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Intergovernmental Authority on Development (IGAD) – Hydrological Cycle Observing System (HYCOS) Project – IGAD-HYCOS

IGAD-HYCOS PROJECT

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REVISED PROJECT DOCUMENT

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ANNEX

1. IMPLEMENTATION WORK PLAN
2. LOGICAL FRAMEWORK
3. IMPLEMENTATION BUDGET – PHASE II

REFERENCE MATERIAL

1. DESIGNING A STRATEGIC AND OPTIMUM OBSERVATION NETWORK FOR IGAD-HYCOS WITH TECHNICAL SPECIFICATIONS – Consultants Report
2. DESIGNING DATABASE MANAGEMENT SYSTEM FOR IGAD-HYCOS WITH TECHNICAL SPECIFICATIONS – Consultants Report
3. DESIGNING DATA TRANSMISSION SYSTEM FOR IGAD-HYCOS – Consultant Report
4. DEVELOPING TRAINING PROGRAMME FOR CAPACITY DEVELOPMENT FOR IGAD-HYCOS – Consultant Report

INTRODUCTION

About 60% of the IGAD region is arid or semi-arid and the availability of water resources is uneven and irregular both in space and time, notwithstanding the presence of the major African river, the Nile, and several lakes. Periodic droughts have affected the region in the last decades, with dramatic human, economic and ecological consequences. The seasonal and spatial distribution of rainfall further complicates the situation. Most of the countries have a short rainy season characterized by high intensity rainfall. The subsequent flash floods cause devastating damages and loss of lives. Such a loss could be preventable if there were early warning systems in place supported by real-time or near real time hydrological information. Combined with the impacts of climate change on the water resources and the absence of appropriate adaptation strategies, it has led to the unforeseen consequences of major flooding with the loss of human lives and the loss of economic resources in the Member States. The OFDA/CRED International Database reports that, over the last two decades, 96 major flood events have been recorded in IGAD-HYCOS Member States. These have affected approximately 12.5 million people with almost 2 million inhabitants having been made homeless and at least 5,000 people having lost their lives.

As IGAD – HYCOS countries' population grows, and Member States seek to develop their economic potential, the importance of the water sector is increasing and given the climate change and its impacts, the role of water in economic development, be it industrial or agrarian, is increasing. The availability of fresh water is the key to sustainable development and an essential element in health, food production and poverty reduction. As every aspect of development is closely linked to the proper utilization of water, this in turn exerts enormous influence on national economies in the region and contributes to poverty reduction and sustainable development through the achievement of the specific MDGs and WSSD targets on water and sanitation.

However, due to shrinking budgets, concrete improvements in the hydrological information management systems and strengthening of the capacity of hydrological services have been neglected. This has prevented provision of adequate baseline data and information services for sustainable water resources management. In order to assess the level of water availability, adequate hydrological, hydro-meteorological and other related data is needed on the amount of water available in the participating countries. Sustainability of water resources infrastructure depends largely on the adequate and accurate basic information related to the state of water resources. Due to lack of adequate hydrological information, many water resources development schemes cannot be designed optimally.

Presently, within the IGAD-HYCOS participating countries, most of the National Hydrological Services (NHS) are not strong and don't have sufficient technical and institutional capacity to collect, store and disseminate timely and accurate hydrological information to enable the efficient and economic management of their national water resources. There is need for support to the NHS to strengthen their capacity to better fulfil their responsibilities, by improving the availability, accuracy, and dissemination of water resources data and information. This will be achieved through the development and implementation of appropriate national water resources information systems which will facilitate the use of the data and information in support of sustainable socio-economic development.

The IGAD-HYCOS project, therefore, is designed to promote sustainable and integrated water resources development and management in the IGAD region through enhancement of regional cooperation and collaboration in the collection, analysis, dissemination and exchange of hydrological and hydro-meteorological data and information for water resources assessment, monitoring and management. For that purpose the project aims at providing adequate infrastructure for hydrological observation and adequate regional cooperation in

information exchange among the IGAD countries. The project is expected to provide the IGAD region with a hydrologic information system that will feed into a regional water information system, and will assist participating countries in developing their national capacities for more efficient, cost-effective and sustainable water management. To achieve this task there is a need to design a modern strategic and optimum monitoring network for data collection and dissemination and to strengthen the National Databases and to establish a Regional Database.

THE OVERALL OBJECTIVES OF THE IGAD-HYCOS PROJECT

1. To promote sustainable and integrated water resources development and management in the IGAD region;
2. To enhance regional cooperation for the collection, analysis, dissemination and exchange of hydrological and hydro-meteorological data and information for water related decision making.

SPECIFIC OBJECTIVES OF THE IMPLEMENTATION PHASE II

The present **implementation phase** of the IGAD-HYCOS project, as described in the Appendix 5 of the Financing Agreement (FA), consists of the following specific objectives:

- i) To establish Regional Water Information System
- ii) Strengthen Regional and National capacities of NHSs

The activities, as described in Appendix 5 “*Draft Project Document – IGAD Hydrological Cycle Observation System (HYCOS)*” of the Financing Agreement (Attached as Appendix to this document), are based on a project document jointly developed by WMO and IGAD Secretariats back in 2003, keeping in view the then state of hydrological networks in the Region. As per this proposal, Djibouti, Eritrea, Ethiopia, Kenya, Somalia, Sudan and Uganda – Members of IGAD - were included as the participating countries in the project. The revised activities are based on the updated information regarding country needs and requirements.

Relevance of the IMPLEMENTATION PHASE (Phase – II)

Indeed the experience drawn from the completed and ongoing HYCOS components has shown that the implementation of HYCOS projects requires careful planning and preparation, setting up clear guidelines and conditions for smoothly carrying out the different activities planned in the project. The Revised Project Document ensures that the IGAD-HYCOS is implemented smoothly and effectively within the given timeframe and responding to the regional and country needs.

Implementation of IGAD-HYCOS will very much determine the success of INWRMP through its Expected Result 4 “*Regional water management information systems and observation networks strengthened*”. Through provision of real time hydrological information for stakeholders and its input to these and other national, regional and international programmes the IGAD-HYCOS project will help decision makers draw more effective water management plans, and adapt to climate change based on accurate information. This will support the improved governance in water and sanitation and management of water resources.

The IGAD-HYCOS Project will address this shortcoming by strengthening the regional capacity to provide hydrological data and information services. IGAD-HYCOS aims at supporting the establishment and enhancement of water resources information management system that provide water related data for water managers, planners, decision makers, scientists and the general public. For that purpose the project will address issues such as inadequate infrastructure for

hydrological observation in many participating countries, inadequate water quality monitoring, inadequate regional co-operation and information exchange, and the lack of a regional hydrologic information system. The project will assist NHSs to rescue their historical hydrological data by transferring the available data in their archives from paper format to electronic format and build the National Database. The information would be available through the Regional Database for basin water planning, calibration of regional climate models for downscaling and research purposes.

At present there is no common mechanism among the participating countries for the exchange of water related information. The IGAD-HYCOS will strive to provide single, easily accessible source of hydrologic information. It will strengthen the technical and institutional capacities of the National Hydrological Services in the region to collect and process hydrological and hydro-meteorological data and meet the needs of end users for information on water issues. It will also promote and facilitate the dissemination and use of water related information using modern information technology.

In the IGAD region a number of initiatives aimed at improving water resources management at national and regional levels have been launched. The IGAD-HYCOS will enable the region to establish institutional arrangements appropriate to the region to interact and contribute to existing projects and new initiatives. The end products will provide a useful input to other ongoing projects and initiatives in the region.

Recognizing the lack of existing appropriate mechanism for data exchange policy among participating countries, the project will promote and encourage establishment of a clear data exchange policy taking into account existing Regional and International mechanisms.

UPDATED INFORMATION – REVISED COUNTRY NEEDS

While the basic concept, goals and expected results envisaged in the original IGAD-HYCOS project document still remain valid, the revised project document is aligned with the new on the ground realities and countries needs to ensure successful implementation of the project. This has been achieved by collecting updated information through a comprehensive process including developing and circulating a questionnaire, country consultation and organizing national and regional workshops. Also an additional three countries have been included namely; Burundi, Rwanda and South Sudan.

Five consultants were recruited to prepare detailed reports on the current situation, the needs and requirements of the participating countries. Four detailed reports on Network Design, design Database Management System, identification of Data Transmission System and Develop a comprehensive Training Programme are identified as reference documents to this Action.

A. NETWORK DESIGN

In this instance, a primary focus of the observation network was for fulfilling the country needs in support of the implementation of the Inland Water Resources Management Programme (INWRMP). Noting this however, countries will need to identify the combined regional and national priorities for water resources information.

