

Nile Basin Initiative (NBI)
Eastern Nile Technical Regional Office (ENTRO)
Nile Cooperation for Result Project (NCORE)

Eastern Nile Knowledge Base Enhancement

Knowledge Management Expert

1. BACKGROUND

The NBI, ENSAP and ENTRO

The Nile Basin Initiative (NBI) is an intergovernmental partnership of the ten Nile Basin states sharing the Nile (Burundi, D.R. Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania and Uganda). The NBI was established to develop the river cooperatively; reduce poverty and environmental degradation; share substantial socio-economic benefits, and promote regional peace and security. The NBI is guided by a Shared Vision which envisages achieving *“sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources”*.

NBI member countries launched a Strategic Action Program with two sub-programs: the basin-wide Shared Vision Program (SVP) that aimed at building confidence, capacity and knowledge base (now phased out), and two Subsidiary Action Programs: The Eastern Nile Subsidiary Action Program (ENSAP) and the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) that initiate concrete joint investments and action on the ground at sub-basin levels.

The Eastern Nile Subsidiary Action Program (ENSAP) of the NBI was launched by Egypt, Ethiopia and the Sudan (with South Sudan joining in 2012) to initiate concrete joint investments and action on the ground in the Eastern Nile sub-basin in the areas of power generation and interconnection, irrigation and drainage, flood preparedness and early warning, watershed management, development of planning models and joint multipurpose programs. ENSAP is governed by the Eastern Nile Council of Ministers (ENCOM) assisted by ENSAP Team (ENSAPT); and implemented by the Eastern Nile Technical Regional Office (ENTRO), based in Addis Ababa, Ethiopia. ENSAP receives its funding from the Eastern Nile countries and also from a range of bilateral and multilateral development partners.

The Integrated Development of the Eastern Nile (IDEN) was the first ENSAP project, agreed in 2002, with an initial set of seven sub-projects aimed at tangible win-win gains in the areas of watershed management, flood preparedness, early warning and response, irrigation and drainage, power supply interconnection and regional power trade and later the Joint Multipurpose Program [JMP]. Some of these projects preparations have been successfully completed, and are advancing towards implementation.

The Nile Cooperation for Results (NCORE) Project is the first phase of the Nile Basin Climate Resilient Growth Program and is part of the 5-year NBI Strategic Plan. As part of implementation of the projects identified in the Strategic Plan, NBI applied for funding from the Nile Basin Trust Fund (NBTF)/Cooperation in International Waters in Africa (CIWA) to support the three NBI centers – the Nile-SEC, the NELSAP Coordination Unit (NELSAP-CU) and ENTRO.

With a development objective to “facilitate cooperative water resource management and development within the Nile Basin,” NCORE supporting the three NBI centers (Nile-SEC, NELSAP-CU and ENTRO). As part of this CIWA fund; ENTRO received support to conduct component (3) which consists of two sub-components:

- **Sub-component 3(a):** Strengthening the knowledge base and analytical framework for Eastern Nile water resources planning and management, and
- **Sub-component 3(b):** Promoting sustainable development and growth in the Eastern Nile

NCORE project started since January 2013 delivered various studies that includes Multi Sectoral investment analysis, Climate change, dam safety, water diplomacy, young professional program, etc ...which generated lots of knowledge and information products. Thus this project will promote enhance the knowledge base and link with other NBI centers by organizing , package and create a system to disseminate these data, information and KPs to a wider users.

2. RATIONALE

Currently the NBI, including ENTRO, lacks institutional and infrastructure capacity to integrate all information and knowledge product in a holistic system which allow receive, archive, process and disseminate to a wider public user. Despite the fact that all NBI centers, including ENTRO, made tremendous effort in collecting, generating and developing various types of information and knowledge products, the existing NBI databases are not in a way that users can easily search and access, and the databases cannot be linked to the other NBI centers. Thus, the existing databases needs enhancement to include all spatial, non-spatial datasets and information generated under ENSAP and NCORE projects, better linkage with the other NBI centers and a user friendly portal interface that allow easy access.

3. Objective

The main objective of this consultancy assignment is to advance access of NBI information and knowledge products to present in a unified format through an NBI wide integrated knowledge portal (IKP). The IKP will serve as a gateway to access relevant NBI thematic knowledge products. The specific objective includes;

- To establish easily accessible and searchable database unified format and linked for all NBI centers and linked to website/portal that is linked to the NBI centers

- To ensure access to agree upon data sets that will provide a more reliable information for future water resource development and management decisions
- To ensure real time data, knowledge product, and information access to wider users
- To update the ENTRO web-portal/website to be linked with other centers and facilitate access to the new database and knowledge products
- To ensure NBI/ENTRO's institutional viability through innovations, knowledge creation and knowledge sharing
- To integrate the data and knowledge to Nile Basin DSS (NB-DSS) that will strength a data and information exchange process in the Nile Basin
- To strength the capacity of Eastern Nile countries on the tools and knowledge product and their use for planning purpose

4. Scope of Work

The scope of the study may be divided into four Tasks. These Tasks are listed as follows and further elaborated in the subsequent sections:

Task 1: Need Assessment and Requirement Gathering

Task 2: System Design

Task 3: Implementation

Task 4: Capacity Building

The activities under these Tasks are as described in the KME TOR and the Consultant is expected to contribute the related deliverables under each of the Tasks.

