iii) Atmosphere, (iv) Hydrosphere, (v) Biosphere, and (vi) Human Environment

The African Marine Atlas provides substantial maps, images, data and information to coastal resource managers, planners and decision-makers from various administrative institutions and specialized agencies in Africa. The Atlas indicates areas of intense use along the coastline requiring careful management and provides potential foresight on likely consequences of specific decisions. It has over 800 downloadable data products derived from the fields of marine geo-sphere, hydrosphere, atmosphere, biosphere, geopolitical and the human socio-economic dimensions. The downloads are available at http://omap.africanmarineatlas.net

Further, the Atlas indicates gaps in knowledge and information base, where additional efforts may be directed. The Atlas will also act in other ways as a guide to recreational opportunities and tourist attractions.

The website is one of a set of Marine Atlas products that will include web data services, web mapping and an Atlas publication when completed. Primary partners in this project were the United Nations Environment Programme (UNEP), and the African Coelecanth Ecosystem Programme (ACEP).

National marine atlases have been prepared by Madagascar and Tunisia.

Objective: Improve atmospheric and oceanic monitoring through database development and communication	
	Tasks: (i) Build historical database on coastal ocean. (ii) Build databases for near real-time coastal ocean observing networks. (iii) Establish long-term relation between national meteorological and hydrological services, coastal oceanographic institutions and environmental agencies. (iv) Contribute to the Global Ocean Observing System of the World Weather and Ocean Watch. **Deliverables:** (i) Historical database on coastal ocean established, (b) Training to update, control and rescue historical data completed. (ii) Study database models for coastal ocean observing systems, (b) Develop database to optimise coastal data, c) Implement database. (iii) List of institutions relevant to HOME network and potential field of collaboration

	(technology, modelling, database), (b) Sensitisation/information workshop organised and prototype MOU drafted, (c) MOU signed by stakeholders and/or relevant institutions. (iv) Potential contribution of GOOS-AFRICA to World Weather and Ocean Watch established, (b) Protocols of partnership established.

The data managers from ODINAFRICA NODCs extracted data from their coastal waters available in WDCs and other centres abroad to use as the basis of a national database. These have been enriched with information collected locally.

Links to access and avail near – real time atmospheric and oceanic data have been provided on the ODINAFRICA website. These include:

- Sea level data
- ARGO data
- Pilot Research Moored Array in the Tropical Atlantic- PIRATA http://www.pmel.noaa.gov/pirata/
- African Monsoon Multidisciplinary Analyses – AMMA http://www.amma-international.org
- Tropical Atlantic Climate Experiment - TACE.

Objective: Promote basic modelling and forecasting through networking	
	Tasks: (i) Identify centres and research teams interested in participating in ocean modelling and forecasting. (ii) Strengthen the existing national data centres to make the best use of regional products. (iii) Improve global data exchange dissemination and processing (GDPS) (iv) Provide adequate national centre infrastructure and operating conditions (v) Strengthen the network of national and regional capacities in coastal ocean modelling and forecasting. **Deliverables:** (i) List of programmes and products of relevant institutions. (ii) List of regional products of relevance to Africa, (b) List of products developed by the national centres using the regional products. (iii) (a) List of the relevant data and source, (b) Data processing system are built and operational.

Modelling was one of the activities that the Project Steering Committee recommended for deferment to a possible next phase.

ODINAFRICA experts have participated in modelling and data management workshops organized in collaboration with JCOMM and IODE at the IODE project office, Ostend, Belgium in September 2005 and October 2006 which covered the following topics: Operational oceanography, Wave research, Modelling Tropical Cyclone and storm surges,

Applications in ocean modelling (search and rescue), Circulation, Ecological modelling, and Requirements for ocean data in support of numerical regional ocean models.

ODINAFRICA is collaborating with the Indian Ocean Tsunami Warning System, the IOC Capacity Development programme, the National Institute for Oceanography in Goa, India, and the Centre for Water Research, Pert, Australia to organize training courses in numerical modelling for data managers and other personnel of ODINAFRICA institutions in the Western Indian Ocean. Institutions in Kenya, Madagascar, Mozambique, Seychelles and Tanzania benefitted from this programme.

There are plans to organize modelling awareness workshops in IOCEA region.