The IGAD-HYCOS will need to establish and maintain optimum networks of integrated meteorological and hydrological observation systems, in order to fully understand and provide coverage for the highly random hydro-meteorological cycle (spatially and temporally). This was carried out in consultation with the Member States guided by the following strategic objectives:

- a) Hydrological monitoring for basin-wide water resource assessment and Planning (in support of the Inland Water Resources Management Programme (INWRMP)).
- b) The proposed network must meet the complex needs for holistic management of water including the design of sustainable water structures and reduction of water related problems such as floods, droughts and water quality, in view of a changing climate.
- c) Water quality and pollution monitoring and control
- d) Monitoring to support environmental and ecological management
- e) Groundwater monitoring and management
- f) The emerging and future needs (e.g., climate change adaptations)
- g) Optimum use of both existing sites/instrumentation and state-of-the-art observing systems/instruments which integrate automatic multi-parameter sampling at high frequency and rapid data transmission (real-time) to the National Data Center (NDC) then the required information would be transferred to the Regional Data Center (RDC).

The revised hydrologic network under the IGAD-HYCOS project was designed on the basis of a, country assisted, in-depth assessment of the present status of the network, of the equipment in place, the available and foreseeable technical skills, overall regional and national relevance of sites and the emerging and future needs (e.g., climate change adaptations).

Since one of the prime objectives of the Inland water Resources programme is to foster cooperation, the criteria of areal weighting were considered. Use of Data Collection Platform (DCP) technology, use of telemetry and data loggers has been high on demand during country consultations and each country wanted these technologies for the upgrade of all monitoring stations. Stations which had strategic dimensions and a Regional and transboundary importance were prioritized for the upgrade.

Different countries had varying needs and differing priority areas for monitoring. Some preferred to focus more on surface water, others Groundwater and countries striking a balance. But most were on surface water. The IGAD-HYCOS Network will include 100 stations to be distributed among the participating countries according to their needs and to ensure a minimum number of the stations required for integrated river basin management is considered. The allocated fund in the budget combined with the cost of each individual station will determine the final number of sites that can be installed. Summary of the country needs is presented below.

Burundi identified 23 new stations for surface water and water quality; they selected 7 stations for surface water and two for water quality as priority stations to be considered as minimum requirement for Burundi.

Eritrea was not responding to the communications from the Project Management Unit, therefore the previous 4 surface water stations identified in the old project documents were considered for inclusion in the new IGAD-HYCOS network with the flexibility for making any changes during the implementation.

Ethiopia identified 44 surface water stations, 30 water quality stations and 74 groundwater sites. 18 stations including surface water, ground water and water quality will be allocated for Ethiopia in IGAD-HYCOS network.

Djibouti identified 20 rainfall stations, 10 hydrometric stations, 7 hydro-climatic and 10 groundwater stations. 6 different stations will be allocated to Djibouti in the new IGAD-HYCOS network with the flexibility for making any changes during the implementation.

Kenya has slightly more than 400 river gauging stations at which Water levels and Sediment load observations are made. Water quality samples are also taken for laboratory analysis. There are no established groundwater level observation wells. They identified 22 stations to be included in IGAD-HYCOS network. Fifteen (15) stations for surface water and groundwater will be allocated to Kenya in the IGAD-HYCOS network with the flexibility for making any changes during the implementation.

Rwanda identified 41 stations for surface water and water quality; they selected 7 stations for surface water and two for water quality as priority stations to be considered as minimum requirement for Rwanda.

Somali due to weak communication with Somalia, 12 surface water stations were identified mainly in the south. Six (6) different stations will be allocated to Somalia in the new IGAD-HYCOS network with the flexibility for making any changes during the implementation or increase the number to add more stations in the north.

South Sudan identified 23 new stations to be rehabilitated and some to be established, it was agreed on 10 stations to be included in the IGAD-HYCOS network as minimum requirements of South Sudan for surface water (gauging stations) and including also water quality. They requested additional stations for Groundwater (3) and Hydro-meteorological stations (5).

Sudan identified 38 new hydrological and meteorological stations to be rehabilitated and some to be established, it was agreed on 15 stations to be included in the IGAD-HYCOS network as minimum requirements of Sudan for surface water (gauging stations) and including also water quality, groundwater and meteorological.

Uganda identified 21 new stations to be included in IGAD-HYCOS network for surface water and water quality. Twelve (12) stations in the Nile were selected as priority stations for surface water and water quality.

However, it should be noted that the budget combined with the cost of each individual station that will determine the final number of sites that can be installed. More details on the network design are available in the consultant report in Reference 1.

B. DATABASE MANAGEMENT SYSTEM

In order to effectively manage the water resources in IGAD- HYCOS countries and provide reliable information for the highly random hydro-meteorological cycle, national and regional database systems require being strengthened or established. These database systems should be implemented to receive, archive and process hydro-meteorological data with the aim of providing information useful in decision making on water related issues to support sustainable socio-economic developments.

To design a database management system that meets hydrological requirements for the countries it is necessary for them to identify their national and regional priorities for water resources information. This objective was achieved through a comprehensive assessment of the hydrological activities in different countries. Through country visits the functions of the hydrological service providers, users, regulators were studied and their capabilities, limitations and expectations were analysed. Another source of information was the response to the questionnaire that was distributed to the countries from the IGAD-HYCOS Project Management Unit.

The activity of information gathering during the countries visits was executed through participation in National workshops, discussions, questionnaire filling, observing the database operations and scrutiny of archived hydrological data records and their structure.

Current status – countries capabilities

The result of the information analysis reflected clearly the hydrological data management capacity in the region. Subsequently the design of suitable databases that meet the data management needs for each country and the entire IGAD region was identified and clearly indicated. HYDATA was found to be used in most countries as the main hydrological data management system for surface water or groundwater. Although it uses ACCESS database which has a limit of 2.096 GB, no country had a database exceeding 500 MB. Most of these databases have been in use for over a decade.

It is anticipated that with implementation of IGAD-HYCOS stations the databases sizes will grow much faster. Experiences from where ACCESS databases have been used in AWS data management like in Kenya Meteorological Department show that it takes more than six years to reach a database size of 1 GB for data from over 20 stations with more than 20 sensors. It is therefore estimated that with installation of about 10 stations, it may take over a decade to exceed the ACCESS limit. However, it is possible to do a process called data segmentation in ACCESS databases and overcome the size limitation in case the 2.096 GB size is reached.

Windows XP to Windows 7 are the common operating systems used in running of the databases for hydrological data management. Although Local Area Network (LAN) exist in most countries data management system are not installed in a way that they can be shared across the LAN. However in Uganda one database is installed in a server for the management of ground water and its operations are shared through different workstations. Still in the same country the database for the management of surface water is installed as a single user.

It was observed that in those countries where HYDATA software is currently being used, data security is by password protection through HYDATA interface. However, this security was found weak as any experienced ACCESS user could bypass the HYDATA interface and access the data using Microsoft ACCESS. Those database systems that were based on ACCESS only had a stronger protection and the database could only be accessed by authorised users. . It should be noted that HYDATA software is no longer being supported by the developers but several hydrological services are still using it until an alternative solution becomes available.

Those found in charge of hydrological data management operations had gained the skills through in-house training and experience at workplace. They were providing the basic hydrological data services but more training would be required for advanced operations.

Database Management System Design

For the IGAD-HYCOS information system to be a great tool in providing useful and critical products that answers the hydrological needs, a sound database system need to be designed. This can be achieved by ensuring that the best hydrological data management practices are accommodated in the database design. Different components were considered in the design that has taken into considerations the user's interests in provision of hydrological services. The approach applied considered the needs of the hydrological service providers and the users in terms of data, functions, tools and products.

All attempts have been made to ensure that the data model designed for database implementation accommodates the types of data currently being used in all countries and those that have been proposed. The design for the user interface has taken into considerations the best technology and what the users are familiar with. Use of web based interface is recommended because it has an advantage that most computer users are familiar with Internet browsers. This will ease the training task. On implementation strategy, cost and time elements have been indicated as the determining factor. More details are available in the consultant report in Reference 2.

To ensure that accommodative database design is achieved with enforcement of data integrity the relationships between entities may be established as shown in **Figure 1**. This is the type of database model that is recommended for implementation in the database system because it guarantees a Relational Database Management System (RDBMS).

