

Water and Environment Support

in the ENI Southern Neighbourhood region



Strengthen the water utilities capacities to manage / reduce NRW and detect leakage:

Activity No. : N-W-EG-1

Task 1: Inception workshop
(by video-conference)

30 November 2020,
Asyut, Egypt



Opening of the Workshop



**Water and
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in the ENI Southern Neighbourhood region

- Dr. Ayman AYADI, EU Delegation
- Dr. Walid HAKIKI WES Focal Point (Ministry of Water Resources and Irrigation)
- Dr. Ahmed MOAWAD, Vice Chairman HCWW
- Dr. Tarek NADA , Head of Planning and Design Sector, Holding Company for Water and Wastewater (HCWW)
- Mohamed SALAH ELDIN, Chairman, Asyut Water and Wastewater Company (AWWC)
- Suzan TAHA, Key water Expert, WES



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WES General Information

Presented by: Suzan TAHA, WES Key Water Expert





WES in a Snapshot

- WES aims at protecting the environment and improving the management of scarce water resources in the Mediterranean.
- It strives to address the country needs for creating the enabling environment and enhancing the capacities of stakeholders in the Partner Countries (PCs) to **tackle problems related to pollution prevention and water use efficiency.**
- WES capitalises on previous successful EU funded regional projects (Horizon 2020 CB/MEP; SWIM SM; SWIM-Horizon 2020 SM).



WES Identity



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Facts & Figures	
Partner Countries:	Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Libya, Palestine* and Tunisia
Project value:	7.917.200 Euros
Duration:	May 2019 – May 2023 (48 months)
Project team:	<p>Team Leader: Professor Michael Scoullos, scoullos@wes-med.eu</p> <p>Water Expert: Ms Suzan Taha, taha@wes-med.eu</p> <p>Environment Expert: Mr Anis Ismail, a.ismail@wes-med.eu</p> <p>Communication & Networking Expert: Ms Pam van de Bunt, vandebunt@wes-med.eu</p> <p>Stakeholders engagement expert: Dr. Emad Adly, wes.gc@raednetwork.org</p>
WES Focal Points (FP) (Egypt)	<p>FP Water : Eng. Walid HAKIKI (Head of Central Department for Water Resources and Uses - Planning Sector, MWRI)</p> <p>FP Environment : Mr. Essam HANNOUT (Labib) (TBC) (Egyptian Environmental Affairs Agency - Ministry of Environment)</p>

*This designation is not to be construed as recognition of the State of Palestine and is without prejudice to the individual positions of the Member States on this issue.



WES Identity



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Our Consortium



LDK Consultants Global EEIG (Leader)



Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE)



Arab Network for Environment and Development (RAED)



Association of Cities and Regions for Sustainable Resource Management (ACR+)



CIHEAM – Mediterranean Agronomic Institute of Bari (CIHEAM Bari)



