

Hands-On Training

on

EN-WRMT WebGIS Portal User Training manual

Trainers:

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Training Modules

Module 1: Overview of the EN WRMT WebGIS Portal

Module 2: Model and Tools Section

Module 3: EN-Hydrological and Hydraulics models - HEC DSSVUE, HEC HMS, HEC RAS

Module 4: EN-Water Resources Planning, Sediments & Erosion Transport Model- HEC RESSIM, HEC HMS and SWAT

Module 5: EN-Toolkits, Web Forum, Links & Resources

Module 1: Overview of the EN WRMT WebGIS Portal and Login

A new platform, which is identified as Eastern Nile Water Resources Models and Tools (EN-WRMT) web portal. It will be integrated with the nilebasin.org website at the end of the project.

Since one of the main functions of the platform is to show geospatial datasets, designing a web application architecture for a geoportal website involves considering the specific needs for handling geospatial data, interactive maps, and various user interactions.

The platform is based on free and open source software's (FOSS) for geospatial data management and publishing as well as free libraries for the design and development of the Web-GIS application. FOSS are computer application libraries that are legally and technically available for use by any interested party without a patent, copyright or any other limitations. These software are freely accessible in standardized formats that are compatible with most computer operating systems.

The web platform is designed to provide users with access to geospatial data and models related to EN-Water Resources. The system is fully linked with a geospatial database (PostGIS) and visualized through MapStore. Users with different authorization levels can access various functionalities, including attribute table views, data filtering, and dataset downloads in multiple formats (shapefile, CSV, GeoJSON, etc.). Additionally, each model integrated into the platform is accompanied by a brief description for ease of understanding.

System infrastructure

The system architecture is based on free and open source software's (FOSS) for geospatial data management and publishing as well as free libraries for the design and development of the Web-GIS application. This project will utilize a number of FOSSs such as Apache Tomcat server, GeoServer, Leaflet JS, Quantum GIS, PostgreSQL and PostGIS. Generally, the Web-GIS will incorporate three specific parts: 1) a geospatial database to store geographic data and allow new data to be incorporated, 2) a geospatial data publisher to act as a server that will send data over the web so it can be mapped, and 3) a web mapping library to display the data and functions of the map itself. The overall infrastructure that is adopted for creating the system architecture for the Web-GIS is as shown in the figure below.

It has Geospatial data management, Geospatial data publishing, Web-GIS client-side development, Web-GIS server-side development



Figure 1. System architecture and software

Web GIS portal interface

The structure of the pages and subpages are the following

- **HOME** : Home page of the web GIS portal and shows the EN-WRMT models and Tools
- **ABOUT EN-WRMT** : A short description about the WebGIS portal
- EN-Water Resources Models and Tools : A sub page that deals with the Models and

Tools along with Web Maps and Dashboards.

- Links and Resources : A sub page that has links and resources like training materials, files and manuals.
- **Contact us** : A sub page that has addresses of the contact organization and person in relation to the Web GIS portal
- Login: It is to give credentials to visiualize GIS maps, download models and etc. as per the privilege given by ENTRO.
- **HOME** : Home page of the web GIS portal and shows the EN-WRMT models and Tools
- **ABOUT EN-WRMT** : A short description about the WebGIS portal

• Login: It is to give credentials to visiualize GIS maps, download models and etc. as per the privilege given by ENTRO.



Models



EN-Hydrological and Hydraulic Models EN HEC-DSSVue EN HEC-HMS EN HEC-RAS



EN-Water Resources Planning Models

EN HEC-RESSim



EN-Sediments & Erosion Transport Models EN HEC-HMS EN SWAT

Tools



Figure 2. Front End interface of the platform homepage or Web portal (Geoportal) interface

Key Functionalities for Eastern Nile /Registered Users

- Main menu: You can find information and tools to manage layer
- **Model Description:** each model integrated into the platform is accompanied by a brief description for ease of understanding
- Access to Attribute Tables: Users can view detailed attribute tables for each layer in the system. And
- **Data Filtering**: Users can filter datasets based on specific attributes for customized analysis.
- **Download Options**: Data is available for download in various formats such as shapefile, CSV, and GeoJSON.
- Importing map file or vector data
- Exporting maps
- Measure area, length and bearing
- Share tools
- Tutorials on how to use the portal and documentations