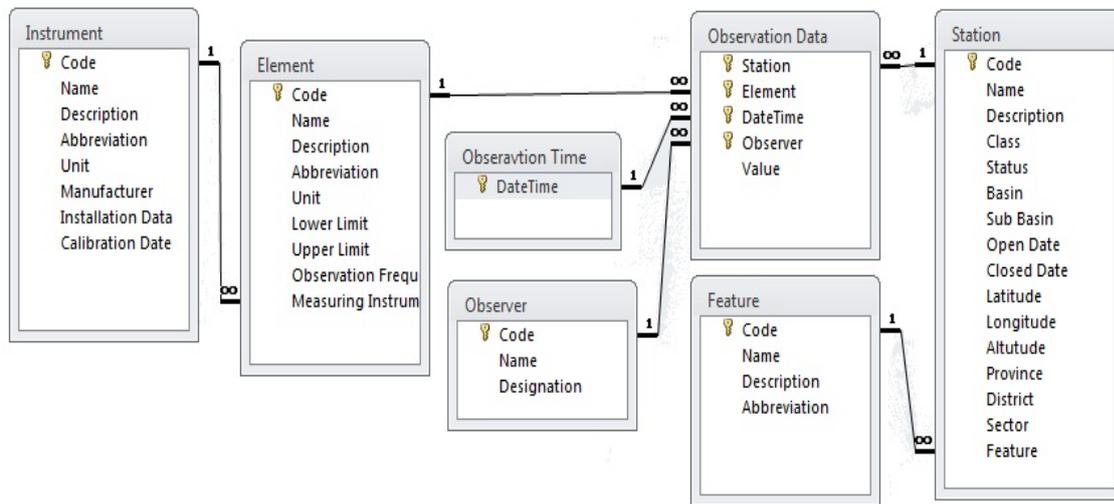


Figure 1. Recommended Database Model

The described database model above is the minimum that is expected for implementation. If a superior one can be available then it can be used so long as it results into a RDBMS. The entities structures can be defined differently but all the attributes listed should be maintained. More attributes may be added whenever found necessary.

This database model can now be implemented in any database system. With IGAD-HYCOS project both the national and regional databases will be implemented using the same database model. During the survey on the data management needs it was observed that the databases used in different countries did not exceed 500 MB. It will then be possible to implement national databases with small database systems like Microsoft ACCESS. This is the current situation in all the current where database systems are in place.

The regional database is expected to be relatively larger with more functionalities than the national databases. It will then be required to be implemented on larger database system such as SQL or Oracle. However, due to the running cost that comes with Oracle licensing, SQL will be the preferred database system in order to have a system that is sustainable within the regional resources.

It was observed that most of the data management applications used in the region are HYDATA, MIKE Basin, Microsoft ACCESS and EXCEL. These applications have windows based user interface. Because in IGAD-HYCOS information system data and information will be accessed through the Internet, the user interface will require web technology. The structure and usage of web based user interface is not very different from the windows based one. Therefore a web based design for the interface is the best compromise. After all almost all of the hydrological services have been using the Internet suggesting they are all familiar with web structured user interfaces.

The user interface will be a web home page for the entire information system. It is from the home page that all the resources will be accessed. These resources will be in form of data and processed information. It will be categorised as those for public domain and those to be

accessed by the authorised users at different levels. The user interface will be similar in the National and Regional databases.

C. DATA TRANSMISSION SYSTEM

The IGAD-HYCOS project aims at establishing a regional water management information system and strengthened observation networks within the participating countries which originally included Kenya, Uganda, Sudan, Ethiopia, Somalia, Eritrea and Djibouti. The project was extended to cover the new country (South Sudan) and other countries which are members of the East African Community including Burundi and Rwanda. In order to establish a reliable regional Information System, it is important not only to establish a suitable and modern data collection network, but also a data transmission system is required to ensure that reliable hydrological data and information are transmitted to the databases in real-time or near real-time to support early warning systems. The Data Communication system is illustrated with the following diagram

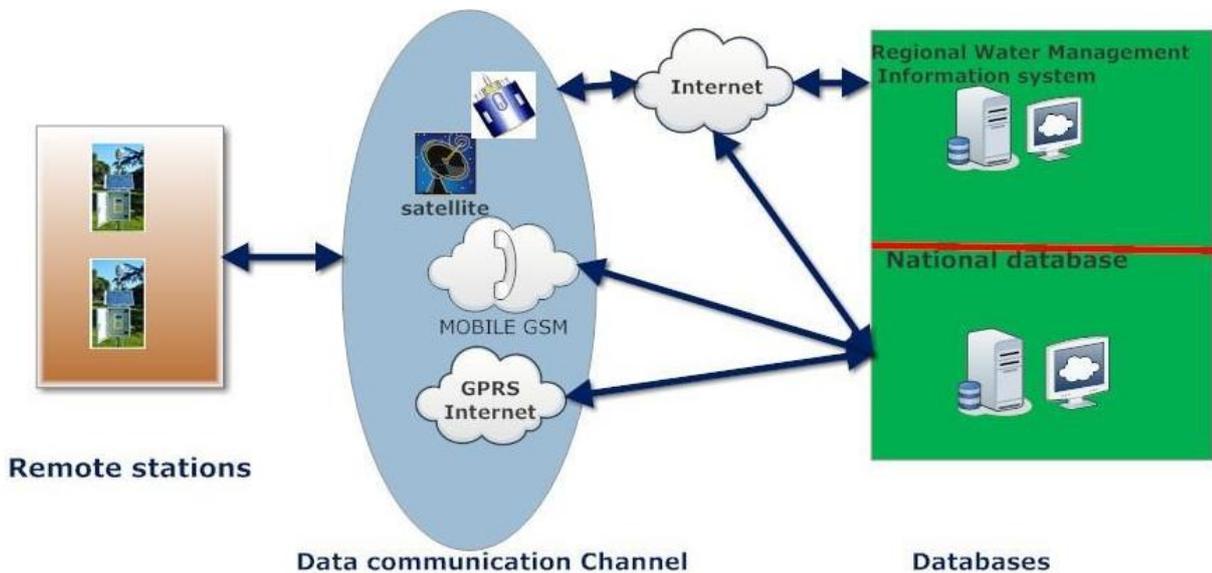


Figure 2 Hydrological Data Communication System

The assessment of the current regional telecommunications infrastructure to support data transmission both at national and regional level was recognized as important issue to assist in the update of the project document of 2003.

This task was achieved through a comprehensive assessment of the existing Telecommunication Systems in different countries. Through country visits the functions of the telecommunications service providers, users, regulators were discussed and their capabilities, limitations and expectations were analysed. Another source of information was the response to the questionnaire that was distributed to the countries from the IGAD-HYCOS Project Management Unit.

It is evident from the country visits and participation in various National workshops, that though technology has evolved significantly in the last decade, this technology is not reflected in the design of the hydrological stations already installed in most IGAD countries. Presently, within the IGAD – HYCOS countries, most of the National Hydrological Services (NHSs) though

equipped with appropriate technology to facilitate real-time or near real-time data transmission have not deployed stations utilizing the same. Information Communications Technology (ICT) has not changed much of the way data communications is being implemented in the hydrological and hydro-meteorological stations.

The design of IGAD-HYCOS data transmission system considered the existing stations and the associated data transmission methods. Additionally the National telecommunications infrastructure, data communications costs for all the countries are well considered in deciding which data transmission options are best for a particular country both at National and regional level. Availability of the Internet, GTS connection and the existence of the Meteosat Second Generation (MSG) will be a major consideration in most countries. More details are available in the consultant report in Reference 3.

National Data transmission

For National data collection from the remote stations, the mobile telephone network has proved to be quite useful and reliable. In all the countries, GSM and GPRS networks have been realized, and have almost a nationwide coverage. A part from possibly very deep valleys, most of the sites is bound to have satisfactory mobile coverage. Since GPRS utilizes the TCP/IP Protocol, can be used anywhere where mobile coverage exist. GPRS networks provide moderate-speed data transfer, by using unused time division multiple access (TDMA) channels and is the best choice for National data communication. National stakeholders can access the data from the national database.

For cases which are not accessible by GPRS, Satellite telemetry should be used alongside one of the methods of DCP data reception through LRIT Direct Dissemination from the MSG station, GTS and Internet. In this case the Stations will support both GPRS and Satellite telemetry.

Regional Data transmission

Data transmission to the regional database will be through the satellite system. This means that the stations should be able to transmit to the satellite telemetry and also to the GPRS Modem at the same time. In this case, every station will be a Data Collection Platform and should be registered and assigned a DCP address and allocated a time slot by Eumetsat.

D. CAPACITY DEVELOPMENT AND TRAINING PROGRAMME

The existing situation in most IGAD-HYCOS member states reveal that there is a strong need to develop hydrological products that are of national and regional interest. This task requires well trained personnel within the NHSs, this can be attained through the implementation of a training program that aims at enhancing the skills of the personnel of the NHSs involved in various technical fields. In this regard the IGAD-HYCOS project will focus on training activities to strengthen the regional and national capacities for better management of their water resources and enhance their capabilities to provide quality hydrological data and information products.