4.1 Task 1: Need Assessment and Requirement Gathering:

The consultant will work with key team members and knowledge management (KM) working group at ENTRO and the NBI centers to ensure that the need assessment and requirements are accurately and completely captured. The requirements for the system design will be checked with the functions of the different NBI centers and its stakeholders. The activities under task 1 include;

- Lead and coordinate the review and assessment of existing knowledge base system at ENTRO with other team members and identify gaps.
- In collaboration with ENTRO staff and other team members:
 - Identify and classify different knowledge products organized into project based knowledge bases and other sources
 - Assess and review different water resource models, EN Tool Kits, other knowledge products
- Identify global and regional spatial and non-spatial datasets in a public domain which are important for water resources planning and development.
- Lead and coordinate need assessment and requirement gathering as specified in the terms of reference for Eastern Nile Knowledge Base Enhancement such as;

- Requirement gathering for broad access to any knowledge/information resources that users require including documents, spreadsheets, charts, spatial and non-spatial data, multimedia files and live feeds. The requirements are gathered for the ability to access and read such knowledge resources including;
 - Spatial and non-spatial data
 - Document/content management systems (website, web portal, Nile IS, e-library etc.)
 - interactive web-mapping applications (commercial and open source providers),
 - Social networking applications,
 - Web based help desk system and community of practice portals,
 - Multi-media applications (animation, image, sound, video clips),
 - Knowledge maps, open source datasets etc....
- Carry out an assessment on the option of continuing with existing desktop and server based ArcGIS software or migrate to Open Source desktop GIS and web map server. Clearly identify and present the pros and cons of both systems and provide expert support for decision to be made by ENTRO and other NBI centers management group
- In consultation with KM working group develop Terms of Reference for the EN Knowledge Base Enhancement team members to be hired by ENTRO

4.2 Task 2: Information and Database Development:

The consultant will work with key team members and KM working group at ENTRO and the NBI centers and web developer to create a database system that will support the requirements gathered in task 1 and robust enough to provide links between different applications and the centralized database. The database should support the content management system (CMS) selected, simple data organization, visualization, query, analysis, and export/import tools and interfaces.

- Recommendation for spatial database design, hardware infrastructure, management, maintenance, data security and levels of access, data standards and support the CMS selected
- Synergize the previous work on spatial database architecture and make appropriate enhancement to support the requirements gathered under Task 1. The database will have a system to support the options of internal use and public domain.
 - Include ArcGIS server and GIS datasets to be able to serve customized maps and a variety of themes for the region and to allow for simple spatial overlay and analysis

- The system will provide an online GIS interface tool that will allow users to visualize and analyze spatial data
- As mentioned in the project TOR (Annex A), work with Nile-Sec in development of non-spatial database to integrate time series datasets. The non-spatial database should provide
 - An interface to effectively provide inputs from models used at ENTRO , NB-DSS and Toolkits
 - It should support access to functions i.e - flood management, climate change, toolkits and analytical tools
 - It should support public domain data such as real time spatial and time series hydromet datasets
- As specified in the project TOR work with KM working group in development of API which fits the database system
- As specified in the project TOR work with KM working group in development of Interface
- As specified in the project TOR work with KM working group in selecting the appropriate hosting environment

4.3 Task 3: Implementation

The consultant will work with key team members and KM working group at ENTRO and the NBI centers on database connection will be created and parts of the system will be tested and continuously validated. The whole process will be demonstrated to KM working group before the deployment. Then, this consultant will oversee the tasks of populating data, and the development of information and knowledge products for the web-portal (front-end development) will be done for ENTRO knowledge management products following for successful implementation.

- Testing of the database system and its linkage with the website/portal for all the NBI centers by adopting the format develop for time series, GIS maps, and documents datasets to migration and linking to website/portal
- Deploy the final unified Website/Web portal systems for all NBI centers to production server and accessible to users linked with database for data visualization, query, analysis, and export/import tools and interfaces
- Support the production and integration of communication materials of project summary, project briefing, project storyline, etc...for ENTRO knowledge products
- Integrate real-time datasets and public domain datasets for Eastern Nile Basin
- Migrate maps, publish maps and link with special database of ENTRO's products

4.4 Task 4: Capacity building

- Prepare action plan for different activities to be carried out by team members for enhancement/implementation of knowledge base system of ENTRO

- Plan, organize and facilitate different events during the course of system enhancement/ implementation: meetings, validation and training workshops
- Provide regular briefings and progress reports on the enhancement of the knowledge base system of ENTRO and collaborative activities with the other NBI centers and report to water resources planning unit coordinator
- Provide training at least 3 training related to web design and database development
- Participate in consultation workshop
- In consultation with KM working group develop Terms of Reference for EN Knowledge Base Enhancement team members
- Support ENTRO procurement staff in the preparation of contract document using World Bank procurement procedure and preparation of procurement plan.

