



Terms of Reference

on

Development of Water Resources Models and Tools
(Internation Firm Concentancy)

Final Draft

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1. Introduction and Background

The Eastern Nile basin covers a vast area, several countries, and a large population with their ways of life, economic activities, and developments. The area being to a large extent arid or sei-arid, the river provides for various forms of livelihoods along its course.

The Nile Basin Initiative (NBI) is a transitional cooperative mechanism of ten riparian countries established in 1999 to realize a jointly articulated Shared Vision: “To achieve sustainable socio-economic development through the equitable utilization and benefit from the common Nile Basin water resources”.

The Eastern Nile Technical Regional Office (ENTRO) includes Egypt, Ethiopia, and Sudan (with South Sudan joining in 2012) facilitating and implementing joint actions 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.

As part of the activities, the Nile Cooperation for Climate Resilient (NCCR) Project is planned to be implemented by NBI centers and other stakeholders with the support of the World Bank. The project development objective is to improve mechanisms for cooperation on water resources management and development in the Nile Basin. NCCR-Project components implemented by ENTRO will support ENTRO in promoting cooperation among EN riparian countries by focusing on providing Water Resources Planning (WRP) models and tools, data and information packages, knowledge products, and services to WRP and management activities in the EN sub-basins. It builds on ENTRO resources as one of the achievements of the EN Planning Models (ENPM) project and seeks to revisit and deepen activities where modeling and analytical tools, and toolkits are relevant to the EN development agenda.

ENTRO as well as other stakeholders have over recent years developed quite a number of tools and database to provide knowledge and assess conditions in the river system. While a lot of data as well as tools are available, accessing this information is not as straightforward as it could be, and information is scattered and not readily accessible. This results in scattered approaches not unfolding the full potential of the resources in the basin.

The Modeling and Knowledge Management support requested in these ToRs is intended to develop the WRP models and analytical tools in the EN region, and develop data and information packages for different WRP models investment planning projects. The activity is implemented by ENTRO and supported under the components including: (i) development of ENPM Modeling Tools, and Toolkits for the EN water resources planning and management; and (ii) collection, integration, and operationalization of data and information packages, geodatabase, and knowledge products in the analysis of water resources development, security and make accessible the services through the Integrated Knowledge Portal (IKP) system and other platforms. The models and tools will be

developed with the aim of robustness of WRP tools and models and expanding their uses and services in the EN region to improve WRP and management systems.

2. Rationale

Water resources modeling tools and knowledge products are key resources in water resource planning and management and development services. ENTRO has developed and archived the ENPM Modeling and Analytical Tools, Toolkits, Geodatabase, and knowledge products. The ENPM models include the RiverWare, RIBASIM, MikeBasin (Mike River and Mike Basin) and NB-DSS, HEC-ResSim, and SWAT models which are used in water resources planning and management. The analytical tools include simulation models [ENMOS, ENMCTM, EN countries Agricultural models (such as EAM for Egypt, ETAM for Ethiopia, SSAM for South Sudan and SAM for Sudan), scenario analysis (such as ENMOS, Agricultural Models, Multi-Commodity Trade), optimization, spatial analysis, Multi Criteria Analysis (MCA) models. In addition, the toolkits include watershed management or sub-basin IMS (BAS and White Nile, Abay-Blue Nile, Tekeze-Sitet-Atbara (TSA), and Main Nile), Power, Agriculture, and Floodplain management toolkits, and HEC-suits. Mike-suits, and GIS tools for flood forecasting system. The Geodatabase includes both the spatial (shape files and raster), and meta database of data and information packages. And the knowledge base includes GIS, Databases, Documents, Web products, Spreadsheets, and other different software and model packages. While providing a solid base, improving data and information accessibility as well as cooperation in the Eastern Nile basin is necessary, in order to improve the level of assessments and as such improve knowledge generation that will benefit informed decision making and sustainable development in the Eastern Nile basin.