It was realized that there is a need to carry out an assessment to NHSs institutional and technical capacities and their needs to develop a comprehensive training programme for enhancing the national and regional capabilities for better performance of the water sector. In addition to technical trainings to NHSs staff, institutional and management capacity building program is important. Specific training to strengthen the institutional and technical capacities of each NHS in participating countries is required. Most water related training institutes in the IGAD HYCOS member states are affiliated to government institutions. These institutes are either universities or national research centres. There are also regional training institutions, like the IGAD Climate Prediction and Application Centre (ICPAC).

To achieve the long term objectives of IGAD-HYCOS project and maintain skilled personnel at each of the NHSs that respond to the demands of national and regional water resources development needs, it is imperative to develop long term capacity building program based on country's priority for training. The output of this is a series of developed training syllabuses that respond to the national and regional NHSs demand. Improved regional cooperation to utilize the shared water resources and improved socio-economic status of the member states is the outcome.

Methodology adopted to assess country priorities for training was based on analysis of country's response to a questionnaire circulated to NHSs for this purpose, country consultations with NHSs staff and through information obtained from stakeholders workshops. Thus the identification of country priorities for training was based on Core Activities, Tools, and Application and Management.

The assessment of country training needs from IGAD-HYCOS member states are clustered for regional training as follows: The clustering was done based on priority order and the nature of courses that can be delivered together.

Regarding **CORE activities**, country demands are prioritized as:

1. Design and evaluation of hydrological networks. This need to be followed by training in installation, operation and maintenance of automatic stations, and also hydrological instruments including water quality devices upkeep and calibration
2. Standard data collection methodologies (including water quality and ground water monitoring). This need to be followed by data management (processing, storage, retrieval and dissemination), and safety measures in hydrometry.

Regarding the **use of TOOLS**, country demands are prioritized as:

- i. Hydrological modelling with emphasis on Rainfall-Runoff relationship. This topic is delivered together with a GIS training
- ii. Hydrological forecasting systems including Flood and Time series analysis

Regarding **applications and management** country priorities are summarized as:

- i. Water resources assessment. This need to be followed by Integrated Water Resources Management (IWRM) and irrigation and drainage.
- ii. Integrated Flood Management (IFM)

Apart from clustering the regional capacity development needs, there is a need to satisfy the national country training demands, even if it is not a priority for other member states. This information was obtained during country visits, information presented on the questioner, and through discussions with each of the national NHSs member.

Thus training programs in the following areas are considered important:

- i. Discharge measurement techniques for Uganda, Rwanda, Burundi, and South Sudan
- ii. Water quality monitoring and management for Ethiopia, Kenya and Rwanda
- iii. Hydropower and storage infrastructure for Rwanda. This training need was identified as crucial for Rwanda during the stakeholders meeting and country visit made to the country. The country is endowed with significant hydropower potential and so far not much has been done in the area of hydropower development and water storage infrastructure.
- iv. Groundwater monitoring and management for Djibouti, South Sudan and Ethiopia
- v. Transboundary water use and negotiation for Ethiopia

Specific Skills Required to IGAD-HYCOS Project Implementation

In addition to the basic training needs required by NHSs staff, the IGAD-HYCOS project requires specific skills for its successful implementation and sustainability. The skills required are:

- i. Installation, commissioning, operation, maintenance and trouble shooting of Data Collection Platforms (DCPs), including periodic recalibration
- ii. Use of Global Telecommunication System (GTS)
- iii. Development and management of hydrological data banks
- iv. Web sites development and internet technologies
- v. Marketing of hydrological products, water resources management, etc
- vi. On the job training for national experts seconded to the Pilot Regional Centre

Six regional and five national training modules were developed to respond to IGAD-HYCOS country demands in capacity development needs. While the regional training modules will be offered for all IGAD-HYCOS member states, the national training needs are specific to countries. Thus apart from the regional clustered training programs the specific demand of capacity development need for any of the member state was addressed in the national training syllabuses.

REGIONAL TRAINING MODULES

Module I: Hydrological Networks

Module II: Data and Data Management

Module III: Hydrological Modeling and GIS

Module IV: Forecasting Systems

Module V: Water Resources Systems: Planning and Management

Module VI: Integrated Flood Management (IFM)

NATIONAL TRAINING MODULES

Module I: Discharge Measurement Techniques

Module II: Water Quality Monitoring and Management

Module III: Hydropower, Storage Infrastructure and EIA

Module IV: Ground Water Monitoring and Management

Module V: Transboundary Waters Use and Negotiations

The training modules were prepared based on country training needs that also consider demand of hydrological products and water resources development plans. It is recommended to deliver the training modules in training institutions that were identified during country visits, information obtained from stakeholders meetings and in consultation with NHSs of the member states. List of identified training centres are available in Reference 4. The current training courses for IGAD-HYCOS capacity development programme are designed for different levels of expertise. The training courses, presented in this document, are designed for different levels of expertise. These range from technicians who work in the field to professionals and the people at the decision making level.

It is expected that the training programs required specifically for the IGAD-HYCOS project will be offered by the equipment supplier institution and the database developer. Hence it is important to indicate these requirements during the tendering process. It is expected that during the implementation of the capacity development training each country sends the right people who make an impact by the use of the training. More details on the training programme are presented in the Capacity development consultant's Report Reference 4.

UPDATED INFORMATION – PROJECT GOVERNANCE MECHANISM AND PARTNERS

The implementation phase, phase II of the project will be implemented by WMO through a PMU established at ICPAC in Nairobi, congruent with the Project Regional Centre (PRC) to be established at ICPAC. To ensure proper project management, it is necessary to define a number of institutions which will play a leading role in the project implementation, operation and maintenance.

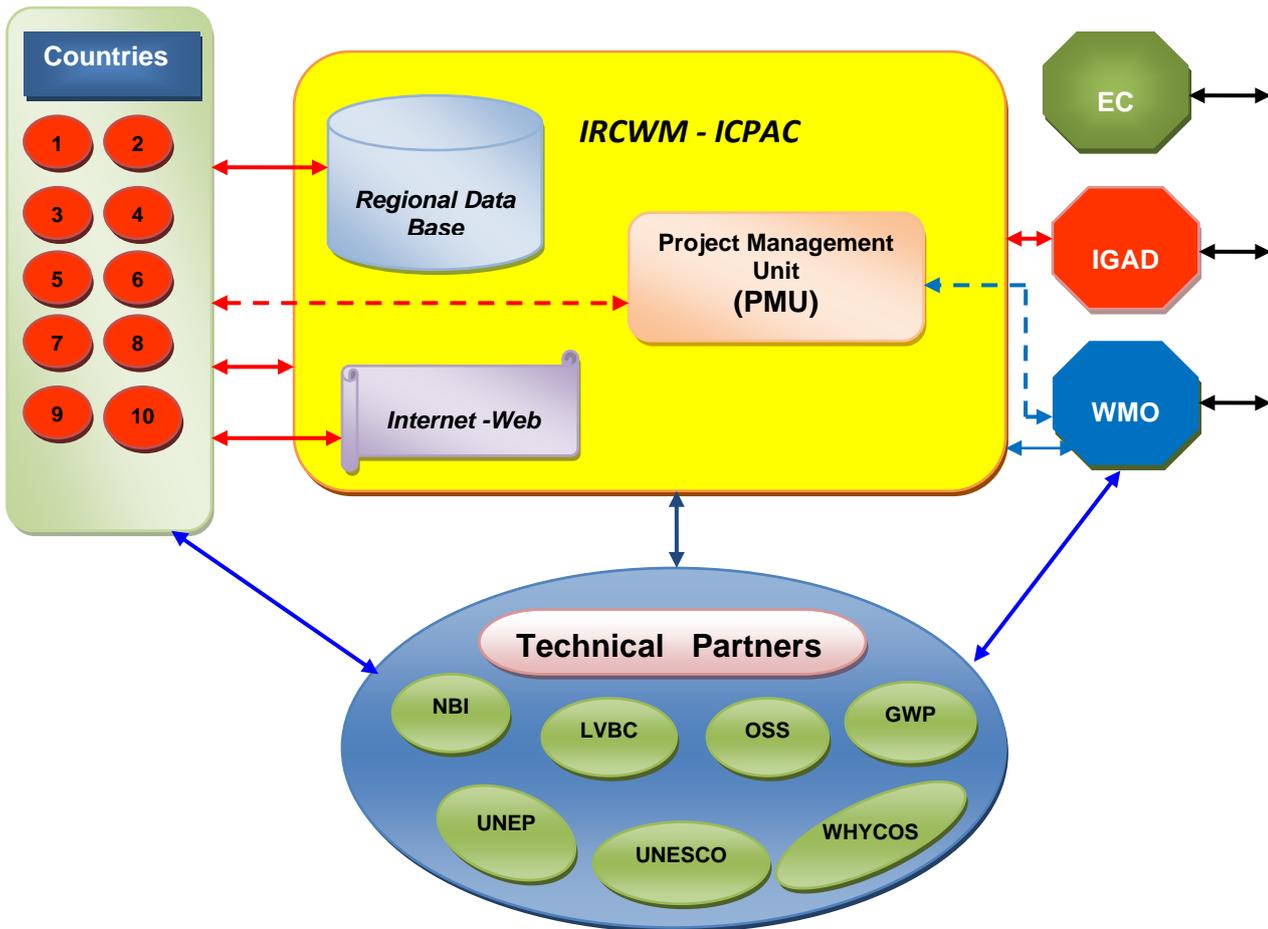


Figure 3: Project Management Structure

The Project Manager must develop the work programme in synergy with INWRMP and shall be endorsed by IGAD Secretariat, specifically by the Director of Agriculture and Environment through the Programme Manager for Natural Resources and Renewable Energy.