5. DELIVERABLES

Deliverable	Description	Timing (after Contract Signing)
Task 1: Requirement Gathering	<ul style="list-style-type: none"> • Review report on existing database and website/portal and area of enhancement • Requirements gathered report for the database system both on its functionality and hardware and software needs • TOR prepared for the other team member for integrated knowledge portal (IKP) project • Report on activities of Task 4 	2 months
Task 2: Information and Database Development	<ul style="list-style-type: none"> • Fully functional and developed spatial database adopted by each centers and separated for local and public domain • Spatial database linked with the website/portal with developed data organization, visualization, query, analysis, and export/import tools and interfaces • Database structure developed with interfaces to effectively provide inputs to the models and toolkits • Hosting service provided • Installation, testing and deploying • Workshop to present and discuss database 	2 - 12 months

	development <ul style="list-style-type: none"> • Report on activities of Task 2 	
Task 3: Implementation	<ul style="list-style-type: none"> • Final version of developed database structures and populated database systems for ENTRO and that also include a separate database for public domain datasets. • Final Website/Web portal systems deployed to production server and accessible to users with linked with database with data visualization, query, analysis, and export/import tools and interfaces • Workshop to present and discuss Final versions of the database and its linkages with the functional website/portal • Report on activities of Task3 	7- 22 months
Task 4: Capacity Building	<ul style="list-style-type: none"> • 3 training given • Participated at least 2workshop • Final report of overall activity of project • User manual 	1 - 22 months

6. IMPLEMENTATION ARRANGMENT

This study requires a KM working group and team of multi-disciplinary experts working in an integral manner and with extensive experience and deep knowledge of database design and development, knowledge management, online GIS integration, content development and organization, and model data integration. The consultant will be working based in ENTRO and will have a regular meeting with the KM working group. Whenever necessary the consultant may travel to Nile-Sec and NELSAP to collaborate and share ideas, and provide support to completing tasks and fulfilling the objectives of the consultancy.

As a client ENTRO will assign a project Coordinator who will be responsible for overseeing the work and contract administration and to whom the consultant shall report. ENTRO shall provide adequate support to the Consultant by facilitating gathering of data, access to relevant information and authorities, and by providing adequate office space and support facilities (such as internet) when the consultant is in Addis Ababa.

Payment shall be effected upon submission of invoices by the Consultant. Reimbursable expenses will include international travel (economy class), accommodation and daily subsistence allowance at the ENTRO rate. All reimbursable expenses will be paid against submission of statement of expense and original receipts to be approved by ENTRO.

7. QUALIFICATIONS & EXPERIENCE

- At least Masters level degree, in Computer Science, Information Systems, Science, Engineering, or other technically related field, or other technically related discipline
 - At least 8 years of working experience, in one of the major RDBM application examples: Oracle, MS SQL Server, Joomla, Drupal, PostgreSQL, MYSQL
 - Experience on Java/Flash information products, integration of multiple media data, and development of public domain and interactive software preferred.
 - Extensive knowledge and experience in using and/or developing spatial information systems, spatial database management, Object-Relational mapping and design, Object-Relational SQL, etc
 - Experience with standard, current GIS tools and technologies, including ArcGIS desktop and ArcGIS Server with exposure to applications in water resources.
 - Exposure to water resources information systems preferred
 - Demonstrated English language skills in writing, analytical, presentation and reporting skills
- Excellent facilitation, consensus-building, multi-cultural, and inter-personnel skills;
strong team leading and mentoring capabilities

Annex A - Eastern Nile Knowledge Base Enhancement

1. BACKGROUND

The NBI, ENSAP and ENTRO

The Nile Basin Initiative (NBI) is an intergovernmental partnership of the ten Nile Basin states sharing the Nile (Burundi, D.R. Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania and Uganda). The NBI was established to develop the river cooperatively; reduce poverty and environmental degradation; share substantial socio-economic benefits, and promote regional peace and security. The NBI is guided by a Shared Vision which envisages achieving *“sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources”*.

NBI member countries launched a Strategic Action Program with two sub-programs: the basin-wide Shared Vision Program (SVP) that aimed at building confidence, capacity and knowledge base (now phased out), and two Subsidiary Action Programs: The Eastern Nile Subsidiary Action Program (ENSAP) and the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) that initiate concrete joint investments and action on the ground at sub-basin levels.

The Eastern Nile Subsidiary Action Program (ENSAP) was launched by Egypt, Ethiopia and the Sudan (South Sudan joined in 2012 following its independence) to identify and prepare concrete joint investments in the Eastern Nile sub-basin that demonstrate the benefit of cooperation. ENSAP is governed by the Eastern Nile Council of Ministers (ENCOM) of water affairs and implemented by the Eastern Nile Technical Regional Office (ENTRO) headquartered in Addis Ababa, Ethiopia. ENSAP is funded by the four member countries and a number of bilateral and multilateral Development Partners.