Objective: Refine the identification of end-users	
	Tasks: Design and distribute questionnaire to potential end-users. **Deliverables:** (i) List of end-users and their specific needs. (ii) National survey and report on impacts of end-products.

This was implemented during the national workshop on data and information for ICAM. However it is important to develop French language interfaces for the products that are available on line.

Objectives: (i) Awareness campaigns involving all stakeholders at local, national and regional levels on the output of the project. (ii) Disseminate outputs of the project to all stakeholders. (iii) Disseminate information on the end products at regional and international institutions.	
	Tasks: ▪ Produce newsletters, posters and brochures. ▪ Create a web site and a communication channels. ▪ Organise seminars/workshops. ▪ Transfer of the end products to the users. ▪ Exchange of data, newsletters, brochures, etc, with other regional and/or international end-users/stakeholders. ▪ Share experiences with other institutions dealing with coastal and ocean activities. **Deliverables:** ▪ Newsletters, posters and brochures published by the stakeholders. ▪ Website and electronic discussion group established. ▪ Update of the end products. ▪ Accessibility and easy use of the end products ▪ Availability of data, newsletters etc, for other institutions

The Project Steering Committee endorsed a Communication Plan, outlining how the various communication tools available through IOC projects implemented in Africa. The following is the focus of the communication tools:

i) The ODINAFRICA posters were revised and printed in 2006 and 2008.

ii) The publication of a booklet providing details on project activities at national, sub-regional and continental level is in progress and should be completed by end of March 2009.

iii) COSMARNews: contains information and news on marine related activities from Africa, and especially be used to publisize the contents of the Africa Ocean Portal. The newsletter is prepared in collaboration with the secretariat for the Coastal and Marine sub-theme of NEPAD. Ten issues have been produced in the current phase (3 in 2005, 4 in 2006, and 4 in 2007) and circulated. This newsletter maybe discontinued due to uncertainty concerning the continuation of the NEPAD/COSMAR secretariat.

iv) WINDOW: remains as the ODINAFRICA project newsletter focussing on project activities, and is published and distributed quarterly in electronic version. Eleven issues of the WINDOW Newsletter were produced during the current phase of ODINAFRICA (2 in 2005, 4 in 2006, 4 in 2007, and one double issue in 2008).

v) http://www.odinafrica.org: is the projects window to the world, giving information on the project and access to its services and products such as databases (directories of institutions and experts, catalogues of library holdings, marine related documents about/from Africa, catalogues of datasets and details of their location and accessibility), and services including document delivery.

vi) http://www.africanoceans.net: This is the African Ocean Portal through which users are able to access all sort of marine related information relevant to Africa- including links to useful sites, directories and catalogues.

vii) African repository of marine related publications (OceanDocs-Africa): Users are able to access marine related publications from Africa through this site (http://iodeweb1.vliz.be/odin/handle/1834/1337)

Other project websites include the African marine atlas www.africanmarineatlas.net, the Sea level data facility www.sealevelstation.net, the sea level information site www.iode.org/glossafrica

The ODINAFRICA Websites Improvement Project has been initiated to assist the webmasters in institutions participating in the project to improve the quality of their sites (or develop sites where these do not exist). This is in recognition of the key role that the internet should play as a medium for dissemination of project services and products Two training courses on websites improvement were held at the IODE Project Office and attended by webmasters from Cote d'Ivoire, Egypt, Kenya, Senegal, Seychelles, Tanzania, and representatives of ACEP and WIOMSA (5-9 December 2005), and Cote d'Ivoire, Ghana, Guinea, Nigeria, Senegal, and Seychelles (2-6 October 2006). National websites of the format www.nodc-countryname.org have been established to provide information at the national level. These are hosted at the IODE Project Office.

Discussions at the websites workshops focused on the need for the webmasters/trainees to have access to equipment, software and reasonable speed internet access to enable them do their work. Participants proposed that an advanced course be organized, and to explore the possibility of providing an award to the institution with the best website.

Mailing list for all ODINAFRICA contacts has been established. Similar lists focusing on data management, information management and biodiversity data management have also been established.

Support was provided to experts from several institutions to promote ODINAFRICA products and services at various fora, including UNEP Clearing House mechanism conference, WIOMSA symposia, UNEP Abidjan and Nairobi Convention conference of parties, GEOSS Ministerial meeting, GOOS Africa and IOGOOS sessions, IOTWS meetings etc.