3. Objectives and scope of work

The objectives of the consultancy include the following:

WP1 – Hydrological and hydraulic modeling

- Modelling inception, review and categorize modelling work done so far in the EN basin.
- Develop hydrological baseline model for the entire Eastern Nile in HEC-HMS, building and incorporating, but at the same time superseding existing models to become a new standard.
- Develop hydraulic baseline model for the entire Eastern Nile in HEC-RAS
- Training for selected trainees from Eastern Nile member countries and ENTRO as on-the job training during model development

WP2 – Water resources planning

- Water resources planning inception, review and categorize existing water resources planning tools and efforts (HEC Res Sim, RIBASIM, Riverware, etc.) in the Eastern Nile basin.

- Develop/enhance HEC Res Sim model for the Eastern Nile
- Develop detailed WEAP model for the Eastern Nile for water resources planning.
- Training for selected trainees from Eastern Nile member countries and ENTRO as on-the job training during model development.

WP3 –Erosion and sediment transport modeling

- Modelling inception, review and categorize work done so far.
- Development of calibrated and validated erosion and sediment transport models for a number of selected river stretches / subbasins in the Eastern Nile basin using HEC models.
- Development of calibrated and validated erosion and sediment transport models for a number of selected river stretches / subbasins in the Eastern Nile basin using SWAT models.
- Training for selected trainees from Eastern Nile member countries as on-the job training during model development.

WP4 –Enhancing Eastern Nile toolkits

- Inception, review and categorize existing toolkits.
- Enhance 5-6 existing toolkits covering different sectors (irrigation, hydropower, etc.). It is expected that this will be done Excel based.

WP5 – Assessing, streamlining and updating ENTROs data and information platforms

- Assessing individual platforms (ENTRO and Nile-SEC) current purpose and identifying overlaps/redundancies (Inception).
- Development of streamlining strategy and agreement with ENTRO and Nile-SEC.
- Repopulating platforms, adding/changing topics, and content as necessary.
- Quality checking, cleaning, and sorting existing and additional datasets, development, and inclusion of metadata.
- Developing and adding inventory information of data that shall not be made available online.
- Provide data gap overview to be shared by riparian countries/institutions with the request for gapfilling where data may be available, Inclusion of incoming data.
- Developing maintenance strategy to ensure platforms and datasets are maintained and publishing of data continues.
- Add/improve platform function for including/presenting project- and study results.

WP6 – Development of Eastern Nile practitioners web-forum

- Review the existing practitioners web-forum.
- Establish a web-based knowledge exchange forum.
- Provide training for forum administration and moderation.

4. Clients' facilitation and planning notes

The client will facilitate the works by providing the necessary contacts and introduce the contractor to the relevant stakeholders in the Eastern Nile countries.

The client will provide full access details to the relevant ENTRO and Nile-SEC databases and web tools.

Consultation and validation workshops is conducted with the allocated budget and will be conducted in line with the timeline and workplan proposed.

The client will establish a Technical Working Group (TWG) or Panel of Experts (PoE) consisting of model developers and ENTRO experts that will follow up on the overall detailed procedures of the Water Resources Planning modeling tools development. The TWG or PoE is expected to be on board at the commencement of project development or during the inception workshop.

5. Detailed workpackage descriptions

5.1. Inception Phase

1. Inception on hydrological and hydraulics for water resources modeling, review and categorize modeling work done so far in the EN basin: Detailed planning and data collection for modeling works relevant to this task, evaluation and categorization of existing works, detailed implementation plan, organization of trainings and trainees.

Duration: 1 month.

Deliverable 1: Inception report.

Estimated expert input: 0.5 person month.

2. Inception on water resources planning inception, review and categorize existing water resources planning tools and efforts (HEC-ResSim, RIBASIM, RiverWare, etc.) in the Eastern Nile basin: During the inception phase, the contractor shall obtain a good overview of previous water resources planning efforts in the Eastern Nile basin. Based on the findings, further steps in developing HEC-ResSim and WEAP models are planned.

Duration: 1 month.

Deliverable 2: Inception report.