The Integrated Development of the Eastern Nile (IDEN) was the first ENSAP project agreed by the member countries in 2002. IDEN consisted of a first set of seven subprojects aiming at tangible win-win on the ground to create confidence and showcase the benefit of cooperation.

Some of the first agreed projects under IDEN have been successfully prepared and handed over to be implemented by the countries. These included: flood preparedness and early warning, Watershed Management, Irrigation and Drainage, and Ethiopia-Sudan Power Transmission Interconnection projects. Furthermore the preparation of the projects also included detailed regional studies undertaken through the Cooperative Regional Assessment (CRA) which the countries have validated and owned. These are the Eastern Nile Irrigation and Drainage; the Watershed Management and Power Trade Investment Study Cooperative Regional Assessments.

Among the findings of the Eastern Nile Irrigation and Drainage Cooperative Regional Assessment study (ENID CRA) is that main challenges facing existing irrigation developments in the Eastern Nile are:

- Insufficient knowledge of water use for irrigation and of water availability for further development at the basin level;
- Outdated irrigation infrastructures in both Egypt and Sudan and that the same outdated technology and infrastructure types are recommended for new developments in Ethiopia
- Low productivity of irrigated agriculture in Ethiopia and Sudan.
- Institutional and policy related challenges.

To respond to these challenge, the ENID CRA also suggested a number of study projects to be conducted. The proposed studies include “*Development of an Eastern Nile data base*” and “*Increasing the performance of existing irrigation*”.

Following the IDEN project, and as part of implementing the projects identified for the second five year Strategic Plan for the period 2104 - 2019, NBI received funding from the Nile Basin Trust Fund/Cooperation in International Waters in Africa (CIWA) titled Nile Cooperation for Results Project (NCORE) supporting the three NBI centers (Nile-SEC, NELSAP-CU and ENTRO). As part of this CIWA fund; ENTRO received support to conduct component (3) which consists of two sub-components:

Sub-component 3.(a): *Strengthening the knowledge base and analytical framework for Eastern Nile water resources planning and management, and*

Sub-component 3(b): *Promoting sustainable development and growth in the Eastern Nile*

Under NCORE, ENTRO delivered various studies that includes Multi Sectoral investment analysis, Climate change, dame safety, water diplomacy, etc but the knowledge gain from all this study is not well captured in way that can be disseminated well and give benefit to wider stakeholder as one of the centers in the whole NBI

platform. Having a reliable IT system increases organizational productivity and supports very efficient development and sharing of knowledge which will enhance the service ENTRO provides to its stakeholders/NBI stakeholders at large. Replacement or upgrading of the current system in ENTRO is becoming essential due to the long time these equipment's served since the system has been installed

2. RATIONALE

Currently the NBI, including ENTRO, lacks institutional and infrastructure capacity to integrate all information and knowledge product in a holistic system which allow receive, archive, process and disseminate to a wider public user. Despite the fact that all NBI centers, including ENTRO, made tremendous effort in collecting, generating and developing various types of information and knowledge products, the existing NBI databases are not in a way that users can easily search and access, and the databases cannot be linked to the other NBI centers. Thus, the existing databases needs enhancement to include all spatial, non-spatial datasets and information generated under ENSAP and NCORE projects, better linkage with the other NBI centers and a user friendly portal interface that allow easy access.

3. Objective

The main objective of this consultancy assignment is to advance access of NBI information and knowledge products to present in a unified format through an NBI wide integrated knowledge portal (IKP). The IKP will serve as a gateway to access relevant NBI thematic knowledge products. The specific objective include;

- To establish easily accessible and searchable database unified format and linked for all NBI centers and linked to website/portal that is linked to the NBI centers
- To ensure access to agree upon data sets that will provide a more reliable information for future water resource development and management decisions
- To ensure real time data, knowledge product, and information access to wider users
- To update the ENTRO web-portal/website to be linked with other centers and facilitate access to the new database and knowledge products
- To ensure NBI/ENTRO's institutional viability through innovations, knowledge creation and knowledge sharing
- To integrate the data and knowledge to Nile Basin DSS (NB-DSS) that will strength a data and information exchange process in the Nile Basin
- To strength the capacity of Eastern Nile countries on the tools and knowledge product and their use for planning purpose

4. Scope of Work

The scope of the study may be divided into four Tasks. These Tasks are listed as follows and further elaborated in the subsequent sections:

Task 1: Need Assessment and Requirement Gathering

Task 2: System Design

Task 3: Implementation

Task 4: Capacity Building

ENTRO with the other NBI centers will establish a working group with knowledge management (KM) experts which includes water resource engineers, communication, IT, librarian, etc,.. This KM working group will be responsible in preparing TOR's for various position of this project and supervising, and supporting activities throughout the project implementation.

Task 1: Need Assessment and Requirement Gathering:

The requirements for the system design will be checked with the functions of the different NBI centers and its stakeholders. This task have four subtasks that will be performed during this phase.