The final decision on the technical issues related to the project and approval of the work programme, within the project budget, will be taken by the Project Steering Committee (PSC). The activities during the implementation phase (phase II), will be undertaken by the Project Manager who will be assisted by technical experts engaged for specific specialised activities. The Project Manager will be answerable to the Programme Manager for Natural Resources and Renewable Energy of IGAD and the Director, Climate and Water Department of WMO. He will liaise with the Director of ICPAC on the on-going project activities. He will be provided with the financial and administrative support by the WMO Secretariat.

Realizing the important role of the Project Steering Committee (PSC) as the governing and steering body of the project, a special nomination form was designed and circulated to all participating countries during the preparatory phase. Each country was requested to nominate a senior officer at decision maker level to represent the country in the Steering Committee of the project as well as an alternate and also a senior technical officer as National Focal Point (NFP) to coordinate the project's activities in the country. Nine countries have nominated their Steering Committee member, as well as an alternate, and the National Focal Point. After the nomination process was completed, the PSC was constituted as the steering executive body of the Project.

The first Project Steering Committee meeting was organized in Nairobi, Kenya on 26 November 2011 to consider the progress on the implementation of the preparatory phase and the future work plan for the remaining period. They endorsed the SC ToR and agreed on its composition and the frequency of the meetings. Future PSC meetings should be planned jointly with the INWRMP Steering Committee meetings to ensure coordination and synergy among the two projects in INWRMP and to save time, energy and resources as most of the Steering Committee members will be the same for both projects.

PROJECT STEERING COMMITTEE – (PSC) TOR

- i. Monitor the progress of the implementation of the IGAD-HYCOS, through the review of the project progress reports, and guide the evaluation of the project implementation at its conclusion.
- ii. Identify and discuss strategies to facilitate the fulfilment of the project objectives during the implementation phase.
- iii. Approve the project implementation plan, annual workplan and budget and make suitable adjustments as and when called for.
- iv. Oversee the implementation of the project in accordance with the Contribution Agreement between WMO and the European Commission.
- v. Facilitate discussions and harmonisation amongst participating countries or partners related to the project.
- vi. Act as a communication channel between the participating countries, partners and other stakeholders.
- vii. Oversee project implementation such that it is aligned to overall WHYCOS objectives and guidelines.
- viii. Any other issue related to the implementation of IGAD-HYCOS, as appropriate.

PROJECT STEERING COMMITTEE - COMPOSTION

- i. One representative from each participating country **(10 members)**
- ii. One representative from the executing agency **(IGAD)**
- iii. One representative from the Implementing Agency **(WMO)**
- iv. One representative from the Donor **(EC)**
- v. One representative from Technical Partner **(ICPAC)**
- vi. The Project Manager **(Secretary)**

PROJECT STEERING COMMITTEE – MEETING FREQUENCY

The IGAD-HYCOS Project Steering Committee will meet at least once every twelve months and it will be chaired by IGAD Secretariat. Extraordinary meetings can be arranged subject to the Chairpersons agreement. Partners such as Nile Basin Initiative (NBI), Niger Basin Authority (NBA), GWP – Nile, Lake Victoria Basin Commission (LVBC), Africa Water Facility (AWF), UNESCO, UNEP, FAO....etc, may be invited to the SC meetings as observers.

UPDATED INFORMATION – PROJECT PARTNERS (ROLES AND RESPONSIBILITY)

The wide range of capabilities needed for the Project is likely to demand several partners to cooperate and collaborate in the implementation process to ensure successful implementation of the project. The SC members identified IGAD-HYCOS project main partners as IGAD Secretariat, WMO Secretariat, EC, PMU, ICPAC, NHSs and NMSs. Role and responsibility of each partner is defined as indicated in the following paragraphs.

NATIONAL HYDROLOGICAL SERVICES (NHSs) – NATIONAL IMPLEMENTING AGENCY

- ❖ Coordinate implementation activities at the national level with Project Management Unit (PMU).
- ❖ Carry out installation and other works required to implement national component of the project, with assistance where needed of the PRC & PMU and/or contractors.
- ❖ Validate raw hydrological data received at the National Data Centre and provide quality data to RDB at the PRC.
- ❖ Provide appropriately qualified staff to participate in Project activities, as required.
- ❖ Continue to identify the user's data needs by organising national workshops.
- ❖ Disseminate data and information to users, and to the Project Regional Centre.
- ❖ Manage and maintain the monitoring of the hydrological Network established by IGAD-HYCOS.
- ❖ Provide information about the Project to national interests and the public.

NATIONAL METEOROLOGICAL SERVICES (NMSs) - Major Partner

- ❖ Coordinate implementation activities at the national level with NHS.
- ❖ Support and strengthen links between WMO and NHS and PMU.
- ❖ Facilitate the use of WMO – GTS and the WIS for the project data transmission As required.
- ❖ Validate any required raw data before sending it to the National Data Centre and provide quality data to RDB at the PRC.
- ❖ Assist in disseminating data and information to users.
- ❖ Promote the Project among public at national level.

IGAD SECRETARIAT– EXECUTING AGENCY

- ❖ Facilitate the interaction between INWRMP and IGAD-HYCOS products.
- ❖ Promote and encourage cooperation among participating countries at political level and develop a framework for data exchange.
- ❖ Facilitate and support the IGAD Climate Prediction and Application Centre (ICPAC) to carry out duties of Project Regional Centre.
- ❖ Collaborate and cooperate with WMO for resource mobilization and to ensure successful implementation of IGAD-HYCOS.
- ❖ Promote IGAD-HYCOS in all IGAD forums to obtain political support at the highest level.
- ❖ Ensure that all IGAD – HYCOS documents are in line with all IGAD water related programmes/projects and cleared by IGAD Secretariat before WMO submission to the EC.
- ❖ Monitor the implementation plan to ensure that it is being carried out according to the agreed time frame.

WMO SECRETARIAT – IMPLEMENTING_AGENCY

- ❖ Monitor, supervise and support the PMU to ensure successful implementation and quality management of IGAD-HYCOS Project.
- ❖ Facilitate technical aspects of Project to ensure that implementation process is in accordance with WHYCOS Guidelines.
- ❖ Provide technical support to the PRC and PMU.
- ❖ Provide links with the meteorological community (NMS and EUMETSAT) to facilitate use of GMS satellite and exchange of data through the GTS and Internet
- ❖ Monitor, supervise, evaluate and support the Project, through regular missions and participation in the Project Steering Committee meetings.
- ❖ Support sustainability of IGAD-HYCOS in the post project stage.
- ❖ Ensure links with other HYCOS Components

IGAD CLIMATE PREDICTION AND APPLICATION CENTRE (ICPAC) - PROJECT REGIONAL CENTER

- ❖ ICPAC is the IGAD focal point for the project in Nairobi and will participate in the planning and implementation of the Capacity Development Programme.
- ❖ Participate in the selection process of the experts to perform various tasks.
- ❖ Manage regional database and associated functions (data dissemination etc.).
- ❖ Support regional, technical and scientific activities in the fields of water resources assessment, monitoring and management among participating countries.
- ❖ Provide a forum for exchange of expertise and knowledge.
- ❖ Support the development and operation of the Information System.
- ❖ Support the development and maintenance of the web-site of the IGAD-HYCOS.

PROJECT MANAGEMENT UNIT - PMU

- ❖ Assist participating countries to develop suitable and an appropriate Hydrometeorological Network and Hydrological Information System.
- ❖ Identify and establish the telecommunication system for data transfer.
- ❖ Preparation and evaluation of tenders for equipment and services.
- ❖ Monitor and provide support to maintain the IGAD-HYCOS network.
- ❖ Develop hydrological products according to the countries needs.
- ❖ Develop and support training programme for capacity building at national and regional level.
- ❖ Develop and maintain a regional and national hydrological information systems.
- ❖ Organize regional meetings and workshops and support such events at national level.
- ❖ Prepare progress reports for consideration by Steering Committee (SC).
- ❖ Prepare annual workplan and related budget for approval by the SC.