Estimated expert input: 1 person month.

3. Inception on erosion and sediment transport modeling, review and categorize work done so far in the Eastern Nile basin: Detailed planning and data collection for modelling works, organization of trainings and trainees.

Duration: 1 month.

Deliverable 3: Inception report.

Estimated expert input: 1 person month.

4. Inception on review and categorize existing toolkits: Review and categorization of existing toolkits, toolkit selection and development of detailed enhancement plan. Toolkits that may currently be implemented on country level shall be made applicable on Eastern Nile level. Toolkit selection should include prioritization and cover different sectors, e.g., irrigation, hydropower, etc.

Duration: 1 month.

Deliverable 4: Inception report including toolkit selection agreed with client.

Estimated expert input: 1 person month.

5. Inception on assessing individual platforms (ENTRO and Nile-SEC) current purpose and identifying overlaps/redundancies as well as streamlining strategy and agreement with ENTRO and Nile-SEC: Based on findings of the previous gaps and needs assessment, the consultant is expected to conduct a careful assessment of the different knowledge platforms hosted by ENTRO and Nile-SEC with the goal to identify their strengths and weaknesses, as well as specifically overlaps and redundancies. The topics, data, and information on these platforms need to be listed in detail to form a basis for the next subtask. This task also serves as project inception, specifically the following platforms which includes:

- Integrated Knowledge Portal (<https://ikp.nilebasin.org>)
- ENTROSpace (<https://entrospace.nilebasin.org> or <https://entro.nilebasin.org/information-hub/entro-knowledge-repository>)
- WEB-IMS (<https://web-ims.web.app/>)
- ENTRO information hub (<http://www.nilebasin.org/entro/index.php/information-hub/technical-documents#>)
- Nile Information System (<http://nileis.nilebasin.org>) – not functional

Based on the assessment of individual platforms, the consultant will develop a strategy for streamlining functionalities in-between the different platforms. This includes the removal/addition of topics from platforms in order to obtain topically stringent and clearly structured platforms with no redundancies. Technical abilities of the platforms need to be considered. It is expected that the consultant prepares 2-3 proposals which will then be discussed and agreed during a stakeholder workshop with both ENTRO and Nile-SEC. Based on workshop results, the consultant will prepare a final version of the streamlining strategy, including clear actions for what needs to be moved or added to the different platforms.

Duration: 1 month.

Deliverable 5: Report showing the detailed structure and data/information lists of the different assessed platforms. Draft streamlining strategies for discussion and agreement during workshop; Final streamlining strategy based on agreed workshop results

Estimated expert input: 1 person month.

6. Inception on review existing practitioners web-forums to establish a web-based knowledge exchange forum: Review existing practitioner web forums including e.g., for WEAP, HEC-RAS, ArcGIS/QGIS, etc. Compile examples and create shortlist of requirements ensuring ease of use and low internet bandwidth of users. User registration shall be simple, various topical areas around data and modeling shall be covered. Proposed way forward with regards to forum functionality shall be presented and agreed with the client.

Duration: 1 month

Deliverable 6: Review report including way forward agreed with the client.

Estimated expert input: 1 person month.

5.2. Development Phase

5.2.1. WP1 – Hydrological and hydraulic models development

Tasks:

- 1.1 Develop hydrological baseline model for the entire Eastern Nile in HEC-HMS, building and incorporating, but at the same time superseding existing models to become a new standard.

The Eastern Nile is currently represented in its entirety in the Nile DSS, though with limited detail. The intention of this task is to develop a detailed hydrological model using HEC-HMS for the Eastern Nile, consisting of individual models for the Blue Nile, the Atbara, the Baro-Akobo-Sobat, and the main Nile downstream of Khartoum.

The models shall be capable to replicate historic and current hydrological conditions in the basin as well as allow for forecasting of conditions under different land development- and climate change conditions as well as hydropower and irrigation offtake scenarios.