Task 1.1: Data and Information gathering:

- Identify stakeholders, ENTRO staff, Nile-Sec representative staff, collaborators and external users
- Review and inventory of the existing database(spatial and non-spatial) , portal, documents, existing data and information format, models, toolkits and knowledge products
- Identify the list of data and information both project based and department base to be included in the system
- Identify models, toolkits and other knowledge products for which data access tools will be included in the system
- Identify public domain datasets that can be included in the system

Task 1.2: Evaluate formats

- Work with other NBI centers to prepare examples of existing data will be collected for review and assessment to propose a common format
- Identify data and information gaps in ENTRO that will be proposed to be filled
- Determine security issues and access limitations

Task 1.3: Develop NBI and ENTRO knowledge management strategy

- Explore synergy and partnership to acquire/share datasets with other NBI centers
- Policy guidelines and procedures to assess current information system and understand the interdependencies among business processes
- System restriction where the system will be restricted for users
- Compilation of a Roadmap for the development, management and dissemination of all types of Knowledge Product supported by ENTRO.

Task 1.4: Requirements Gathering

- Requirement gathering for
 - Data, information, knowledge product, etc ...
 - Non-functional - legal and regulatory requirements, application standards, and quality attributes of the system to be built including usability, reliability, performance or supportability requirements
 - Interface, software, system, etc...
- Requirement gathering for broad access to any knowledge/information resources that users require including documents, spreadsheets, charts, spatial and non-spatial data, multimedia files and live feeds. The requirements are gathered for the ability to access and read such knowledge resources including;
 - Spatial and non-spatial data
 - Document/content management systems (website, web portal, Nile IS, e-library etc.)
 - interactive web-mapping applications (commercial and open source providers),
 - Social networking applications,
 - Web based help desk system and community of practice portals,
 - Multi-media applications (animation, image, sound, video clips),
 - Knowledge maps, open source datasets etc....
- Identify center specific requirements. Consensus should be reached among centers to use common system and platform and the requirements gathered that can support the kind of functionality proposed for ENTRO and other centers
- Preliminary implementation plan that meets user requirements

4.2 Task 2: System Design:

Work with all the NBI centers to create a design that will support the requirements gathered in task 1 with different applications and robust enough to provide links between the application and the centralized database. The system should support all NBI centers requirements and web-based content management system that support simple data organization, visualization, query, analysis, and export/import tools and interfaces. In order to effectively organize and use the databases and interface with the website/ portal. This task will make sure that the key functionalities are supported and the sub task under Task 2 includes;

Task 2.1: Document Management system- Work with all NBI centers to design a document management system which can support the requirements gathered under Task 1. This work can benefit the effort made both by ENTRO and Nile-sec through the development of D-Space and Nile-IS. The document management system will run on the server database used to track, manage and store digital

documents. It will be linked to website/portal interface that have searchable capability. The document mangment system will include;

- Information about ENTRO, activities, its projects, etc...
- Documents of basin related studies, ENTRO's projects, master plan , etc on Nile
- Knowledge base and modeling outputs reports
- Information that can be presented as interactive web interface which gives a glance information about the basin i.e. State of the basin, One system inventory, basin atlas, e-book etc... with interactive maps and graphs
- A system that can allow easy update of contents
- Easy access with a searchable tools that allow user to locate documents with options of key words

Task 2.2: Geo-Database - this sub task is led by ENTRO to synergize the previous work on data architecture and central database and make appropriate enhancement to support the requirement gathered under Task 1. The geo-database will have a system to support the options of internal use and public domain.

- Include ArcGIS server and GIS datasets to be able to serve customized maps and a variety of themes for the region and to allow for simple spatial overlay and analysis
- The system will provide an online GIS interface tool that will allow users to visualize and analyze spatial data from the EN

Task 2.3: Non-Spatial Central Database- this sub task is led by NileSec to synergize work on data architecture and system organization, and on datasets(time series datasets) developed to support web-service for NB DSS through which users can access selected tools and analysis results provided by the Nile Basin DSS.

- A database to store and manage and connected to website/portal to internal and external users
- A user-interface to effectively manage the database through loading, visualization, query, analysis, and export/import tools
- An interface to effectively provide inputs to the models used at ENTRO and NB-DSS and a system that integrate the results of such models back into the database.

Task 2.4: Model and Toolkits integration- Work with Nile-Sec to develop interfaces and/or programming environments (scripting, custom GUIs, etc.) to effectively provide inputs to the models used at ENTRO and also provide interfaces to integrate the results of such models and analytical tools back into the databases. The subtask includes but not limited to;

- It should support access to functions i.e - flood management, climate change, toolkits and analytical tools
- It should support to make available public domain data such as real time spatial and time series hydromete datasets .This data and maps should be downloadable

Task 2.5: API Services (Application Program Interface) – Working with NileSec

- A service that enable seamless uniform access to the database and serve
- A service which creates a gate way to enable applications to get access of spatial and non- spatial data with a standardized format

Task 2.6: Interface- In synergy with Nile-Sec to develop an integrated interface which have access to center specific data portals into one integrated/interlinked portal interface

- A holistic interface (consistent with other NBI centers) which is a user friendly and support access from various systems including mobile devices such as smart phones and tablets.