FINANCIAL PARTNERS (EC)

- ❖ Provide financial support to the project.
- ❖ Provide financial guidance and supervision to the Project Implementing

Agency and PMU.

- ❖ Ensure that expenditure and tendering procedures of the project are carried out according to rules and financial regulations of the donor agency.
- ❖ Assist in mobilizing additional funds in support of the programme.

TECHNICAL PARTNERS (NBI, NBA, UNESCO, GWP,)

- ❖ Provide technical support and guidance to the Project Management Unit (PMU).
- ❖ Support technology transfer among participating countries and PRC.
- ❖ Assist with project implementation through the introduction and monitoring of standard operating procedures and capacity building.
- ❖ Assist with the identification and development of hydrological products to meet specific national and regional needs.

OUTPUT AND EXPECTED RESULTS

As a result of the implementation of Phase II, it is expected to have in place a strong and powerful tool to help and assist participating countries in their socio-economic development plans. A Regional Water Information System will be operational and supported by a modern Regional and National Databases. The expected results of the implementation phase (Phase II) and associated outputs are:

ER 1. A Functional Regional Centre - (IGAD Regional Centre for Water Management - IRCWM)

Methodology

The PMU is a temporary body established for the purpose of implementing the Project activities. It is expected to be converted or renamed after handing over the responsibility of the project operation and maintenance to the countries, to be a Regional Centre responsible for maintain the Regional database, IGAD-HYCOS web page and providing technical assistance to the countries in water related issues.

To ensure appropriate functionality of the PMU, three Technical Experts in different fields will be appointed for different periods. A Hydrologist will be appointed for a period of thirty months (30) to assist the Project Manager (PM) in Hydrological issues related to the Project. An IT and Database expert will be appointed for a period of twenty four months (24) to help and assist in the establishment and operating the Regional and National Databases. A Field Hydrologist will be hired for a period of sixteen months (16) to help and assist NHSs in the installation and testing the monitoring Hydrological Network. The three technical experts under the supervision of the Project Manager will support the establishment of the Regional and National Hydrological Networks and Databases. They will directly report to the Project Manager.

The appointed PM will continue to be responsible for facilitating the activities to be carried out during the implementation phase (Phase II) and support all necessary logistics for smooth running of the PMU. The PM will continue to be responsible for coordinating all the activities under Phase II; coordinating with various experts recruited for carrying out specific tasks; communicating with all identified and potential partners and communicating with the stakeholders of the project. The PM will report to the Chief of Basic System in Hydrology

Division in WMO who will liaise with other units (procurement, finance, administration) within the WMO Secretariat.

The appointed secretary, who is at the same time a technical assistant to the PM will continue to take care of day to day office work and to assist the PM in carrying out his duties. The appointed Driver of the project will also continue to facilitating the staff/visitors movements and meeting the transportation needs of the PMU. The PMU will work closely with ICPAC.

Output

- The IGAD Regional Centre for Water Management will take over all equipment and the responsibility of the Project Management Unit (PMU) after being well established and fully operational.

ER 2. A modern and relevant Hydrological monitoring Network is established in The IGAD countries.

Methodology

The goal of the activities under this expected result (2) is to modernize, upgrade, rehabilitate or installs new stations in the IGAD countries to be able to provide high quality data in real or near-real time. In accordance to WMO and EC procurement rules and regulations, tender documents with the technical specification will be finalized and advertised for supplying hydrological equipments including DCPs according to the countries priorities.

The supplier will deliver and assist in the installation of the DCPs in the participating countries. The NHSs will carry the necessary civil work required for the installation. The supplier will train the national staff in the installation, operation and maintenance. The project will provide limited financial assistance to the countries to contribute to the cost of the civil work. The type of hydrological equipment and DCPs will be provided to the countries according to their priority and the allocated fund.

Communication system, suitable to the region and based on the available telecommunication facilities/systems in the countries (access to WMO Information System (WIS), extent of cellular telephone networks, etc) and their suitability to respond to data transmission requirements (e.g. minimizing the disruption to data flow in case of extreme events, etc.) would be considered in identifying the specific equipments and DCPs for each country.

Output

- A modern and reliable hydrological monitoring network is established as a major component in the Water Information System in IGAD countries.
- NHSs staffs are trained in installation, operation and maintenance of DCPs.
- High quality data are produced in real – time or near real time from IGAD-HYCOS stations.

ER 3. A Regional and National Databases are developed / enhanced

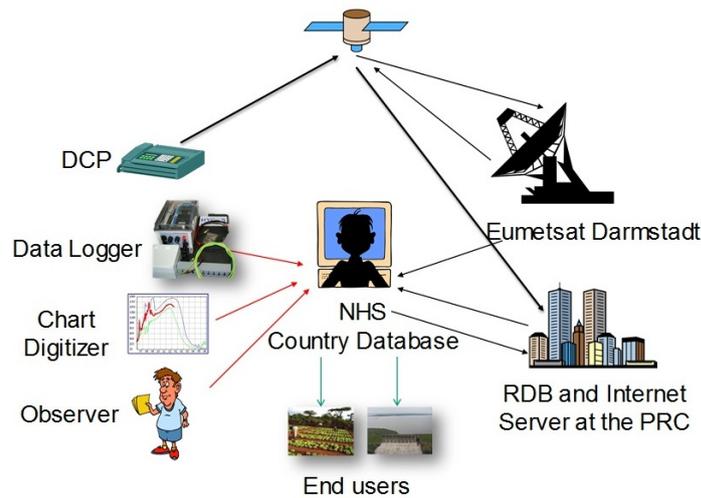


Figure 4: Data Flow

Methodology

A Regional Water Information system as a powerful tool will require a modern database capable of efficiently receive, analyze, archive and process the collected data from the DCPs. Under this expected result (3), activities will focus on developing regional Database and enhancing the existing National Databases in the countries. A Memorandum of Understanding between the NHSs and the Regional Database will be developed to agree on the modality of data sharing and exchange from the IGAD-HYCOS stations.

In accordance to WMO and EC procurement rules and regulations, tender documents with the technical specification will be finalized and advertised for supplying the most reliable, suitable and compatible system to receive, archive, analyze and process data received from DCPs and produce useful hydrological products. NHSs staff will be trained in operating the new system. A qualified staff will be also trained to operate and maintain the System at regional level.

Output

- A Regional Database developed and operational
- National Databases are improved and strengthened
- Data flow smoothly from DCPs to Regional/National Databases
- NHSs Staff trained on operating and managing their databases.
- Useful Hydrological products are available and disseminated.
- A Memorandum of Understanding between the NHSs and the Regional Database is signed

ER 4. IGAD-HYCOS web page is developed and on line

Methodology

IGAD-HYCOS web page is very important tool for exchanging and sharing information among experts in IGAD-HYCOS participating countries. It is also very important element in designing

the database. The IT experts with the assistance of web page experts will design a web page and in it will be linked to other HYCOS web pages and available in the internet to the public with limited access to certain information.

Outputs

IGAD-HYCOS web page available in the internet

<p>ER 5. Hydrological tools for strengthening Regional and National capabilities in Water Resources Management.</p>
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Methodology

Developing hydrological products that are of national and regional interest, requires well trained personnel within the NHSs, this can be attained through the implementation of a training program that aimed at enhancing the skills of the personnel of the NHSs involved in various technical fields. In this regard the IGAD-HYCOS project will focus in training activities to strengthen the regional and national capacities for better management of their water resources and enhance their capabilities to provide quality hydrological data and information products.

Activities under this expected result (4) will focus on implementing the proposed Capacity Development programme prepared during the preparatory phase. According to country's priorities, trainings will be based on Core Activities, Tools, and Application and Management.

Six regional and five national training modules will be conducted to respond to IGAD-HYCOS country demands in capacity development needs. While the regional training modules will be offered for all IGAD-HYCOS member states, the national training needs are specific to countries. Thus apart from the regional clustered training programs the specific demand of capacity development need for any of the member state was addressed in the national training syllabuses.

The training sessions will be organized in collaboration with Regional and National recommended training centres. The training courses will be provided to different levels of expertise. These range from technicians who work in the field to the people at the decision making level.