Based on the developed baseline models and analysis of hydrometeorological return periods, flow return periods shall be computed and tabulated for various locations in the basins. It is expected that a dense system of nodes is used in the models to allow model results to be used to drive hydraulic models for a variety of locations.

The models and results will be handed over to the client.

Duration: 3 months

Deliverable 1.1: Hydrological models for Blue Nile, Atbara, Main Nile, and Baro-Akobo-Sobat developed and calibrated; Return periods and scenarios analyzed and results presented in a modelling report

Estimated expert input: 3 person month

- 1.2 Develop hydraulic baseline model for the entire Eastern Nile in HEC-RAS model.

Three hydraulic models are envisaged to be developed for the Blue Nile, Atbara, Main Nile, and Baro-Akobo-Sobat rivers. A 1D model approach shall be taken with limited river cross

section data provided by the client or estimated using suitable means, noting that readily available river geometry data is limited. Hydraulic structures and topographic features have to be sufficiently considered in the models. Different flow conditions shall be analyzed driven by the HEC-HMS modelling results developed in the previous workpackage, specifically analyzing the resulting flooding.

The models shall be the basis for later site specific flood assessments allowing to quickly set up coupled 1D-2D model systems for local detailed assessments (not part of this assignment). Fieldwork for measuring missing cross sections is not required.

The models and results will be handed over to the client.

Duration: 3 months

Deliverable 1.2: Hydraulic models for Blue Nile, Atbara, Main Nile, and Baro-Akobo-Sobat developed and calibrated; Report on modelling and flow/flood condition analysis

Estimated expert input: 3 person month

1.3 Training for selected trainees from Eastern Nile member countries as on-the job training during model development.

Training shall be conducted alongside model implementation mostly remotely through regular online sessions using e.g. Zoom, constantly involving the trainees in the main decisions and works in weekly training sessions where modelling progress is shared with the trainees in an interactive manner, i.e. not purely through presentations, but actually working on the models and highlighting the most important modelling steps ranging from data preparation to model setup and calibration. Next to the actual modelling steps also problems and solutions shall be discussed. Trainings are to be designed in a training for trainers' format. Expected achievements of the training include full exposure of the trainees to the modelling process, enabling them to understand the main works and requirements in modelling. With trainees likely having various backgrounds and different degrees of pre-exposure to modelling, it is not expected that all trainees will obtain full modelling skills, but it is envisaged that trainees will fully understand the processes, data needs, plausibility aspects, etc., enabling them to supervise model implementation.

Duration: 6 months

Deliverable 1.3: At least 10 trainees trained in hydrological- and hydraulic modelling using HEC-HMS/HEC-RAS; Training report.

Estimated expert input: 2 person month

5.2.2. WP2 – Water resources planning models development

Tasks:

1.4 Develop/enhance HEC-ResSim model for the Eastern Nile

HEC-ResSim models shall be set up to model outflow scenarios of the existing and planned dams in the Eastern Nile, covering the Blue Nile, the Atbara, the Main Nile, and the Baro-Akobo-Sobat. The models shall specifically allow to model scenarios of different dam operations in the subbasins. All operational and planned dams shall be included (see e.g. Hydropower and Dams 2022 world map for reference)

Duration: 2 months

Deliverable 1.4: HEC-ResSim models for the EN subbasins, reservoir simulation report.

Estimated expert input: 2 person month

1.5 Develop detailed WEAP model for the Eastern Nile for water resources planning.

The WEAP water evaluation and planning model shall be implemented for the entire Eastern Nile basin to enhance the ability for holistic basin planning. It is intended that the model can later be used for scenario assessment purposes.

Duration: 3 months

Deliverable 1.5: WEAP model, modelling report models reservoir operations.

Estimated expert input: 2 person month

1.6 Training for selected trainees from Eastern Nile member countries as on-the job training during water resources model development.