Figure 3. Key functionalities for ENTRO/registered users

Module 2: Model and Tools Section

The interface of the system was developed to interact with maps and hydrological data of the project work packages, divided into four main sections:

- EN-Hydrological and hydraulics models sub page
 - HEC DSSVUE GetData and Goto Map
 - o HEC HMS GetData, Download Models, Dashboards, and Goto Map
 - o HEC RAS Goto Map
- EN-Water Resources Planning Models sub page
 - Maps HEC-RESSIM Maps both Existing and Future Configuration
- EN-Sediments & Erosion Transport Models sub page
 - HEC-HMS and SWAT
- EN-toolkits Sub page
 - EN-Irrigation and Drainage Toolkit
 - Watershed Management Toolkit
 - EN Power Tools and Guidelines Toolkit
 - o Information Management System
 - o CAPMAS Agriculture Database Model
 - o Eastern Nile Irrigation Toolkit



Figure 4. EN-WRMT Models and Tools Section

EN-Water Resources Models and Tools- These pages are accessible to the users with login-ENTRO Users.

Precipitation of each sub-basins, river reach, and station flow data is visualized with interactive map tools. Registered users can filter data for customized analysis and export it in various formats.

Some of the pages are with username and password

Sub sections: EN-Hydrological and hydraulics models:



Figure 5. Interface of the WebGIS for EN-Hydrological and hydraulics models

HEC-DSSVue - short description (A link is provided to see the details) https://www.hec.usace.army.mil/software/hec-dssvue/

- Get Data (It takes the users to the DSSVue.dss file uploaded in the database)
- Go to Maps (It takes the users to the WebGIS Maps with Flow stations average flow rate and Rainfall stations (Number of records)

HEC-HMS - short description (A link is provided to see the details) https://www.hec.usace.army.mil/software/hec-hms/

- Get Data (It takes the users to the .dss file uploaded in the database)

- Download Models (it provides the links to download the HEC HMS Models V1.0 for Atbara, Blue Nile, Main Nile, BARO AKOBO SOBAT)
- Dashboards (it provides the links to download the HEC HMS dashboards for Atbara, Blue Nile, Main Nile, BARO AKOBO SOBAT)
- Go To Map (It takes the users to the WebGIS Maps with
- **HEC-RAS** short description (A link is provided to see the details)
 - Go To Map (It takes the users to the WebGIS Maps of Average water level Average level [m a.s.l.] for a dry year, Average level [m a.s.l.] for a reference year, and Average level [m a.s.l.] for a wet year
 - Average Level Scenario 0 (Current Condition)
 - Average Level Scenario 1 (SSP2)
 - Average Level Scenario 2 (SSP3)
 - Rivers- Rivers network

EN-Water Resources Planning Models:

HEC-RESSim- short description (A link is provided to see the details)

- Maps (It takes the users to the WebGIS Maps of HEC-RESSIM in the Existing Configuration and Future Configuration)
 - RESSIM Existing Configuration Point data of Existing and Rivers networks
 - RESSIM Future Configuration Point data of Future and Rivers networks

EN-Sediments & Erosion Transport Models:

HEC-HMS -short description (A link is provided to see the details)

- Go To Map (It takes the users to the WebGIS Maps of HEC-HMS (Sediment and Erosion Modelling)
 - Atbara River Sediment, Rivers, and Atbara Basin Sediment
 - Blue Nile River Sediment, Rivers, and Blue Nile Basin Sediment

SWAT -short description (A link is provided to see the details)

- Go To Map (It takes the users to the WebGIS Maps of **SWAT**
 - Atbara Rivers

- Atbara Basin
- Blue Nile Rivers
- Blue Nile Basin

Module 3: EN-Hydrological and Hydraulics models - HEC DSSVUE, HEC HMS, HEC RAS

Sub sections: EN-Hydrological and hydraulics models:



Figure 6. Interface of the WebGIS for EN-Hydrological and hydraulics models

3.1. HEC-DSSVue - short description (A link is provided to see the details) https://www.hec.usace.army.mil/software/hec-dssvue/

- Get Data (It takes the users to the DSSVue.dss file uploaded in the database)
- Go to Maps (It takes the users to the WebGIS Maps with Flow stations average flow rate and Rainfall stations (Number of records)
- It includes GIS layers of
 - Flow stations average flow rate (m³/s)
 - Rainfall stations (Number of records)

Baselayers: Nile lakes, Nile rivers, Nile Subbasins, Nile basin, EN-Countries, Africa Countries



It shows a graph of number of records per Sub Basins

Click to Download		
NAME	VERSION	ACTION
ENTRO_HYDRO_STATIONS.dss	v1.0	Download
ENTRO_HYDRO_STATIONS.shp	v1.0	Download
ENTRO_METEO_STATIONS.dss	v1.0	Download
ENTRO_METEO_STATIONS.shp	v1.0	Download
HYDRO_METEO_DATABASE.zip	v1.0	Download

Figure 7. HEC-DSSVue Web Map



Figure 8. HEC-DSSVue Web Map (identifying detail information about a flow station)



Figure 9. HEC-DSSVue Web Map (identifying detail information about a Rainfall station)

3.2. HEC-HMS - short description (A link is provided to see the details) https://www.hec.usace.army.mil/software/hec-hms/

- Get Data (It takes the users to the .dss file uploaded in the database)

- Download Models (it provides the links to download the HEC HMS Models V1.0 for Atbara, Blue Nile, Main Nile, BARO AKOBO SOBAT)
- Dashboards (it provides the links to download the HEC HMS dashboards for Atbara, Blue Nile, Main Nile, BARO AKOBO SOBAT)
- Go To Map (It takes the users to the WebGIS Maps with
 - Atbara Basin HMS Results and Atbara sub-catchments
 - Main Nile Basin HMS Results and Main Nile sub-catchments
 - Blue Nile Basin HMS Results and Blue Nile sub-catchments
 - Baro-Akobo_Sobat Basin HMS Results and Baro-Akobo-Sobat sub-catchments

The map for EN-HEC-HMS is updated showing the sub-basins information for each basin: the specific GIS layers for each basin, sub-basin and its attributes. One can see the attributes or information while clicking on the sub-basin spatial data.



Figure 10. HEC-HMS short description with buttons to go to Map, DSS file, Version1.0 Models and Dashboards for Atbara, Blue Nile, Main Nile and Baro-Akobo-Sobat basins

3.2.1. Get Data

It takes the users to download the .dss file uploaded in the database for HEC HMS (HMS_RESULTS (1).dss)

3.2.2. Download Models

It provides the links to download the HEC HMS Models V1.0 for Atbara, Blue Nile, Main Nile, BARO AKOBO SOBAT. EN-HEC-HMS models (Atbara, Main Nile, Blue Nile, and Baro-Akobo-Sobat basins) are uploaded in the portal through a splash screen to choose the desired model as per the user needs and interest.

HEC HMS Models Click to Download		
NAME	VERSION	ACTION
Atbara	v1.0	Download
Blue Nile	v1.0	Download
Main Nile	v1.0	Download
BARO AKOBO SOBAT	v1.0	Download

Figure 11. HEC-HMS Version1.0 Models for Atbara, Blue Nile, Main Nile and Baro-Akobo-Sobat basins

3.2.3.Dashboards

It provides the links to download the HEC HMS dashboards for Atbara, Blue Nile, Main Nile, BARO AKOBO SOBAT

HEC HMS Dashboards Select a Dashboard	
NAME	
Atbara	View
Blue Nile	View
Main Nile	View
Baro-Akobo-Sobat	View

Figure 12. HEC-HMS Dashboards for Atbara, Blue Nile, Main Nile and Baro-Akobo-Sobat basins



Figure 13. HEC-HMS Dashboards for Atbara Subbasin

3.2.4. Go To Map

It takes the users to the WebGIS Maps with

- Atbara Basin HMS Results and Atbara sub-catchments
- Main Nile Basin HMS Results and Main Nile sub-catchments
- Blue Nile Basin HMS Results and Blue Nile sub-catchments
- Baro-Akobo_Sobat Basin HMS Results and Baro-Akobo-Sobat sub-catchments