ODINAFRICA Seminar – 2006: The second ODINAFRICA Seminar was held at the IODE Project Office in Ostende, Belgium from 24-26 April 2006 and attended by more than 60 people representing all the 25 countries participating in ODINAFRICA, regional projects/programmes and organisations involved in marine related programmes, the government of Flanders (Belgium), ODINAFRICA trainers, and members of the ODINAFRICA Project Management and Steering Committees. The objective of the seminar was to review progress in implementation of the activities planned for the current phase of the project, recommend ways of improving implementation, and explore the potential collaboration with other programmes/projects. The theme was "Ocean Data and Information for Management and Development in Africa".

An exhibition and poster presentation on the activities of the ODINAFRICA National Data and Information Centres (NODCs), and the ODINAFRICA Sea Level Data Facility was held during the seminar and opened by the Hon. Fientje Moerman, the Vice-Minister-President of the Flemish Government and Flemish Minister for Economy, Enterprise, Science, Innovation and Foreign Trade. Dr David Pugh, the President of the Intergovernmental Oceanographic Commission of UNESCO, also attended the session.

ODINAFRICA Seminar – 2008:

Objective: Assess the impact of products on the end-user	
	Tasks: Assess the impacts of end products to the end users (e.g. socio-economic, sustainable livelihoods). **Deliverables:** National reports and surveys.

The assessment of the impacts of the products on end users was not undertaken. This will be one of the core activities of ODINAFRICA-IV.

III. Difficulties and Problems encountered and measures taken, changes in implementation.

Delays in preparation of sites for installation of tide gauges led to long delays in completion of the works. This was particularly in Cameroon and Egypt (still not completed). In the cas of Madagascar repairs on the jetty took too long and so the station was abandoned. In some countries the policies on data exchange mitigated against installation of gauges (eg Tunisia).

Staff movements continued to pose a challenge in some of the countries, with trained personnel moving to better jobs out of the institutions. However there was significant improvement in retention of staff compared to previous phases of ODINAFRICA.

The level of collaboration between the NODCs and other institutions in the respective countries is still inadequate. This is one area that should be addressed in the coming phase.

IV. Project Results achieved and indicators in accordance with the log frame (please also complete the attached **matrix table)**

One of the core methodologies of ODINAFRICA-III was the concept of national versus regional work plans. Although the project had a number of regional objectives and expected deliverables, each partner institution was expected (and provided with the support) to address specific national needs for data or information products. This approach resulted in a wide and rich variety of data and information products being generated.

The implementation progressed well, with the achievements including:

- Each of the participating institutions developed a suite of data and information products that have been quality controlled, merged and availed through the project website (www.odinafrica.org). These include: library catalogues, catalogues of national data sets and data sources (meta databases), directories of marine and freshwater professionals, directories of marine related institutions and their profiles, marine data archives and marine biodiversity databases. These are also from NODC websites (www.nodc-countryname.org e.g. www.nodc-senegal.org). Training was provided on a wide range of topics such as data and information management, development of e-repositories, websites development, application of remote sensing and GIS to coastal management, marine biodiversity data management, modeling; end to end data management; and sea level data analysis and interpretation.

- New tide gauges were installed in Cameroon, Congo, Djibouti, Egypt, Ghana, and Mauritania. The installation of Global Navigations Satellite Systems – GNSS receivers at the sea level stations in Takoradi (Ghana), and Inhambane and Pemba (Mozambique) provides the connection between the horizontal and the vertical datum at these locations. This brings the total number of tide gauges installed along the African coastline to more that 40. Information on the network is available on the African Sea Level Network website (www.iode.org/glossafrica), while the data from 22 of the stations can be accessed near-real time at www.sealevelstations.net.

- The African Marine Atlas developed in collaboration with the African Coelacanth Project (ACEP), and the United Nations Environment Programme (UNEP) provides

access to maps, images, data and information to a wide range of users. The static website (http://omap.africanmarineatlas.net) contains over 800 downloadable data products derived from the fields of marine geo-sphere, hydrosphere, atmosphere, biosphere, geopolitics and human socio-economics.

