Data Management

The development of an appropriate GEOHAB data management plan is a fundamental and critical activity upon which the ultimate success of GEOHAB will depend. The collective value of data is greater than their dispersed value. Data management and exchange are therefore important components of GEOHAB research projects and should be addressed within each application for endorsement. Each Open Science Meeting will be asked to discuss data management and to include data management plans within the research plans produced.

GEOHAB data are relevant to scientists and managers beyond the GEOHAB community. Therefore, GEOHAB will participate in co-operative non-governmental and intergovernmental data management systems. GEOHAB will co-operate with the framework for research data being developed for SCOR and IGBP projects (see Table 3). GEOHAB will also participate in data management processes of the International Oceanographic Data and Information Exchange (IODE) activity of IOC. The Intergovernmental Panel on Harmful Algal Blooms (IPHAB) has recommended that "the IOC ensure that data-quality management and data exchange relevant to GEOHAB be given due consideration, in accordance with the Terms of Reference for the Group of Experts on Biological and Chemical Data Management Exchange Programme (GE-BCDMEP), and that a GEOHAB representative be included in the GE-BCDMEP."

Table 3. Data Management Framework for IGBP and SCOR Large-Scale Ocean Research Projects *

Based on the data management experience of mature programmes (JGOFS, WOCE, LOICZ and GLOBEC), it is clear that the following actions are extremely beneficial to projects:

- Establishment of a Data and Information Management Unit at the outset.
- Development of distributed, scalable data management
- Adoption of standards to facilitate interoperability of data and information
- Utilization of existing infrastructure, but with additional resources to ensure it fulfils international rather than national specifications and standards
- Provision of services and data access that match the needs of scientists
- Provision of data through alternative media, for example, CD-ROM, for those without Internet access
- Development of a close working relationship between data managers and scientists through means such as "end-to-end" project data management and the provision of data access tools

Recommendations for New Large-Scale Ocean Research Programmes

1. Projects should establish a data policy at the outset to address the following issues:
   - Data sharing within the programme, between programmes and the entry of data into the public domain
   - Data quality issues
   - Long-term security of the data
2. All new programmes should dedicate resource to the development of a project meta-database that will form the project data inventory. This should conform to appropriate international standards (e.g., ISO19115 for spatially referenced data) to facilitate integration and exchange of information between programmes. Previous experience has shown that this resource is most effective if located in the IPO.
3. Projects should establish a data management working group such as the JGOFS Data Management Task Team or the WOCE Data Products Committee. Past experience has shown that these groups are more effective if they comprise both data managers and scientists.
4. National science programmes should address data management in a credible manner, including giving consideration to capacity building, if appropriate.

* This information resulted from a special workshop at the 2003 IGBP Congress in Banff, Canada. The session was chaired by Roy Lowry (British Oceanographic Data Centre), with Bernard Avril (JGOFS IPO) as rapporteur.

GEOHAB will use a decentralised data management and distribution system with a centralised index. The components, centralised under the supervision of the IPO, will include a comprehensive inventory of databases relevant to GEOHAB, as well as meta-data, with links to their locations and contact persons. All investigators should be prepared to share their data and data products within two years from the time those data are processed, and should recognise the "proprietorship" (rights to first publication or authorship) of data acquired from other investigators. Each GEOHAB project should address the long-term archival of observational data and data products to ensure a lasting contribution to marine science. Data management issues will be handled by a small GEOHAB Data Management Committee, which will be responsible for ensuring that the GEOHAB data management policy is followed by participating projects and will assist the International Programme Office in data-related issues. The GEOHAB data management policy will be posted on the GEOHAB web site.

Identification of Protocols and Quality Control

GEOHAB encourages the use of existing standard protocols and guidelines for sampling and experimental methods. Open science meetings for the Core Research Projects will be asked to specify core parameters that will be measured initially in each location, as well as standard measurement protocols. In addition, GEOHAB recommendations on methods and measurements will be disseminated through the IPO and GEOHAB web site. Task Teams will be established, when necessary, to define methods to be applied or recommended in GEOHAB projects and to organise intercomparison of methods and models. GEOHAB will identify relevant existing modelling activities through a Task Team that has the responsibility to organise model inter-comparison exercises, including comparison of predictive models for HABs. GEOHAB investigators retain the primary responsibility for quality control and assurance. It is essential that the methods adopted to ensure quality control and the protocols used for data collection are fully documented in information files (meta-data) accompanying data sets.

Capacity Building

GEOHAB can meet its objectives through international co-operative research only if well-trained scientists from a wide range of countries that experience HABs are involved. GEOHAB will arrange training through courses, summer schools, and training sessions on relevant science workshops, and will encourage means of exchange of scientists between international, regional, and national projects. This approach provides the opportunity to train marine scientists in the use of instruments relevant to HAB monitoring and in the conduct of research in ecosystems that are relevant to their respective countries or regions.

Training activities can be organised by the SSC and proposals for training activities can be submitted to the SSC for endorsement as GEOHAB activities. GEOHAB encourages incorporation of a training and capacity-building component in all GEOHAB Core and Targeted Research projects, as well as in regional and national GEOHAB projects. Projects including exchanges of scientists between research institutions in developing and developed countries will be organised, thereby enhancing research capacity and infrastructure in participating countries. Training activities will be supported to develop and strengthen scientific networks globally, with particular attention devoted to developing scientific capacity in developing countries. GEOHAB will also facilitate the adoption of up-to-date technology and research methodologies world-wide through the organisation of specific workshops (see Example Framework Activity Box 1 as an example).