Outputs

- NHSs capability enhanced and their performance improved.
- Decision Makers well informed on the value of hydrological data and the role of NHSs in supporting sustainable development plans

<p>ER 6. Monitoring and Evaluation for Project implementation.</p>

Methodology

Partners of IGAD-HYCOS will be engaged to monitor the progress and solve obstacles facing the implementation process. The Steering Committee (SC) is constituted as the top governing body of

the project which will meet once or twice a year to consider and approve technical reports, progress reports, annual work plan and budget. The Project Manager will submit quarterly progress reports on project implementation and operation, budgetary application and budgetary status to WMO and the IGAD Secretariat. These reports will be tabled for discussion and approval by the PSC. It is the prerogative of WMO and/or the IGAD Secretariat and/or the PSC and/or the EC to request specific information or interim reports on any aspect during the life cycle of the project. An independent expert (or experts) will undertake an evaluation of the IGAD-HYCOS project at the end of the project.

Outputs

- Quarterly progress reports prepared by the Project Manager
- Steering Committee meetings organized
- Final Evaluation Report prepared by independent Consultant.

THE PROPOSED ACTIVITIES

The proposed activities can be classified under six main components:

Component 1: Establishing the IGAD Regional Centre for Water Management (IRCWM)

Component 2: Establishment of IGAD – HYCOS monitoring Network

Component 3: Development Regional Database and enhancing the National Databases

Component 4: Development of IGAD – HYCOS Web page

Component 5: Strengthen Regional and National capabilities for Water Resources Management

Component 6: Monitoring and Evaluation

Under each component, a number of activities will be carried out as detailed below.

COMPONENT 1: ESTABLISHING THE IGAD REGIONAL CENTRE FOR WATER MANAGEMENT (IRCWM)

Activity 1.1 Finalize the office renovation and furniture

The PM will ensure that all the office renovation work is completed and the required furniture has been delivered. This activity will help to develop good work environment and motivate the staff to deliver quality work.

Activity 1.2 Appointment of Hydrologist

A Hydrologist will be appointed for a period of thirty months (30) to assist the Project Manager (PM) in Hydrological issues related to the Project. His appointment will be according to WMO financial and administrative rules and regulations. He will work under the supervision of the Project Manager and report directly to him.

Activity 1.3 Appointment of Field Hydrologist

A Field Hydrologist will be hired for a period of sixteen months (16) to help and assist NHSs in the installation and testing the monitoring Hydrological Network. His appointment will be according to WMO

financial and administrative rules and regulations. He will work under the supervision of the Project Manager and report directly to him.

Activity 1.4 Appointment of IT and database expert

An IT and Database expert will be appointed for a period of twenty four months (24) to help and assist in the establishment and operating the Regional and National Databases. His appointment will be according to WMO financial and administrative rules and regulations. He will work under the supervision of the Project Manager and report directly to him.

Activity 1.5 Technical works start to ensure smooth operation

The Project Manager in collaboration with the technical experts will continue provide support to national experts to ensure smooth running and handing over of IRCWM to IGAD.

COMPONENT 2: ESTABLISHMENT OF IGAD – HYCOS MONITORING NETWORK

Activity 2.1: Call for Tenders

The Project Manager in collaboration with the NFP in each country will finalize the technical specifications of the equipment and agree on the type of the DCP to be installed. According to WMO financial and procurement rules, WMO will advertise a tender for supplying the required equipments and instruments. The successful tenderer will be invited to supply the equipment to the countries and to assist in the equipment installation and training of NHSs staff on the operational procedures.

Activity 2.2: Construction of civil work for housing the equipment

Each NFP will be requested to prepare the selected sites for the installation of the equipment and to carry out the necessary required civil work. The Hydrologist and Field Hydrologist will help and assist the countries in the installation work. Each participating country will receive limited amount from the project budget to cover part of the cost of the civil works.

Activity 2.3: Regional Workshop on the installation and maintenance of Equipment

Prior to the installation of the equipment a Regional Workshop on the installation and maintenance of equipment will be organized to familiarize the national experts with the nature of work to be done and train them in solving the common problems which they may face.

Activity 2.4: Delivery and installation of Equipment

The supplier will deliver the equipment for each country through the UNDP offices. The NFP will be working with a local clearing agency to release the items duty free using UNDP facilities. Once the items are released and transported to the site, the NFP will make the necessary arrangements with supplier and the Field Hydrologist for installing, testing and training the staff on the operation procedures.

Activity 2.5: *Collecting hydrological data*

The National Hydrological Services will start testing the installed equipment and make any required adjustment to ensure smooth running of the network. They will start receiving and validating the data at NHS in order to be forwarded to RDB.

COMPONENT 3: DEVELOPMENT REGIONAL DATABASE AND ENHANCING THE NATIONAL DATABASES

Activity 3.1: *Call for Tenders*

Project Manager will finalize the technical specifications of the Database Management System to be used in the Regional Database and the ones to be used for the National Databases. According to WMO financial and procurement rules, a call for tender will advertise for developing the required databases. The successful applicant will be invited to develop the Regional Database and enhance the National Databases.

Activity 3.2: *Development of Regional Database*

The Database Developer in close collaboration with IT expert will make an assessment for the hardware required to develop and install the new system. The identified server and computers will be provided to allow the installation of the system. After installation the system will be tested for smooth operation. We will need a tender process for the supply of the IT equipment as well.

Activity 3.3: *Enhancement and strengthen National Database*

The Database Developer in close collaboration with IT expert and NFP will make the necessary arrangements for installing the suitable system in each country. Each NFP will be requested to prepare the required server and computers for the installation process. The project will cover the cost of purchasing the computers and server.

Activity 3.4: *Preparation of inventory of historical data*

An inventory of historical data will be prepared for inclusion in the regional database.

Activity 3.5: *Regional Workshop on Database Management systems*

Prior to the installation of the system a Regional Workshop on the installation, operation and maintenance of database systems will be organized to familiarize the national experts with the nature of the new system and train them in solving the common problems which they may face.

Activity 3.5: *Process and produce hydrological products*

The Regional and National Database experts will start processing the received data. They will calibrate the system to ensure that the selected system is capable of producing the required hydrological products.

COMPONENT 4: DEVELOPMENT OF IGAD – HYCOS WEB PAGE

Activity 4.1: *Identifying a consultant for web page design*

A special expert on web page design will be selected to design and construct a special web page for IGAD-HYCOS.

Activity 4.2: *Development and testing the designed IGAD-HYCOS web page*

The IT expert will work closely with the web page consultant to develop a suitable web page according to the requirements and needs of IGAD-HYCOS. The web page will be tested and linked to other related sites.

Activity 4.3: *Regional Workshop on web page management*

A short training course on web page management and maintenance will be conducted with Regional Workshop on the database systems, to familiarize the national experts with the newly developed web page and train them in solving the common problems which they may face.

Activity 4.4: *Publish online hydrological information and bulletins*

The Regional and National experts on web-page management will start putting on line all the hydrological products produced by the IGAD-HYCOS and other regional and national projects. They will issue also regular regional and national bulletin on the water issues in the region.

COMPONENT 5: STRENGTHEN REGIONAL AND NATIONAL CAPABILITIES FOR WATER RESOURCES MANAGEMENT

Activity 5.1: *Regional Training Workshops (ToT)*

Six regional training modules will be organized to respond to IGAD-HYCOS country demands in capacity development needs. The training will be conducted as training of trainers. It will be offered for all IGAD-HYCOS member states and it will be implemented in collaboration with regional and national research and academic institutions. The trained participants will be facilitating and conducting similar workshops at the National level.

Activity 5.1.1: *Regional Training Workshop on Hydrological Networks*

This Training course will address issues related to design and evaluation of hydrological networks, installation, operation and maintenance of automatic stations, and also hydrological instruments including water quality devices upkeep and calibration.

Activity 5.1.2: *Regional Training Workshop on Data Management*

This Training course will address issues related to standard data collection methodologies (including water quality and ground water monitoring). It will be followed by data management (processing, storage, retrieval and dissemination), and safety measures in hydrometry.

Activity 5.1.3: *Regional Training Workshop on Hydrological Modeling and GIS*

This Training will be introductory course in Hydrological modelling with emphasis on Rainfall-Runoff relationship. This topic will be presented together with a GIS training

Activity 5.1.4: *Regional Training Workshop on Hydrological Forecasting*

This Training course will address issues related to Hydrological forecasting systems including Flood Forecasting and Time series analysis.

Activity 5.1.5: Regional Training Workshop on Water Resources Planning and Management

This Training course will focus on Water resources assessment followed by Integrated Water Resources Management (IWRM) including requirements for irrigation and drainage.

Activity 5.1.6: Regional Training Workshop on Integrated Flood Management (IFM)

This Training course will address flood issues and introduce the Integrated Flood Management (IFM) Concept which allows people to adopt their life for living with floods by minimizing the negative impact and maximizing the flood benefits.