- ODINAFRICA used several mechanisms to publicise its activities and products. These included: posters and brochures, newsletters (WINDOW and COSMARNews), and websites (http://www.odinafrica.org; African Ocean Portal: http://www.africanoceans.net; African repository of marine related publications - OceanDocs-Africa: http://iodeweb1.vliz.be/odin/handle/1834/1337; African marine atlas www.africanmarineatlas.net; the Sea level data facility www.sealevelstation.net; the sea level information site www.iode.org/glossafrica).

V. Lessons learned and Sustainability

Collaboration with other partners such as NEP AD/COSMAR, UNEP Regional Seas programme, WIOMSA, ACEP, as well as those at national level provides a mechanism to ensure sustainability of the network.

Further development of the Atlas provides an opportunity for collaboration with other programmes and organisations as already demonstrated by the close collaboration with UNEP and ACEP.

Sustainability will be assured in countries where the activities have been incorporated in the work plans of the host institution. In such instances national budgets have been allocated, in some cases higher than the resources provided by the project. However there still a few occasions where the activities are still implemented separate from the institution budget and wholly relies on project budgets. It must be emphasised to such institution that such an approach is neither realistic nor sustainable.

VI. Evaluation recommendations when applicable

A team of two experts (Dr Lesley Rickards and Prof Bisher Imam) undertook an External Evaluation of the projects implemented under the Flanders UNESCO Science Trust fund in the period March 2004- March 2007 and submitted their report in October 2007.

The Evaluation found that “Without exception, FUST supported programs have demonstrated capability to address country and regional needs as well as UNESCO priorities as accorded by the Flemish Government” Concerning the implementation of ODINAFRICA the report asserted that: *The current success of ODINAFRICA III warrants the continuation of the FUST Agreement. ODINAFRICA III is an ambitious project, with many components and data and information centres of widely varying capabilities. It is making good progress and has begun to deliver new data streams and data products. In fact, this is a critical stage, infrastructure is in place, but further funding is required to ensure the long term sustainability of the different activities. The evaluator strongly supports the extension of this project.*

The ODINAFRICA Project Steering Committee, at its fifth session (13-16 November 2007, Ostende, Belgium) agreed on the following measures to address the recommendations of the evaluation report:

FUST RECOMMENDATION 1: Continue to expand the number of countries participating in ODINAFRICA: a further five countries have expressed interest in joining a further phase of the project. However, in doing this it needs to be recognized that some participants are experienced and need to be given more

challenges and responsibilities, perhaps by way of new sub-projects.

The PSC identified the following countries as potential participants in the next phase: Sierra Leone (Armah and Angora to provide contacts), Gambia (Arame to provide contacts), Liberia (Armah and Angora to provide contacts), Guinea Bissau ((Angora to provide contacts), Equatorial Guinea, Sao Tome and Principe, Sudan and Eritrea. It was emphasised that all countries that will participate in the next phase must be involved in the development of the ODINAFRICA-IV proposal.

FUST RECOMMENDATION 2: Develop more regional leadership (in contrast to national) and regional sub-programmes. These latter are in a good position to bid for funding within the different regions within Africa, as is increasingly the case for the east African countries.

The PSC recognized the contribution of regional collaboration to accelerated capacity development, and noted the activities implemented in Eastern Africa in collaboration with regional partners such as WIOMSA, ACEP and the WIOLab projects. Such regional initiatives address common concerns, and enable the counties to share experiences. The PSC recommended that similar activities should be initiated with potential partners in other regions, especially the LME prorammes. Armah was requested to informally explore the possibility of ODINAFRICA and GCLME jointly organizing a sea level data analysis workshop. Malika will be requested to explore similar initiatives for the Mediteranean countries. Such initiatives should be continued within the framework of ODINAFRICA-IV.

FUST RECOMMENDATION 3: Until the present, ODINAFRICA has rightly concentrated on developing the infrastructure necessary for establishing and operating data and information centers, the next phase will need to concentrate more on service provision, building on the marine atlases as a coastal zone management tool and on the tide gauge data for tidal predictions and storm surge modeling, as well as for sea level research. ODINAFRICA-III has moved away from the single programme (IODE) model towards an integrated model including GOOS, IODE and ICAM. The GOOS (GLOSS) and IODE elements have been well developed, the ICAM component needs to be better developed."

The recommendation was taken into account in developing the proposal for the next phase of ODINAFRICA.

