

# A Climate, Marine and Atmospheric Science and Education Centre for West Africa

## A Joint Vision of:

Leibniz-Institut für Meereswissenschaften, Kiel;

Leibniz-Institut für Troposphärenforschung, Leipzig;

Max-Planck-Institut für Biogeochemie, Jena;

## The Problem

West Africa and its adjacent Ocean is an extraordinarily sensitive region with respect to global climate and marine ecosystems. Pressures on the region from the developed world are already large and are growing rapidly. Examples of external pressure on the West African environment include:

- **Fishing.** The region is host to valuable fisheries that are heavily exploited by the European, Japanese, Russian and Chinese fishing industry.
- **Tourism.** Portions of tropical West Africa are seeing rapid expansion of tourism. Coastal zone development is rapid.
- **Climate Change.** The West African region is a locus for major atmosphere-ocean-land couplings that determine climate variability. West African is frequently predicted to be a region of significant greenhouse-gas related climate change involving adverse impacts.

The nations of this region lack the **observational and scientific capacity** to plan for, manage or prepare



to adapt to these direct and indirect pressures from the developed world. For example: despite an enormous regional fishing effort by developed nations, the coastal states of West Africa still have only very restricted capability to **observe, measure, study and assess** the productivity of their marine ecosystems in order to manage their exploitation.

*Left: One of several 100m trawlers from Lithuania that fish off the Mauritanian coast.*

*Right: Artisanal fishermen with their catch, Santa Antao, Cape Verde*

## Significance of Coastal West Africa for Global Earth Observation

The eastern tropical Atlantic has major significance for global-scale processes ranging from climate variability and change (e.g. African monsoon, desertification), global biogeochemistry (e.g. effect of terrestrial dust on oceanic nitrogen fixation, upwelling) and atmospheric chemistry (oxidative capacity, pollutant removal). Despite this major significance, the West African coastal states are largely devoid of long-term, *in-situ* observations. In part this is due to the economic and political problems of the region which cause logistical difficulties for maintaining observational and education programmes over the long-term.

## The Cape Verde Atmosphere-Ocean Observatory

In order to initiate long-term observations of the Earth System in this region, in the context of global change, an Atmosphere-Ocean Observatory was established recently on the island of Sao Vicente, Cape Verde. This initiative grew out of a workshop in 2004 (supported by the Volkswagen Stiftung).

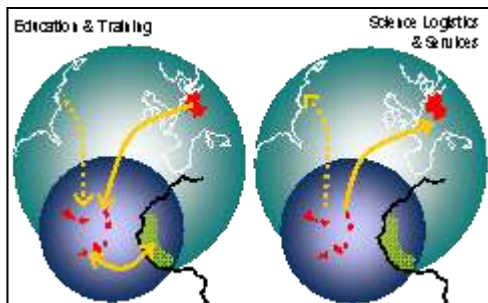
Subsequently, the IFM-GEOMAR (Kiel) together with the Leibniz-Institut für Troposphärenforschung (Leipzig), the Max-Planck-Institut für Biogeochemie (Jena), and two Cape Verde Institutions, developed initial plans for an Observatory. Through a major collaboration with the University of York and financing

from the UK Natural Environment Research Council, these early plans have been realized and regular measurements and sampling campaigns have commenced. This has involved construction of an atmospheric site on land (including a road to the site, power lines, communications, etc), refurbishment and conversion of Cape Verde's research vessel *Islandia*, and provision of laboratory space for ocean measurements. A broad community of scientists from numerous institutions in Germany (WGL, MPG and University-based) and the UK have initiated research projects at the Observatory, including the BMBF Verbundprojekt SOPRAN, the DFG Schwerpunktprogramme SAMUM, DFG Sonderforschungsbereich 754, as well as several projects funded by the European Union. The Observatory already employs 4 Cape Verdean technicians, involves several Cape Verdean scientists, and plans are in place for joint projects leading to PhDs for young Cape Verdeans.



### Strengthening of West African Climate, Marine and Atmospheric Science

The Observatory's operations and associated projects involve regular visits of large number of "northern" scientists to West Africa, including research vessel and research aircraft missions and extended stays in Cape Verde by international teams of scientists. The countries of the region, including Cape Verde, therefore provide valuable scientific "services" for the scientific community from northern nations. **The long-term nature of the Observatory, combined with the broad base of disciplines and institutions that will be working in the region, creates unique possibilities for capacity building and education in the West African Region. An investment in education and training would be a suitable payback for scientific services provided.**



Specifically we propose to (1) **consolidate the Observatory** for long-term operation in order to **guarantee continued, long-term involvement of German scientists and their institutions in the West African region**. Further, and in this context of a long-term scientific interest and commitment, we propose (2) **to establish an educational component to the Observatory** that will provide teaching and capacity building for the entire region (i.e. Cape Verde and its neighboring countries).

As with the Observatory, this vision has been developed amongst the German institutions and their scientists, however our UK collaborating institutions would be interested to cooperate in such an education initiative. Hence this could form the basis for a **Germany-UK Bilateral Initiative** concerning Global Change. Representatives of the **Volkswagen Stiftung** who have been involved with initial support for the activities in Cape Verde are aware of this vision for regional capacity building and are supportive of it.

### Specific Requirements

#### 1. Consolidation of the Observatory

In order to ensure a long-term future for the recently established observatory and the associated educational initiative, the following enhancements to Observatory infrastructure are required:

- **A laboratory building at the Cape Verde Fisheries Institute to include a remote sensing data centre; an autonomous-vehicle control centre; clean laboratories and wet laboratories.** Present laboratories are small, not built to modern safety standards and are not suitable for many required analyses. There are no facilities for receiving remote sensing data products or for communicating directly with *in-situ* measurement systems.
- **A laboratory building at the atmospheric site, with renewable power, sanitation facilities and some overnight accommodation..** Present facilities rely on containerised laboratories that are constructed in and shipped from Europe. The remote site relies on portable chemical toilets and has an insufficient and sometimes unreliable power supply.

In both cases, modern, custom buildings are required in order that state-of-the-art observing and measuring technologies can be used locally, instead of relying on the current practice of sending data and many samples to Europe for analysis. Improved infrastructure will be essential for long-term sustainability of the site and is necessary if the observing activities are to be transferred to African scientists and sustained in the long-term.

## *2. Infrastructure and Support for Education*

The Observatory will be used as the scientific foundation and focal point for capacity building in the region. Specifically we envision using the associated long-term commitments of supporting institutions associated with the Observatory as the context for a **West African Climate, Marine and Atmospheric Education Centre**. This would be located either at the Cape Verde Fisheries Institute in Mindelo, or on the campus of the newly established Cape Verde University nearby. The centre, which can be affiliated to the newly established Cape Verde University, would provide teaching rooms, student accommodation, and accommodation for visiting lecturers and scientists. The centre would be designed to teach students from Cape Verde and the surrounding region including: **Mauritania, Senegal, Guinea, Gambia, Guinea-Bissau (and, perhaps at a later date, Sierra Leone, Liberia and Ivory Coast)**. These countries already participate in a variety of regional networks with Cape Verde. Financial support for students from these countries would be an essential part of the programme. Teaching would be provided by a core group of teachers/researchers employed by the Observatory, but would be supplemented by commitments from European and North American scientists associated with the Observatory and the research being conducted there. Additional support from the DAAD and Volkswagen Foundation would be solicited in order to establish the necessary educational programmes. A UK participation in this program is possible. Teaching at the Centre would focus on providing the tools required to measure and evaluate the growing regional and global pressures on the West African environment, as well as management strategies and adaptation approaches.