Task 2.8: Hosting – Provide hosting solution to deploy the system

- Work closely with NileSec team to assess options of hosting environment that support ENTRO and NBI centers functionalities and suggest preferred hosting providers

4.3 Task 3: Implementation

The system design describe previously will be implemented using a hosting server, it will make sure that the requirement gathered under Task 1 are all considered. Database connection will be created and parts of the system will be tested and continuously validate. The whole process will be demonstrated to and evaluated by all NBI centers before the deployment. Then populating data, information and knowledge products will follow for successful implementation. The subtasks under Task3 includes;

Task 3.1: Testing

- Working with the NBI centers to do the testing of the system by adopting the format develop for time series, GIS maps, and documents datasets to migration and linking to one central database

Task 3.1: Data Migration - Undertake data entry for ENTRO part

- Time series data migrating
- Integrate document and knowledge produces from the different ENSAP projects, Country Master Plans and other studies
- Produce and integrate communication materials of project summary, project briefing, project storyline, etc...

- Integrate real-time datasets
- Migrate maps, publish maps and link with geo-database to provide basin wide datasets

4.4 Task 4: Capacity building

Throughout the study a continuous capacity building activity are done in all tasks mentioned above but the main human and institutional capacity building tasks includes;

Task 4.1: Training – it will be a continuous process which cross cut at each level of the project through training manual, training and on job capacity building

- Develop appropriate documentation for all the activities and sub-portals developed under this assignment.
- Undertake training (both on-the job training and training sessions for ENTRO and NBI staff, interns/young professionals and other potential users on database development, portal development, knowledge manament, etc...
- Organize two consultation workshop for requirement gathering and verification and gathering feedback of the study

Task 4.2: Procurement

- Procurement and supply servers and software
- Procurement, supply and replacement of old network equipment's Maintenance of backup power supply equipment's and standardized installation including supply of spare parts

5. DELIVERABLES

Table 1: Deliverable and targeted schedule

Deliverable	Description	Timing (after Contract Signing)
Task 1	<ul style="list-style-type: none"> • Elaborated approach, Team build-up and updated work plan • Requirements Document (provides requirements traceability, evolving with each development iteration) and Knowledge Capture Documents (documentation of specific knowledge items obtained from stakeholders and subject matter experts) • Develop a knowledge management strategy • Inception report <ul style="list-style-type: none"> ○ Prepare and inventory work that includes the list of data, information, project base deliverables and 	2 months

	<p>knowledge product</p> <ul style="list-style-type: none"> ○ Road map for development of information and database/portal 	
Task 2	<ul style="list-style-type: none"> ● Formal document to capture the details of the system components, features, and interfaces and system design that evolves with each development iteration ● Developed a database structures for geo-database, non-spatial database and document management for both internal and public domain datasets ● Developed data organization, visualization, search, query, analysis, and export/import tools and interfaces. ● Developed interfaces linked with the NBI centers to effectively link the different databases, provide inputs to the models and integrated results of such models back into the databases ● Hosting service provided ● Installation, testing and deploying ● Task 2 report about system design summary of activities, etc... 	2-12 months
Task 3	<ul style="list-style-type: none"> ● Final database system(geo-database, non-spatial database and content manament) accessible with all data, information and knowledge product populated and linked to the interface ● Final Website/Web portal systems deployed to production server and accessible to users ● Task 3 report summary of complete project activity and outcomes (documentation of the structure and relationship of the database elements) and Security System Plan (documentation of the accounts, roles, authentication methods, and authorization levels for accessing the system 	7-24 months
Task 4	<ul style="list-style-type: none"> ● Two consultation workshop conducted ● Network and electrical system upgraded ● Maintenance done for the backup power supply system ● Network equipment and server procured ● Training given on the database and portal preparation ● Awareness raised on information and knowledge management ● training materials (collateral for use during training 	2-22 months

	sessions such as PowerPoint slides and lab manuals) and User Manuals (end user documentation, standardized installation, development work and help files)	
--	---	--

The Final Report shall include a separate Executive Summary and Annexes containing data and detailed activity of the project.

6. IMPLEMENTATION ARRANGMENT

This study requires a KM working group and team of multi-disciplinary experts working in an integral manner and with extensive experience and deep knowledge of database design and development, knowledge management, online GIS integration, content development and organization, and model data integration. For a key part of the activities consultants will be hired and will work closely with KM working group. To successfully carry out the project the team of consultants will be led by a project team leader (knowledge management expert) who is responsible for delivering and overall coordination with the consultants, ENTRO and other NBI centres. Each of study team members has specific tasks and activities assigned to him/she and will report directly to the project team leader. Regular team meetings will be held throughout the project to focus individual efforts, collaborate and share ideas, and provide support to completing tasks and fulfilling the objectives of the consultancy.