FUST RECOMMENDATION 4: A number of the current participants are experienced in their field: more use should be made of these skilled experts; they should be the next generation of trainers. For example, they could train any new participants in data and information management.

Noted and the focus of the future training will be on use of expertise in the network for ODINAFRICA training courses.

FUST RECOMMENDATION 5: Although the collaboration with the IOC Project Office for IODE and VLIZ to provide a web site displaying the real-time ODINAFRICA has been a great success, at some stage this operation should either be transferred completely or mirrored at one or more sites in Africa, to ensure that ODINAFRICA participants "own" the tide gauge data system and take responsibility for it.

The PSC was informed that the requirements to host a mirror of the ODINAFRICA Sea Level Data Facility include a GTS connection, and a webserver. Sufficient bandwidth is also necessary to be able to address the users requirements. One challenge that creating a mirror of the facility would face is the changes in station metadata which impact on the correctness

of the data. The PSC also aknowledged the importance of providing sea level data from the national tide gauges in the national websites.

FUST RECOMMENDATION 6: Investigate links with IHP to improve the provision of hydrological data for the African Marine Atlases.

It was pointed out that the WMO Run Off data centre would be a better source for hydrological data sets. The websites for these are www.grdc.de, www.bafg.de, and wmo.int. Mr Wellens Mensah provided the contacts at WMO Global RunOff Data Centres (looser@bafg.d) andAvinash Tyagi - ATyagi@wmo.int (Director, Hydrology and Water Department, WMO),Wolfgang Grabs WGrabs@wmo.int (Chief of Water Resources Division), and Mohamed Tawfik MTawfik@wmo.int (Chief of Hydrology Division).

FUST RECOMMENDATION 7: on visibility through high ranking visit by Flemish officer??

The Flemish minister was invited to attend the ODINAFRICA Seminar in April 2006. Invitations for activities in Africa should be considered in the next phase.

VII. Visibility: describe the visibility actions implemented during the contract period in order to disseminate the project activities and results as well as the cooperation between UNESCO and the Donor(s) *(logo in the publications, display the donor support, participation of the donor to the events, joint press conference, Internet)*

PUBLICATIONS

(i) WINDOW: focuses on the ODINAFRCA project activities. Eleven issues of the WINDOW Newsletter were produced during the current phase of ODINAFRICA (2 in 2005, 4 in 2006, 4 in 2007, and one double issue in 2008).

(ii) **COSMARNews:** contains information and news *on* marine related activities from Africa, and especially be used to publisize the contents *of* the Africa Ocean Portal. The newsletter is prepared in collaboration with the secretariat for the Coastal and Marine sub-theme of NEP AD. Ten issues have been produced in the current phase (3 in 2005, 4 in 2006, and 4 in 2007) and circulated.

(iii) The ODINAFRICA posters [both national and WP and products focussed] were revised and printed in 2006 and 2008.

(iv) contributed to a chapter on *"New Marine Observing Systems around Africa"* in the book "The Full Picture" launched during the GEO ministerial conference in Cape Town, South Africa, 27-30 November 2007.

(v) A booklet providing details on project activities at national, sub-regional and continental level has been prepared and will be published by end of March 2009.

WEBSITES .

http://www.odinafrica.org: is the projects web site and window the world, giving information on the project and access to its services and products such as databases

(directories of institutions and experts, catalogues of library holdings, marine related documents about/from Africa, catalogues of datasets and details of their location and accessibility) and services (document delivery services, ...)

National websites of the format www.nodc-countryname.org have been established to provide information at the national level. These are hosted at the IODE Project Office, Ostende, Belgium.

http://www.africanoceans.net: This is the African Ocean Portal through which users are able to access all sort of marine related information relevant to Africa- including links to useful sites, directories and catalogues.

African repository of marine related publications (OceanDocs-Africa): Users are able to access marine related publications from Africa through this site (http://iodeweb1.vliz.be/odin/handle/1834/1337)

Other project websites include the African marine atlas www.africanmarineatlas.net, the Sea level data facility www.sealevelstation.net, the sea level information site www.iode.org/glossafrica

CONFERENCES AND WORKSHOPS

ODINAFRICA was represented at several meetings, including the 8th African GIS Conference (September 2007, Ouagadougou, Burkina Faso), 5th Scientific Conference of the Western Indian Ocean Marine Science Association – WIOMSA (October 2007, Durban, South Africa), joint session of the Abidjan and Nairobi convention- UNEP Regional Seas programme (November 2007, Johannesburg, South Africa), and the GEO Ministerial conference (November 2007, Cape Town, South Africa). Presentations on ODINAFRICA activities were made and well received during these important meetings.