Figure 13. HEC-HMS go to Map for Atbara, Blue Nile, Main Nile and Baro-Akobo-Sobat basins

3.3. HEC-RAS - short description (A link is provided to see the details)

- Go To Map (It takes the users to the WebGIS Maps of Average water level Average level [m a.s.l.] for a dry year, Average level [m a.s.l.] for a reference year, and Average level [m a.s.l.] for a wet year
 - Average Level Scenario 0 (Current Condition)
 - Average Level Scenario 1 (SSP2)
 - Average Level Scenario 2 (SSP3)
 - Rivers- Rivers network



Figure 14. HEC-RAS go to Map for Average level for a dry, a reference, and a wet year in current condition, Scenario 1 and Senario 2.

Module 4: EN-Water Resources Planning, Sediments & Erosion Transport Model- HEC RESSIM, HEC HMS and SWAT

EN-Water Resources Planning Models:

HEC-RESSim- short description (A link is provided to see the details)

- Maps (It takes the users to the WebGIS Maps of HEC-RESSIM in the Existing Configuration and Future Configuration)
 - It has the following information -- Basin Name, Reservoir name, Latitude, Longitude, Status, Construction year, True if in the ResSim model, Installed Power (MW), Energy Generated per Time Step - day (MWh) in Current Condition, SSP2, and in SSP3, Evaporated volume (MCM/year) in Current Condition, SSP2, and SSP3; Plant Factor in Current Condition, SSP2, and SSP3; Power Generated (MW) in Current Condition, SSP2, and SSP3; Pool Storage (MCM) in Current Condition, SSP2 and SSP3
 - RESSIM Existing Configuration Point data of Existing and Rivers networks
 - RESSIM Future Configuration Point data of Future and Rivers networks

EN-Sediments & Erosion Transport Models:

HEC-HMS -short description (A link is provided to see the details)

- Go To Map (It takes the users to the WebGIS Maps of HEC-HMS (Sediment and Erosion Modelling)
 - Atbara River Sediment, Rivers, and Atbara Basin Sediment
 - Blue Nile River Sediment, Rivers, and Blue Nile Basin Sediment

SWAT -short description (A link is provided to see the details)

- Go To Map (It takes the users to the WebGIS Maps of SWAT
 - Atbara Rivers
 - Atbara Rivers Average Sediment Load in Scenario 0 (Current Condition)
 - Atbara Rivers Average Sediment Load in Scenario 1 (SSP2)
 - Atbara Rivers Average Sediment Load in Scenario 2 (SSP3)
 - Atbara Basin

- Atbara Average Sediment Yield in Scenario 0 (Current Condition) (t/ha/year)
- Atbara Average Sediment Yield in Scenario 1 (SSP2)
- Atbara Average Sediment Yield in Scenario 2 (SSP3)
- Blue Nile Rivers
 - Blue Nile Rivers Average Sediment Load in Scenario 0 (Current Condition)
 - Blue Nile Rivers Average Sediment Load in Scenario 1 (SSP2)
 - Blue Nile Rivers Average Sediment Load in Scenario 2 (SSP3)
- Blue Nile Basin
 - Blue Nile Average Sediment Load in Scenario 0 (Current Condition)
 - Blue Nile Average Sediment Load in Scenario 1 (SSP2)
 - Blue Nile Average Sediment Load in Scenario 1 (SSP3)

NILE BASIN INITIATIVE INITIATIVE DU BASSIN DU NIL EN-WF	RMT номе	E ABOUT EN-WRMT MODELS & TOO	DLS LINKS & RESOURCES CONTACT US Logout
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EN HEC-RESSim	HEC-RESSIM Maps Select a map		
	MAP		voir System Simulation (HEC-
C C C C C C C C C C C C C C C C C C C	Existing Configuration	View	nodel reservoir operations at
		N. C	for a variety of operational
	Future Configuration	view	. The software simulates
			flood management, low flow
t General de la constante de			supply for planning studies,
		detailed reservoir reg	gulation plan investigations, and
2 State Part State State Part Sta		real-time decision sup	oport. HEC-ResSim can represent
		both large and small	I scale reservoirs and reservoir
		systems through a r	network of elements (junctions,
		routing reaches dive	reione recorvoire) that the user

Figure 15. HEC-RESSIM Maps both Existing and Future Configuration



Figure 16. HEC-HMS Sediment and Erosion Modelling Web Map



Figure 17. SWAT Model result web maps: average sediment yield across the Atbara and Blue Nile basins.