As a client ENTRO will assign the water resource planning unit for overseeing the work and contract administration and to whom the consultant shall report. The consultants will be working in ENTRO, Addis Ababa but whenever necessary they may travel to other NBI centres to fulfilling the objectives of the consultancy. ENTRO shall provide adequate support to the Consultant by facilitating gathering of data, access to relevant information and authorities, and by providing adequate office space and support facilities (such as internet) when the consultant is in Addis Ababa. The tentative list of study team and tasks assigned to each team member are highlighted in Table 2.

Payment shall be effected upon submission of invoices by the Consultant. Reimbursable expenses will include international travel (economy class), accommodation and daily subsistence allowance at the ENTRO rate. All reimbursable expenses will be paid against submission of statement of expense and original receipts to be approved by ENTRO.

Whenever necessary a regional and national consultant will be hired for the following tasks

Table 2: Tentative team Build-up and Summary of Assigned Tasks

Position in the Study	Organization	Assigned Tasks
WRPU	ENTRO	<ul style="list-style-type: none"> - Overall project coordination and quality control of project deliverables - Linkages with ENTRO and NBI centers team, EN stakeholders and development partners - Over all support of the project in requirement gathering, inventory, system design, test, installation and deployment
Communication	ENTRO	<ul style="list-style-type: none"> - Support and quality assurance on the preparation of communication materials
IT	ENTRO	<ul style="list-style-type: none"> - Over all support of the project in requirement gathering, inventory, system design, test, installation and deployment
Other unites on ENTRO and Nile-Sec	ENTRO	<ul style="list-style-type: none"> - Providing support for the project activity on requirement gathering, system design and deployment - Quality assurance of the deliverables
Team Leader/Knowledge manament specialist	Consultant	<ul style="list-style-type: none"> - Study Team Leader - Work with ENTRO and Nile-Sec throughout the project - Work with ENTRO to prepare the TOR(team members) for consultant recruitment - Lead the team of consultant and insure all project activities are delivered, includes responsibility of writing, reviewing and editing technical materials for project deliverables and tool development - Work with ENTRO and other NBI centers in coordinating and controlling the quality of outputs, coordinate production of all deliverables, reports - Work with ENTRO in organizing workshops with ENTRO Team - Responsible for specific tasks: <ul style="list-style-type: none"> • Requirement gathering, • Design components of knowledge manament database, • Recommendation for database design, hardware infrastructure,

Position in the Study	Organization	Assigned Tasks
		<p>management, maintenance, data security and levels of access, and data standards</p> <ul style="list-style-type: none"> • Database development, design and implementation of user interfaces • Develop a strategy for database manament and design a framework to link with the interface, <ul style="list-style-type: none"> - Provide training at least 3 training related to web design and database development - Organize and participate in consultation workshop - Completion and any other related tasks to the study
Web designer /developer	Consultant	<ul style="list-style-type: none"> - Work with ENTRO and NileSec to review existing website/portal, database - Requirements Discovery - Prototype Development and Review - System Development - Design a user interface and various components of database, website/portal with architecture and linkages with the system - Work for the deployment of system - Provide training at least 3 training related to web design and database development - Participate in consultation workshop - Report writing
Database and online service expert	Consultant	<ul style="list-style-type: none"> - Work with knowledge management expert(KME) to recommendation for database design, hardware infrastructure, management, maintenance, data security and levels of access, and data standards - Database development, design and implementation of user interfaces - Develop a strategy for database manament - Integrate online services into website/portal - Work for the deployment of system - Provide training on how to develop an online service and database

Position in the Study	Organization	Assigned Tasks
		<ul style="list-style-type: none"> - Participate in consultation workshop - Report writing
Content manament expert	Consultant	<ul style="list-style-type: none"> - Develop architecture and graphics format for parts of website/portal and database - Responsible in preparing communication material and putting contents into website/portal and database - Provide training on use and development of the Content Management System - Participate in consultation workshop - Report writing
Technical writer	Consultant	<ul style="list-style-type: none"> - Summarizing ENSAP reports with executive summary and factsheets to give glance information about the projects - Responsible in preparing communication material and putting contents into website/portal and database - Provide training on report writing and related area - Participate in consultation workshop - Report writing
Visualization expert	Consultant	<ul style="list-style-type: none"> - Develop a system that is interactive visualizations and dashboards and synthesize large amounts of information - Develop web applications defined to use and interact with the software toolkits - Quick data visualization tools with high quality static and dynamic visual representations produced to communicate innovation projects and activities; - Produce relevant communication material including infographics in support of the communications products. - Provide training in the use of visualization tools - Participate in consultation workshop
Spatial Analyst/ GIS expert	Consultant	<ul style="list-style-type: none"> - Development of the tool by detailed consultations with various potential tool users

Position in the Study	Organization	Assigned Tasks
		<ul style="list-style-type: none"> - Managing, developing, and implementing the spatial analysis work required under various projects - Prepare project deliverables including spatial information analysis, databases development, and publishing online maps with ArcGIS Online. - Integration of GIS data with ground measurements and remote sensing datasets, image analysis, and organization and archiving of data and analyses developed - Design and implement user interfaces with ArcGIS Online. - Provide technical assistance to projects as needed including support to acquisition of field data, aerial surveys, and other imagery. - Provide training in the use of GIS, remote sensing and spatial analysis
Intern	ENTRO	<ul style="list-style-type: none"> - Fill gaps of project activity in database development, web design, content management, visualization tool development, etc.. - Contribute to the knowledge product development and packaging - Contribute to report writing and preparation of communication material