Training shall be conducted alongside model implementation mostly remotely through regular online sessions using e.g. Zoom, constantly involving the trainees in the main decisions and works in weekly training sessions where modelling progress is shared with the trainees in an interactive manner, i.e. not purely through presentations, but actually working on the models and highlighting the most important modelling steps ranging from data preparation to model setup and calibration. Next to the actual modelling steps also problems and solutions shall be discussed. Trainings are to be designed in a training for trainers' format. Expected achievements of the training include full exposure of the trainees to the modelling process, enabling them to understand the main works and requirements in modelling. With trainees likely having various backgrounds and different degrees of pre-exposure to modelling, it is not expected that all trainees will obtain full modelling skills, but it is envisaged that trainees will fully understand the processes, data needs, plausibility aspects, etc., enabling them to supervise model implementation.

Duration: 3 months

Deliverable 1.6: At least 10 trainees trained in water resources planning models; Training report

Estimated expert input: 2 person month

5.2.3. WP3 – Erosion and sediment transport models development

Tasks:

1.7 Development of calibrated and validated erosion and sediment transport models for selected river stretche/subbasins in the Eastern Nile basin using HEC models.

For a number of pilot cases in example catchments, erosion and sediment transport models shall be set up including:

- Watershed erosion and sediment routing with HEC-HMS erosion and sediment transport model
- Sediment transport modelling with HEC-RAS 1D
- Sediment transport modelling with HEC-RAS 2D
- Mud- and debris flow modelling with HEC-RAS

Models shall be calibrated and handed over to the client together with respective modelling reports. The models and model reports shall showcase and provide good practice examples for future initiatives, especially highlighting additional data needs and approaches as well as the potential to assess problems beyond hydology/hydraulics, e.g. in reservoir sedimentation and respective scenario assessments, etc.

Duration: 3 months

Deliverable 1.7: Erosion-, sediment transport-, and mudflow models; Modelling reports

Estimated expert input: 2 person month

1.8 Development of calibrated and validated erosion and sediment transport models for selected river stretches / subbasins in the Eastern Nile basin using SWAT models.

Erosion as well as sediment transport are important processes in the eastern Nile. The Soil & Water Assessment Tool (SWAT) is able to quantify the impact of land management practices in watersheds and as such can be used for situational analysis and scenario assessment. Specifically, erosion and sedimentation can be assessed. Models shall respectively be set up for the Eastern Nile subbasins to be used for future assessments.

Duration: 3 months

Deliverable 1.8: Readily set up and calibrated SWAT model, WSWAT modelling report.

Estimated expert input: 2 person month

1.9 Training for selected trainees from Eastern Nile member countries as on-the job training during model development

Training shall be conducted alongside model implementation mostly remotely but constantly involving the trainees in the main decisions and works in regularly scheduled weekly training sessions. Trainings are to be designed in a training for trainers' format. Expected achievements of the training include full exposure of the trainees to the

modelling process, enabling them to understand the main works and requirements in modelling. With trainees potentially having various backgrounds and pre-exposure to modelling, it is not expected that all trainees will obtain full modelling skills.

Duration: 9 months

Deliverable 1.9: At least 10 trainees trained in hydrological-, hydraulic-, erosion/sediment transport-, and mudflow modelling; Training report

Estimated expert input: 1 person month

5.2.4. WP4 – Enhance Eastern Nile toolkits

Tasks:

1.10 Enhance 5–6 existing toolkits covering different sectors (irrigation, hydropower, watershed, etc.), which is Excel based.

5-6 existing toolkits shall be enhanced considering improved technical applicability as well as Eastern Nile wide applicability. It is expected that the tools are set up (or improved) Excel based to ensure broad applicability. Standardized approaches and protected cells/sheets shall be used in order to ensure usability for standard users to work with the tools without special training. Tools shall be user friendly and include required explanations and tutorials/examples

Duration: 3 months

Deliverable 1.10: Tools/Toolkits improved and handed over to the client. Task report including application examples

Estimated expert input: 3 person month

5.2.5. WP5 – Assessing, streamlining and updating ENTROs data/information platforms

Tasks:

1.11 Repopulating platforms, adding/changing topics and content as necessary

Based on the streamlining strategy developed under Task 1.2, and with admin access to the platforms provided by ENTRO / Nile-SEC, the consultant will reorganize and rebuild the web platforms to include the agreed information and datasets. As necessary, this may include complete revision of the site layout and structure and need to have the ability to include additional data later, both adding to existing datasets, and adding new topics/parameters. All platforms shall have a detailed search function. The revised platforms shall be quality controlled for their content and functionality, presented to ENTRO / Nile-SEC during an online presentation and launched online. The admin rights to the sites then need to be handed back to ENTRO / Nile-SEC. A training shall be provided to ENTRO / Nile-SEC responsible staff for future maintaining and handling and updating the revised platforms.

Duration: 4 months

Deliverable 1.11: Data migrated as necessary; Updated/revised streamlined platforms online and handed over to the host institutions; Training for platform handling provided

Estimated expert input: 2 person month

1.12 Quality checking, cleaning, and sorting existing and additional datasets, development, and inclusion of metadata.

While the existing platforms hold significant amounts of information, there are also significant uncertainties and gaps and there is data that is not available through the online platforms. All data, already existing in the platforms as well as additionally included data, will be quality checked to remove obvious erroneous data, ensure proper and uniform formatting, include metadata for all datasets, etc. to ensure high quality databases. The consultant will identify additional available data at ENTRO and Nile-SEC that is not yet included in the platforms and include this data in cooperation with ENTRO / Nile-SEC in the respective platforms.

Duration: 2 months

Deliverable 1.12: Data quality controlled; Data report on data checking, updating, and quality control, including full data lists, metadata overviews, and report on remaining gaps

Estimated expert input: 2 person month

1.13 Developing and adding inventory information of data that shall not be made available online.

While there is plenty of data available in the existing platforms as well as with the NBI organizations, there are further significant datasets, especially primary data like water levels, flows, rainfall, etc. that are available with Eastern Nile basin country institutions in Ethiopia, South Sudan, and Sudan that are not intended to be provided online but that are only available on request. These datasets reside with the responsible ministries in the individual countries (e.g. Ministry of Water & Irrigation, etc.). ENTRO will facilitate contacts to Ethiopian, South Sudanese, and Sudanese governments for the consultant to obtain inventories of the available data (not the data itself). The inventories shall be made available in the platforms together with contact details at the responsible institutions with the goal to provide knowledge of what further data is available on request at Nile basin institutions.

Duration: 2 months

Deliverable 1.13: Inventories of primary and secondary data available at Nile basin institutions; Inventories included in the platforms

Estimated expert input: 1 person month

1.14 Provide data gap overview to be shared by riparian countries/institutions with the request for gapfilling where data may be available, Inclusion of incoming data.

Based on the populated databases, the consultant will develop a short report on data gaps, listing data that is not available but would be beneficial for improved hydrometeorological modelling, as well as assessments in the riverine-environmental, irrigation, and hydro-energy sectors in the Nile basin. The data descriptions need to be comprehensive, including suggested parameters, locations, measuring frequencies, equipment requirements, etc. Ongoing monitoring improvement initiatives have to be considered and mentioned. The report is intended to be shared with the Eastern Nile countries to provide suggestions for future upgrading of data collection.

Duration: 1 month

Deliverable 1.14: Data gap report including recommendations for data collection

Estimated expert input: 0.5 person month

1.15 Developing maintenance strategy to ensure platforms and datasets are maintained and publishing of data continues.

In cooperation with ENTRO and Nile-SEC the consultant will develop a maintenance strategy to ensure the platforms will stay updated and in use. This will include a dissemination strategy inviting Nile basin country institutions to use the platforms/databases, as well as for them to upload their own data into the databases on a regular or as-required basis, as well as a maintenance strategy for ENTRO and Nile-SEC to handle incoming data and continuously update the databases. It is expected that at least two online workshops are held between the consultant and ENTRO/Nile-SEC during the development process and that various stakeholders are being contacted for their guidance for successful implementation.