Module 5: EN-Toolkits, Web Forum, Links & Resources

5.1 EN-toolkits Tab

1. **EN-Irrigation and drainage Toolkit :** Short Description, To find out more and download the toolkit, please select (Click) here.

NILE BASIN INITIATIVE EN-WRMT	OME ABOUT EN-WRMT MODELS & TOOLS LINKS & RESOURCES CONTACT US
EN-Irrigation and Drainage Toolkit	
	The overall objectives are to provide solid and comprehensive profile information, crop water requirement estimates and cropping patterns for all the EN irrigation schemes (existing and projected schemes). Furthermore, it aims to assess the benefits that the investment could bring (Cost-Benefit and Multi Criteria Analysis) and present general irrigation design guidelines. To find out more and download the toolkit, click here .
	齿 User Guide

2. Watershed management Toolkit; Short Description, To find out more and download the toolkit, please select (Click) here.

NILE BASIN INITIATIVE INITIATIVE DU BASSIN DU NIL EN-WRMT	HOME ABOUT EN-WRMT MODELS & TOOLS LINKS & RESOURCES CONTACT US
<section-header><section-header><section-header></section-header></section-header></section-header>	The overall objectives are to develop a sustainable framework for the management of the four sub-basins focusing on reducing vulnerability to shocks, enhancing sustainable livelihoods, achieving food security and alleviating poverty. The Kit Provides access to knowledge and information on WM, Simple analytical tools for erosion and sediment analysis and Guide for SWC practices for practitioners.
	🛃 User Guide

3. **EN power tools and guidelines Toolkit:** Short Description, and To find out more and download the toolkit, please select (Click) here.



4. **Information Management System:** Short Description, and To find out more and download the toolkit, please select (Click) here.

NILE BASIN INITIATIVE INITIATIVE DU BASSIN DU NIL EN-WRMT	HOME ABOUT EN-WRMT MODELS & TOOLS LINKS & RESOURCES CONTACT US
Information Managment System	
Nile Basin Initiative (NBI) Eastern Nile Technical Regional Office (ENTRO) Main Nile Sub-Basin Information Management System Nile Basin Initiative (NBI) Eastern Nile Technical Regional Office (ENTRO) Tekeze Setit Atbara (TSA) Information System	This Information Management System (IMS) toolkits were developed by ENTRO as a knowledge product and analytical tool.It is for Tekeze-Setit-Atbara Basins, Main Nile Basin, Blue Nile Basin, and Baro Akobo Sobat Basin. To find out more and download the toolkit, please
Nile Basin Initiative (NBI) Eastern Nile Technical Regional Office (ENTRO) Baro-Akobo Sobat White Nile Information management System(IMS) Nile Basin Initiative (NBI) Eastern Nile Technical Regional Office (ENTRO) Abbay Blue Nile Basin Information Management System	click here .

5. CAPMAS Agriculture Database Model; Short Description, and To find out more and download the toolkit, please select (Click) here.

NILE BASIN INITIATIVE EN-WRMT	HOME ABOUT EN-WRMT MODELS & TOOLS LINKS & RESOURCES CONTACT US Logout
CAPMAS Agriculture Database Model	
Area & Production Plants Number & Production Animals Execute (Number & Production Animals	 The Agricultural Statistical Agency Data Model's Structure 1. Statistical of crop areas and production plant: Data includes the size of crop and plant production (crops - vegetables - fruit) in the three lugs for oldand new lands, according to the republic governorates. 2. Irrigation and Water Resources: its includes measurement of levels and actions of the Nile, drainage projects and compare the size of cultivated land, rations of waters. 3. Livestock Statistics: Its includes estimates of the number of cattle, poultry, livestock production quantities and Insecticide.
	 4. Animal statistical of fish production: its includes statistical data on fish production according to species, fishing areas, months, and the value of exports and imports. 5. Estimated income from the agricultural sector : its includes data on the value of production and net farm income (plant, animal,

6. Eastern Nile Irrigation Toolkit : Short Description, and To find out more and download the toolkit, please select (Click) here.

