



## **3 African Marine Atlas**

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The African Marine Atlas is a continental-scale online resource of public-domain geospatial data for the support of coastal and marine research and management in Africa. The project was designed to identify, collect and organise data sets into an atlas of environmental themes. A second aim was to provide training to increase the use of Geographic Information Systems (GIS) and spatial data products for the dissemination of appropriate, timely and relevant information. The structure of the atlas is also in accord with the end-to-end data

Figure 1. African Marine Atlas project participants.



management systems paradigm of earth observations systems. The Atlas provides maps, images, data and information to users who include scientists, students, coastal resource managers, planners, and decision-makers from administrative institutions and specialized agencies in Africa.

The Atlas Project was designed and implemented by countries participating in ODINAFRICA III, in collaboration with the African Coelacanth Ecosystem Programme (ACEP) and the United Nations Environment Programme (UNEP). The Intergovernmental Oceanographic Commission's (IOC) International Oceanographic Data and Information Exchange (IODE) Programme coordinated the project and identified international ocean data specialists to provide training and key inputs in data analysis.

The Atlas will ultimately also be of use to naturalists, local administrators, park managers, fishing cooperatives, tourists, hotel keepers, teachers, NGOs, the general public, and any others interested in coastal and marine environments. At present, the resolution and coverage of most data in the atlas lend themselves towards regional scale applications. Future development of the atlas products will be geared towards adding higher resolution data at national or local scales, thereby providing useful data for local management applications and reaching a wider user group.

The inventory of data sets in the atlas is a useful indicator of gaps either in: the knowledge base; the available public domain data, or where efforts at repatriation or processing of new data sets should be directed.

A suite of data dissemination products is planned for the atlas, including web data services, web mapping, a static clearinghouse service and a hardcopy atlas publication.

## The African Marine Atlas online

The initial list of over 200 data sets which were identified for the atlas were based on an extensive survey of coastal and marine data needs undertaken in early 2006 by all the countries participating in ODINAFRICA. A website was set up and hosted by the UNESCO/



Figure 2. African Marine Atlas using Mapserver.

IOC Project Office for IODE, as a clearinghouse of data sets (http:// omap.africanmarineatlas.net). This site currently serves over 800 downloadable spatial data products in the fields of marine geosphere (19 products), hydrosphere (445 products), atmosphere (96 products), biosphere (231 products), and human environment (27 products). In addition, 61 basemap data sets are provided to give spatial reference to the other data layers.

A Mapserver demonstration site (www.africanmarineatlas.net) was developed by the atlas team using a sub-set of data, as a joint training and data dissemination exercise. Through the IODE, the African Marine Atlas joined the International Coastal Atlas Network (ICAN), a growing body of organizations developing new approaches for interoperability of coastal web atlases.

BASE MAPS: The backbone of the Atlas is a set of fundamental maps and images onto which the thematic data lavers can be overlaid. These include several coastlines of different resolution. the depth contour lines from the global GEBCO bathymetry best data, the available gridded bathymetry (at



Figure 3. Bathymetry of the Namibian continental shelf.

1-minute resolution - as illustrated in the figure shown here with the Namibian coastline), a gazetteer of ocean place names, and masking files to use with satellite images where either water or land is not desired in the outputs.

GEOSPHERE: The solid earth and its mineral resources are represented in the Atlas by geohazard data (for example earthquakes, tsunamis, underlying fault structures). clas-sical geology data (minerals, core sample data, coastal soils), and physical parameters (for example sediment thickness - an important data set for implementation of the Law of the Sea). The sample figure presented shows historical tsunami runup sites.









Figure 5. Marine sediment thickness.

As mentioned above, sediment thickness is very important for legal considerations and as an indicator of possible hydrocarbon deposits. This figure shows the variation in marine sediment thickness (deep deposits shown in brown), which interestingly mirror areas of high productivity.

HYDROSPHERE: The largest number of themes available in the Atlas covers marine and fresh waters, and includes:

- *Physical Oceanography* data layers covering sea level, average currents, surface and at-depth temperatures and salinity
- *Chemical Oceanography* oxygen, nitrate, nitrite, phosphate, silicate grids for selected depths
- *Optical Oceanography* incoming light fields, and climatologies of light intensity in the water column, as related to photosynthesis
- Limnology gridded runoff data

**ATMOSPHERE**: The Atlas includes both climate and weather themes. Seasonal climatologies of cloudiness, precipitation, humidity, pressure and temperature set the background for valuable collections of synoptic wind, storm track and storm zone patterns (currently in draft form).

**BIOSPHERE:** The most difficult task facing the Atlas team was the selection and compilation of biological themes from the thousands of possible options. Many of the most desired themes (for example the distribution patterns of principal fisheries species) are not well known or are not in the public domain. The team contacted a wide cross section of specialists in the following areas, obtaining a unique and valuable collection of data layers (some never before published in this way). These include:

- Phytoplankton distribution, biomass, and seasonal patterns
- · Chlorophyll/pigments distribution and seasonality
- Zooplankton taxonomy and distribution
- Algae and kelp species distribution
- Mangroves occurrence and spatial extent
- Coastal vegetation type
- Fishing areas
- Fisheries catch statistics and aquaculture production
- Distribution of important fisheries resources
- Coral cover
- Fish species distribution
- Invertebrate species distribution
- Protected areas
- Exotic and invasive species distributions (selected species)
- Protected species distributions (selected species)

In addition, although downloadable files are not provided, links are provided to other data sites providing data on mammals, reptiles and birds. HUMAN ENVIRONMENT: The selection and compilation of human social and economic themes directly relevant to coastal and marine resource management was one of the most complex challenges facing the atlas team. In this area, the African Marine Atlas was greatly assisted by the involvement of the United Nations Environment Program, in particular UNEP's national-level GIS projects along the African coast. With their help, the team was able to assemble data layers in the following useful areas:

- Country and international boundaries
- Exclusive Economic Zone (EEZ) boundaries
- Maritime features
- Population
- Industrial and commercial entities
- Transportation
- Energy transmission
- Hospitality and tourism

## CONCLUSION

The African Marine Atlas Project has brought benefits to participating national institutions and marine practitioners; by increasing capacity for working with spatial data, as well as increasing access to useful information about the coasts and oceans.

The African Marine Atlas will be augmented with new datasets during the course of the ODINAFRICA IV project, as the project partners discover and convert them to standard GIS formats. A considerable undertaking in itself. The next phase will also focus on developing additional value-added products and content that can support interrogation and information services at national and local level, specific to coastal management issues of current concern.

Partnerships that have been formed through this project extend beyond Africa and the IOC of UNESCO, to other regional and global programmes and data vendors. The African Marine Atlas project has motivated and encouraged scientists to work together, learn new techniques, and build collaborative teams for the future.



*Figure 6. Chlorophyll concentration for African surface waters.* 

Figures and some of the text from this chapter were first published in Position IT and the UNESCO Nairobi Office Bulletin.