7. QUALIFICATIONS & EXPERIENCE

The Regional and national Consultant shall have the following qualifications and experience:

Table 3: Qualification and Competencies of the tentative Study Team

Position in the Study	Competencies
Team Leader/Knowledge management specialist	<ul style="list-style-type: none"> - At least Master level degree in natural resource management, information and communication technology or closely related fields - Extensive experience in knowledge management, web development, and implementation of information-rich, user-friendly and large websites is required

Position in the Study	Competencies
	<ul style="list-style-type: none"> - Extensive experience with CMS (Joomla preferred), including experience with both commercial and Open Source systems is required - Advanced proficiency with HTML, art and office/web software packages is desired - Experience in web development programming languages is desired - Experience in coordination is required
Web designer /developer	<ul style="list-style-type: none"> - At least Master level degree in computer science, software engineering or closely related fields - Extensive experience in web development, graphic design and implementation of information-rich, user-friendly and large websites is required - Extensive experience with CMS (Joomla preferred), including experience with both commercial and Open Source systems is required - Advanced proficiency with HTML, including style sheets, templates, complex tables and image maps. Must possess working knowledge of basic composition, page layout, art and office/web software packages, Dreamweaver, Adobe PageMaker, Illustrator, Photoshop and Acrobat (or Open Source Software equivalents) is required - Experience in web development programming languages (PHP, perl, ASP, Python, JSP etc.) is required - Knowledge of W3C standards such as XHTML, accessibility standards, content sharing standards such as RSS/RDF and Open Archives Initiative is desired
Database and online service expert	<ul style="list-style-type: none"> - At least Masters level degree, in Computer Science, Information Systems, Science, Engineering, or other technically related field, or other technically related discipline - Extensive experience in one of the major RDBM application examples: Oracle, MS SQL Server, Joomla PostgreSQL, MYSQL is required - Experience on Java/Flash information products, integration of multiple media data, and development of public domain and interactive software is required - Extensive knowledge and experience in using and/or developing spatial database management, object-Relational mapping and design, Object-Relational SQL, etc is required - Experience in GIS, remote sensing applications, spatial DBMS, web map server and related tools in water resources studies is desired

Position in the Study	Competencies
Content managment expert	<ul style="list-style-type: none"> - At least Master level degree in information and communication technology or anything related - Excellent experience in writing and editing skills is required - Extensive experience in one of: Oracle, MS SQL Server, Joomla PostgreSQL, MYSQL is desired - Experience on Java/Flash information products, integration of multiple media data, and development of public domain and interactive software is desired
Technical writer	<ul style="list-style-type: none"> - At least Master level degree in information and communication technology or anything related - Excellent experience in writing and editing skills is required
Visualization expert	<ul style="list-style-type: none"> - At least Bachelor level degree in graphic design/visual design, front-end design or any related discipline - Experience using visualization libraries and software like with D3.js, Crossfilter/dc.js, Leaflet.js, Processing/P5.js, CartoDB or Mapbox or similar software is required - Experience with front-end frameworks and libraries like Bootstrap, AngularJS, ReactJS, ember.js. or similar frameworks is required - Extensive experience in graphic design and implementation of information-rich, user-friendly and large websites - Extensive experience with CMS (Joomla preferred), JavaScript code design, including experience with both commercial and Open Source systems - Advanced proficiency with HTML, including style sheets, templates, complex tables and image maps. Must possess working knowledge of basic composition, page layout, art and office/web software packages such as MS Word, Excel, Dreamweaver, Adobe PageMaker, Illustrator, Photoshop and Acrobat (or Open Source Software equivalents) - Experience with photographic manipulation, digital painting. Digital audio and video experience highly desirable - Experience with new technologies like RSS, podcasts etc. highly desirable - Experience with web servers (Apache, Tomcat, IIS, Zope etc.) highly desirable
Spatial Analyst/ GIS expert	<ul style="list-style-type: none"> - At least Masters level degree in GIS/ Information Systems or related fields (Earth Sciences, Water Resources Engineering, Geology, IT, Civil Engineering, etc. or any related discipline - Experience in RS-GIS applications, spatial DBMS, web map server and related tools in water resources studies (planning, management and development is required

Position in the Study	Competencies
	<ul style="list-style-type: none"> - Extensive in using and/or developing spatial information systems, geodatabase development, spatial database management, Object-Relational SQL, etc is required - Experience with database management systems, web mapping applications, multi-server area network and statistical software packaging is desired
Intern	<ul style="list-style-type: none"> - At least Bachelor degree in hydrology/ hydraulics/water resources engineering. GIS, IT, or other technically related field to the task - Demonstrate high analytical skills - Younger than 32 years old