Duration: 2 months

Deliverable 1.15: Report on maintenance strategy for data and information platforms with concrete implementation steps

Estimated expert input: 0.5 person month

1.16 Add/improve platform function for including/presenting project- and study results.

The currently existing platforms mainly host data but do not include the ability to specifically include project- or study results. The consultant will develop this additional functionality by adding it to one of the existing platforms. The new project space is envisaged to include pages with project name, project number, implementing parties (donors, hosts, consultants, stakeholders), a description of project results, and the ability to integrate or provide permalinks to project reports (with the reports being integrated in the literature repository of the data platform). The project space shall have the ability to continuously add projects and as such allow third parties (e.g. universities, consultants) who conduct relevant work on the Nile to publish their project information and as such generate a project repository including detailed search function.

Duration: 2 months

Deliverable 1.16: Platform function for presenting project results integrated in platforms
Estimated expert input: 2 person month

5.2.6. WP6 – Development of Eastern Nile practitioners web-forum

Tasks:

1.17 Establish a web-based knowledge exchange forum.

The web-based knowledge exchange forum is intended to allow interested individuals to sign up with the forum to find solutions, discuss, ask questions, and provide knowledge with regards to hydrometeorological assessment related topics in the Nile basin. Topics shall include hydrological and hydrologic modelling, sedimentation/erosion, hydrology and water balances, environmental aspects, hydropower, irrigation, etc. The consultant will propose and agree an initial structure including search functions in order to make forum information easily visible and accessible. Examples for such forums with envisaged similar functionality include e.g. the WEAP¹ and HEC² modeller forums where topic specific problems are being discussed. Interested people shall have the ability to sign up for these forums, receive bulletins, receive e-mail messages when receiving answers to their threads, etc. Administrators shall have all rights to deal with the forum including deleting inappropriate threads. Registered users shall have the possibility to open new threads and reply to threads, using plain text as well as including images files. Following development, feeding some initial threads, and acceptance by the client, the forum shall be presented in an online workshop to a wide audience to promote its utilization.

Duration: 3 months

Deliverable 1.17: Eastern Nile practitioners forum online and running; Workshop provided
Estimated expert input: 2 person month

1.18 Provide training for forum administration and moderation.

Administrator/moderator manuals shall be provided for all aspects of running and maintaining the forum. Training for administrative and moderation tasks shall be provided to ENTRO in order to fully enable selected ENTRO staff to run and moderate the forum as well as to solve any issues.

Duration: 1 month

Deliverable 1.18: manuals provided; Training provided
Estimated expert input: 0.5 person month.

¹ <https://www.weap21.org/index.asp?action=48>

² <https://www.kleinschmidtgroup.com/the-ras-solution-forum/forum/hec-ras-help/>

6. Timeline and workplan

The workpackages are envisaged to be implemented within a 12 month timeframe.

Workplan	Implementaton period (months)											
	1	2	3	4	5	6	7	8	9	10	11	12
WP1 – Hydrological and hydraulic modelling	■	■	■	■	■	■	■					
Modeling inception	■											
1.1 Hydrological baseline model		■	■	■								
1.2 Hydraulic baseline model					■	■	■					
1.3 Training for selected trainees		■	■	■	■	■	■					
WP2 – Water resources planning	■	■	■	■								
Water resources planning inception	■											
1.4 Develop HEC Res Sim model		■	■	■								
1.5 Develop WEAP model		■	■	■								
1.6 Training for selected trainees		■	■	■								
WP3 – Erosion and sediment transport modelling	■	■	■	■								
Modeling inception	■											
1.7 Erosion 6 sediment transport models HEC		■	■	■								
1.8 Erosion 6 sediment transport model SWAT		■	■	■								
1.9 Training for selected trainees		■	■	■								
WP4 –Enhance Eastern Nile toolkits	■	■	■	■								
Toolkits inception	■											
1.10 Enhance 5-6 existing toolkits		■	■	■								
WP5 – Assessing, streamlining and updating ENTROs data	■	■	■	■	■	■	■	■	■	■	■	■
Assessing individual platforms and streamlining inception	■											
1.11 Repopulating platforms		■	■	■	■							
1.12 Quality checking, cleaning and sorting						■	■					
1.13 Inventory information								■	■			
1.14 Provide data gap overview										■		
1.15 Developing maintenance strategy											■	■
1.16 Add/improve platform function				■	■							
WP5 – Develop Eastern Nile practitioners web-forum	■	■	■	■	■							
Review existing practioners web-forums inception	■											
1.17 Web-based knowledge exchange forum		■	■	■								
1.18 Training					■							