Activity 5.2: National Training Workshops

Apart from the regional capacity development needs, there is a need to satisfy the national country training demands, even if it is not a priority for other member states. Five national training modules will be organized to respond to IGAD-HYCOS country demands in capacity development needs.

Activity 5.2.1: National Training Workshop on Discharge Measurement Techniques

This training workshop will be organized to train NHSs Technicians in **Uganda, Rwanda, Burundi, and South Sudan** to enhance their capacity in the field work.

Activity 5.2.2: National Training Workshop on Water Quality Monitoring and Management

This training workshop will be organized to train NHSs staff in **Ethiopia, Kenya and Rwanda** to address Water Quality issues and enhance their capacity in monitoring and management.

Activity 5.2.3: National Training Workshop on Hydropower, Storage Infrastructure and EIA

This training workshop will be organized to train professionals in NHSs in **Rwanda** to enhance their capacity to respond to the water demands from the major stakeholder with focus on Hydropower and Storage Infrastructures.

Activity 5.2.4: National Training Workshop on Groundwater Monitoring and Management.

This training workshop will be organized to train NHSs staff in **All Participating countries** except **Uganda** to address Water Quality issues and enhance their capacity in monitoring and management.

Activity 5.2.5: National Training Workshop on Transboundary Waters Use and Negotiations

This training workshop will be organized to train professionals in NHSs in **all countries** to enhance their capacity to address Transboundary water issues and strengthening regional cooperation.

COMPONENT 6: MONITORING AND EVALUATION

Activity 6.1: Preparation of quarterly progress reports

The Project manager will prepare every three months a progress report on project implementation and operation, budgetary application and budgetary status. The reports will be submitted to WMO and the IGAD

Secretariat. These reports will be tabled for discussion and approval by the PSC. WMO and/or the IGAD Secretariat and/or the PSC and/or the EC may request specific information or interim reports on any aspect during the life cycle of the project.

Activity 6.2: *Organizing the Steering Committee meetings*

The Steering Committee members will meet once a year to evaluate the project progress and to consider and approve technical reports, progress reports, annual work plan and the yearly budget. The project manager with the support of the PMU staff and the host institute will make all necessary logistic arrangements. He will prepare all the background and working documents including the agenda and any draft for proposed resolutions.

Activity 6.3: *Project Evaluation.*

Six months before the end of the project an independent consultant, with clear specific TOR will be appointed to prepare a comprehensive report on the project implementation. He will evaluate the achievements against the expected results and identify problems effected the implementation process. He will summarise the success and lessons learned. He will give his recommendation for the way forward.

DURATION AND INDICATIVE ACTION PLAN FOR IMPLEMENTATION OF THE ACTION

The Revised Project Document forms the implementation of Phase II of the IGAD-HYCOS Project and has a completion date of 27 March 2015. The work plan with the phasing of various activities is indicated in Annex 1.

SUSTAINABILITY

The ownership of the project lies with the countries. The long-term sustainability of a HYCOS component, once external funding ends, is considered a prerequisite and should be addressed right from the project development stage to the preparatory phase and subsequently to the implementation phase of the project. Long-term sustainability of the project would depend on:

1. The commitment of the countries;
2. The robustness of the project elements; and
3. The capacity of the country to absorb and maintain the technology.

The commitment of the countries to continue supporting the participation of their NHSs in the day-to-day activities of the IGAD-HYCOS project implementation is essential. They need to ensure that the activities such as data collection, operation and maintenance of the network, quality control and primary processing of data, database updating, preparation of products, dissemination of data and information, etc., must continue even after the implementation of phase II is completed.

This commitment would be demonstrated through the establishment of MoUs between the IGAD Regional Centre for Water Management (IRCWM) and the NHSs of the participating countries to commit themselves to sustain the project in the medium and long term by including it in their national programs. In return, the IRCWM must provide the countries with

access to high quality regional information truly relevant at national level. This includes the status and trends of water resources along international waterways, timely information on floods, droughts, accidental pollution, etc. At the same time a commitment from the IGAD Secretariat and the IRCWM would be required and obtained through MoU between WMO, IGAD and IRCWM.

In addition, it is important to choose the right types of instruments and technology for the IGAD-HYCOS which can withstand adverse extreme weather conditions in the participating countries. The technology used in the instruments should be such that it can be maintained in the long term by the countries. These issues has been considered during the preparation of the technical specifications of the equipments and it will be also consider when making final decisions on the choice of the instruments deployed in the project. Efforts would be made to ensure that instruments using the same technology as those already being used in the country (unless obsolete or outdated) are used. This would enable countries to obtain spare parts and keep expertise available for the smooth functioning and maintenance of the instruments and equipments procured under the project in the long term.

THE LOGICAL FRAMEWORK

The logical framework for the IGAD-HYCOS Implementation phase (Phase II) is provided in Annex 2.

THE BUDGET

A summary of the budget is shown below and the detailed budget is provided in Annex 3.

Summary Budget with Task/Activity Percentages

Task/Activity	Allocated budget (€)	% of total Budget	1st Period	2 nd Period	3rd Period
A. Hydrological Instrumentation for NHS	1,271,744.00	33	1,271,744.00	-----	-----
B. ICT, Transport and Civil Works Budgets for Member States NHS.	560,000.00	14.5	430,000.00	130,000.00	-----
C. Database Management Systems and the web sites	340,200.00	8.8	235,200.00	95,000	10,000.00
D. Strengthening Institutional Capacity of NHS	80,000	2.1	30,000	30,000.00	20,000.00
E. Project Management Unit (PMU)	1,130,500.00	29	313,500.00	487,000.00	330,000.00
F. Project Monitoring and Evaluation	123,100.00	3.2	25,000.00	60,100.00	38,000.00
Contingencies	89,756.00	2.4	49,800.00	20,000	19,956.00
WMO SCA Fee 7% of eligible costs	251,700.00	6.6	164,900.00	57,547.00	29,253.00
Grand Total	3,847,000.00	100.00	2,520,144.00	879,647.00	447,209.00

RISK ANALYSIS AND ASSUMPTIONS

ASSUMPTIONS

- a. An efficient monitoring Network capturing and providing quality data
- b. Data is transmitted through a telemetry system in real or nearly real time.
- c. Regional and National databases are operating and producing useful hydrological products.
- d. Products and Information are disseminated to the various stakeholders.
- e. Free exchange of hydrological data and information between participating Member States.
- f. Staff of NHS are well trained and their performance is improved
- g. IGAD-HYCOS is interacting and exchange information with other regional programmes
- h. NHS make available for training relevant qualified and committed personnel.

RISKS

- a. Hydrological equipment including DCP's are inadequately installed by NHS
- b. Constructions of the civil work for the Stations delayed or poorly carried-out
- c. The Regional and National Databases are not functioning properly.
- d. Equipment is put at risk to vandalism/theft.
- e. Delay in signing the CA between WMO and EC disrupt the implementation logic of the project activities and threaten the effectiveness of the PMU.
- f. Absent of commitments from countries to sustain the project.
- g. Political instability halts the exchange of information and collaboration between Member States.
- h. Absent of relatively qualified staff from NHS in the Training workshops.

MEASURES

- a. Suppliers will be responsible for the installation of equipments and providing short on job training sessions.
- b. Limited fund will be provided to NHSs to cover the cost of civil work for the stations.
- c. Regional and National Databases will be developed on user friendly principals and sufficient training to NHS will be provided.
- d. Experiences from other HYCOS projects will be considered with other protection measures to avoid vandalism.
- e. All proposed agreements and MoU will be drafted and available as scheduled.
- f. Countries will be encouraged to sign the letter of commitments and related MoU.
- g. Participant's CV for training workshop will be requested to identify the suitable trainee.
- h. Promote the technical aspects of the project to drive away from political disputes and strengthen regional cooperation

PERFORMANCE INDICATORS AND OVERALL PROJECT PROGRESS ASSESSMENT

The PMU will develop a practical implementation plan in collaboration with the participating countries for the installation of equipment. It is important to recognize that the installation of equipment should not be the major thrust of the project. It should be completed by due dates as agreed, keeping in mind that the target for full installation of equipment should be within the first year after start of the project.

After successful installation, both the participating countries and the PMU will have joint responsibility for detecting malfunctioning equipment, identification of data with questionable quality and systems not functioning properly (RDB, web site, hydrological products, etc).

PROJECT EVALUATION

The Project Manager will submit quarterly progress reports on project implementation and operation, budgetary application and budgetary status to WMO and the IGAD Secretariat. These reports will be tabled for discussion and approval by the PSC.

It is the prerogative of WMO and/or the IGAD Secretariat and/or the PSC and/or the ESA to request specific information or interim reports on any aspect during the life cycle of the project.

An independent expert (or experts) will undertake an evaluation of the IGAD-HYCOS project at the end of the project.