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	E BASIN INITIATIVE IATIVE DU BASSIN DU NIL EN-WRMT	HOME ABOUT EN-WRMT MODELS & TOOLS	LINKS & RESOURCES CONTACT US Logout
Easter	n Nile Irrigation Toolkit		
NILE BASI	IRRIGATION TOOLKIT	l Office(ENTRO)	
c	Overview	Sources of Data	
Home Th Water Resources	nis section provides	1.JMP1 One System Inventory (ENTRO Project)	
Projects	1. Water Availiability	2.JMP1 Scoping Study (ENMOS Model) (WB Consultant)	~~~~ { } ` ` ` `
Guidelines Performance Indicators	2. Hydrology of the EN Sub-basins	3. EN Power Trade Study Water Availiability (ENTRO Project)	
Design Sheets	3. Characteristiics of Existing and Potential Large Scale Reservoirs	 EN Flood Preparedness and Early Warning (ENTRO Project)5. Nile- DST (NBI-Project) 	my 23
	4. Water Demands for Irrigation Schemes	6. FRIEND Project (Stochastic Component) (UNESCO-Project)	
	5. Connectivity and Schematics of the Eastern Nile River Systems	5. CP19: US/DS Project (IWMI Project)	Khartonfr
		6. Minstry of Irrigation and Wter Resources - Sudan	La Cherry
		7. Minstry of Water Resources and Irrigation - Ethiopia	Sudan
		8. NBCBN River Mirphology Cluster	Recent Later
		9. PhD Research (Marc-Guland Consultant to WB)	
		10. Other Public Domain Sources available in the Internet	mark from

5.2. "Links and resources" Next to EN-Water Resource Models and Tools Tab

for the training modules and additional links for the users.

All the links will be here too.

NILE BASIN INITIATIVE INITIATIVE DU BASSIN DU NIL EN-WRMT	HOME ABOUT EN-WRMT MODELS & TOOLS LINKS & RESOURCES CONTACT US
EN Models	EN-WRMT Training Programs (TPs)
EN-Hydrological and Hydraulics models > EN HEC-DSSVue > EN HEC-RAS > EN HEC-HAS EN-Water Resources Planning Models > EN HEC-RESSim EN-Sediments & Erosion Transport Models > EN HEC-HMS > EN HEC-HMS	TP1: Hydrological and Hydraulics Models Development DSS-Vue Recordings Day 1 Day 2 Day 2 Day 2 Day 2 Day 2 Day 1 Day 2 Day 1 Day 1 Day 2 Day 2 Day 1 Day 1 Day 2 Day 2
EN-Toolkits > EN-Irrigation and Drainage Toolkit > Watershed Management Toolkit > EN Power Tools and Guidelines Toolkit > Information Management System > CAPMAS Agriculture Database Model > Eastern Nile Irrigation Toolkit	Training Materials Exercise Day 1 Exercise Day 2 Presentations EarValley DSS Training Entering Nile Data Example OGIS Recordings Day 1 Part 1 Part 2 Day 2

5.3. Contact Us section

The "Contact Us" page features a contact form along with ENTRO's contact details. The form will prompt site visitors to provide essential information (like email, phone no. etc) before specifying the purpose of their inquiry. Once completed, the compiled message will be directed to a designated email address, which will be managed by an appointed individual, likely the ENTRO Admin.



Make a Call +251 11 646 1130 +251 11 646 1132

Send an Email



Eastern Nile Technical Regional Office (ENTRO) P.O. Box: 27173-1000 Lamberet, Dessie Road,Addis Ababa, Ethiopia

Contact Us section