ODINAFRICA exhibited posters on its activities and demonstrated the African Marine Atlas at the joint session of the Abidjan and Nairobi convention (UNEP Regional Seas programme) held in Johannesburg, South Africa in November 2007. ODINAFRICA also demonstrated the African Marine Atlas during the GEO Ministerial meeting in Cape Town, South Africa, 27-30 November 2007, and contributed to a chapter on *"New Marine Observing Systems around Africa"* in the book "The Full Picture" launched during the ministerial conference.

VIII. Annexes

i. Publications, evaluation reports and other outputs, when applicable

ii. List of national and international staff; fellowships awarded

Peter Pissierssens
Head, IOC Project Office for IODE
Intergovernmental Oceanographic Commission of UNESCO (IOC)
Wandelaarkaai 7
8400 Oostend, BELGIUM
Tel: +32 59 34 01 58
Fax: +32 59 34 01 52
E-mail: p.pissierssens@unesco.org

Mika Odido
ODINAFRICA Project Manager
Intergovernmental Oceanographic Commission of UNESCO
UNESCO Nairobi Office
P.O. Box 30592, 00100 Nairobi, KENYA.
Email: m.odido@unesco.org
Tel: [254] 20 7623830
Fax: [254] 20 7622750

Dr Angora Aman
ODINAFRICA Coordinator WP2 [Coastal Observing Systems]
Laboratory of Atmospheric Physics and Fluid Mechanics
UFR- SSMT Cocody University
BP 582, Abidjan 22, Cote d'Ivoire
Email : aman_angora@hotmail.com, aman_angora@yahoo.fr;

Dr Desiderius Masalu
ODINAFRICA Coordinator WP3A [Data Management]
Associate Director , Institute of Marine Sciences, University of Dar es Salaam
P.O. Box 668, Zanzibar, Tanzania
Email: masalu@ims.udsm.ac.tz
Tel.: +255 24 223 0741
Fax:: +255 24 223 3050

Mrs. Arame Ndiaye Keita
ODINAFRICA Coordinator WP3B [Information Management]
Direction de l'Océanographie et des Pêches Maritimes
1 rue joris BP 289 Dakar, Senegal
Email: arame.keita@gmail.com

Mr A.K. Armah
ODINAFRICA Coordinator WP4 [Products Development and Dissemination]
Department of Fisheries and Oceanography
University of Ghana Legon
P.O. Box LG99, Accra, Ghana
Email: akarmah@yahoo.com; akarmah@ug.edu.gh

[LIST OF NATIONAL COORDINATORS AND FELLOWSHIPS ANNEXED]

iii. List of major equipment provided under the project and status after termination contract period

Tide gauges were purchased and installed at following locations. The institution that will be responsible for each of the equipment is indicated:

(i) Nouakchott - Mauritania (December 2006)

(ii) Takoradi – Ghana (December 2006)

(iii) Djibouti – Djibouti (Djibouti Ports Authority)

(iv) Pointe Noire – Congo (Pointe Noire Ports Authority)

(v) Limbe - Cameroon (SONARA Oil Refinery)

Two additional gauges will be installed and operated at the following locations:

(vi) Alexandria – Egypt (National Institute of Oceanography and Fisheries)

(vii) Casablanca – Morocco (

Deliveries of new computer equipment for NODCs were made in Algeria, Angola, Congo, and Egypt, while Namibia was provided with funds to purchase the equipment locally.

Resources were also provided to NODCs for upgrade of equipment.

iv. List of progress reports prepared during the contract period

- FUST – 10 report
- FUST – 11 report
- FUST – 12 report
- FUST – 13 report
- FUST – 14 report
- FUST – 15 report
- ODINAFRICA Progress report December 2006
- ODINAFRICA PMC/PSC report November 2007
- ODINAFRICA PMC/PSC report April 2006
- ODINAFRICA Progress report July 2008