7. Staffing of consultant's team

The consultant is required to bring the following experts to the project. Positions can be filled flexibly by one or more experts, combining expertise.

Overall

Team Leader with a background in transboundary water resources planning and management, data management, water resources modeling, hydrological and hydraulic modelling in the Nile basin, minimum of 15 years work experience in the Nile basin.

WP1 – Hydrological and hydraulic modelling

Hydrological and Hydraulic Modeller(s) with experience in HEC-HMS and HEC-RAS models as well as ideally experience with other models used by ENTRO (e.g. RiverWare, RIBASIM, MIKE). GIS and RS experience. Minimum of 10 years experience modelling in the Nile basin. Training experience.

WP2 – Water resources planning

Modeller with strong experience using HEC Rs Sim and WEAP, Training experience, ideally Nile basin experience. GIS experience. Training experience

WP3 – Sediment (and erosion) transport modelling

Modeller with strong experience in applying the erosion- and sediment transport modules of HEC-RAS. Ideally Nile basin experience. GIS and RS experience. Training experience

Modeller with strong experience using SWAT under similar conditions as in the Eastern Nile. Ideally Nile basin experience. GIS experience. Training experience

WP4 – Enhance Eastern Nile toolkits

Water resources expert with very good Excel skills for programming Excel based tools. Nile basin experience.

WP5 - Assessing, streamlining and updating ENTROs online data and information platforms

Website developer including experience with frontend programming and backend integration of databases and websites related to management and information systems. Minimum of 10 years experience. Sub-saharan experience required.

Database management expert with experience related to hydrometeorological data and GIS and RS. Minimum of 10 years experience.

Hydrologist with experience with data management in the Nile basin. Minimum of 10 years experience.

GIS and Remote Sensing expert with experience in hydrological data management and a minimum of 10 years experience.

WP6 – Development of Eastern Nile practitioners web-forum

Web forum developer with experience in development and maintaining of online web forums and integrating these into websites. Experience in sub-saharan Africa required.

Annex – Need and Gap Assessment Report on Water Resources Models and Tools

1. Background

2. Objective and Scope of Works

- 2.1 Task 1: Review ENPM Modeling tools, Toolkits and ENTRO Knowledge Products
- 2.2 Task 2: Water Resources Planning Tools and Models Needs and Gaps Assessments
- 2.3 Task 3: Develop Firm Level Terms of Reference

3. Initial Discussion Results

4. Assessment Criteria

5. NBI Web Resources

- 5.1 Integrated Knowledge Portal (IKP)
- 5.2 ENTROSpace
- 5.3 WEB-IMS
- 5.4 ENTRO information hub
- 5.5 Nile Information system
- 5.6 Nile DSS
- 5.7 Other models
- 5.8 Summary and discussion of available tools

6. Workshop Results

- 6.1 Situational analysis - Data
- 6.2 Gap assessment - Data
- 6.3 Potential solutions - Data
- 6.4 Potential ToR tasks - Data
- 6.5 Situational analysis – Models and Tools
- 6.6 Gap assessment– Models and Tools
- 6.7 Potential solutions – Models and Tools
- 6.8 Potential ToR tasks – Models and Tools

7. Mission Results

8. Overall Needs and Gaps Assessment

- 8.1 Data
- 8.2 Knowledge sharing
- 8.3 Modelling
- 8.4 Capacity building

9. Recommendations and Way Forward