Gopa Infra GmbH



Ramboll Denmark A/S



Royal HaskoningDHV



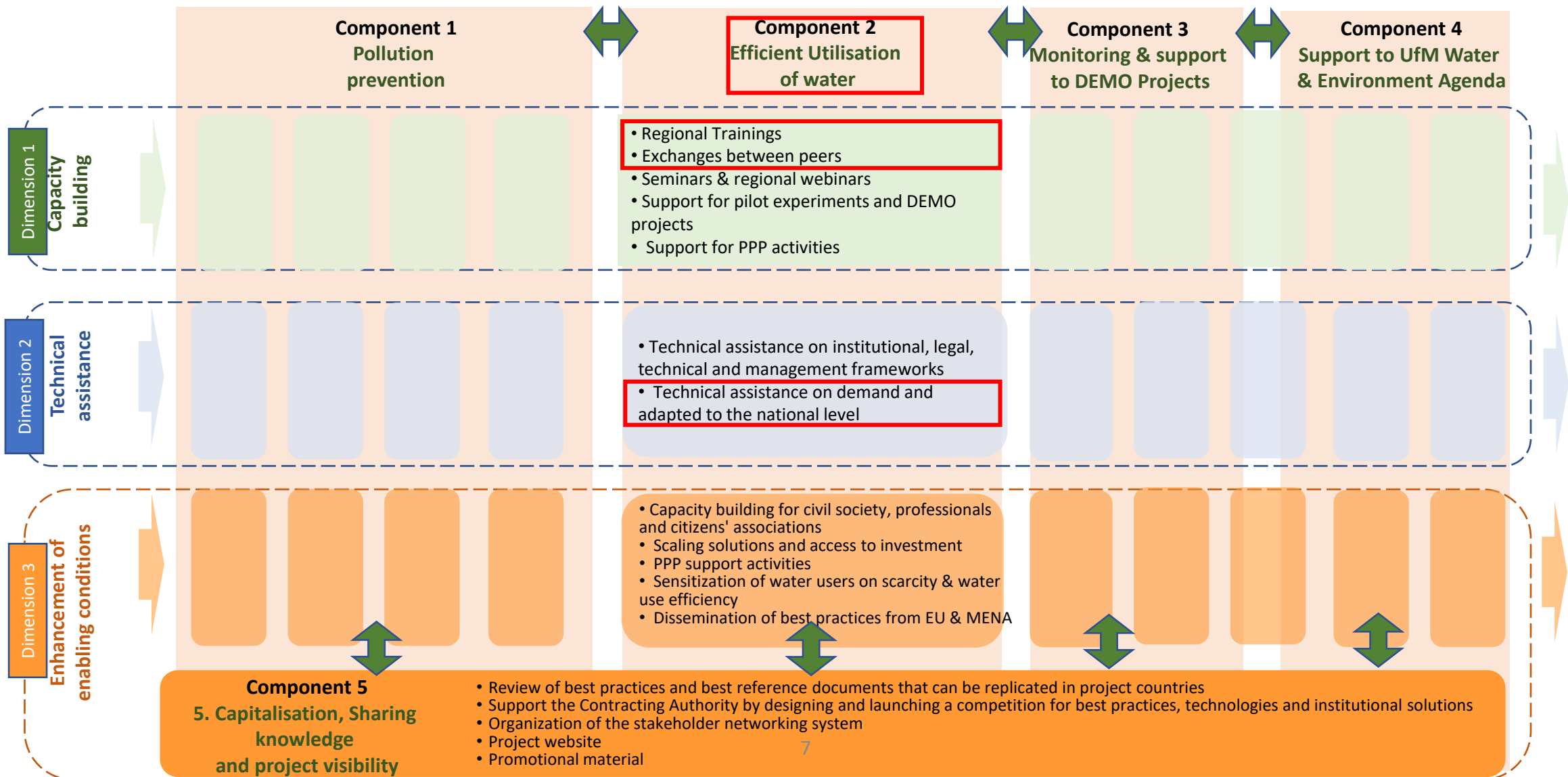
Regional Activity Centre for Sustainable Consumption and Production (ARC-SCP/RAC) of UN Environment/Mediterranean Action Plan



Project Architecture



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Project Activities

Component 2 – Technical Assistance (Egypt)

- **N-W-EG-1:** Strengthen the water utilities capacities to manage / reduce NRW and detect leakage

Launched 2 September 2020 with HCWW and ASWWC as partners

- **N-W-EG-2:** Assist Egypt in the preparation of a framework related to PPP to provide opportunities to create guarantees for the banking system, allowing the private sector to be involved and improve “water network management and resources efficiency (on-farm and main network)

TOR under preparation



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Diagnosis of the performance of Non-Revenue Water (NRW) in a pilot public service:
Activity N° : N-W-EG-1

Task 1: Inception Workshop
(by video-conference)

30 November 2020 Asyut, Egypt

Scoping of the workshop: objectives and Agenda



Scoping of the workshop:



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- **N-W-EG-1:** Strengthen the water utilities capacities to manage / reduce NRW and detect leakage
Started in September 2020 with Asyut Water and Wastewater Company as partner

Non-Key Experts	Position in the activity
M. Paolo RUFINI	International Expert on NRW, Water and Leak Detection and Technical Coordinator
M. Walid ELBARKI	Local NRW Expert
M. Zakaria YEHA	Local GIS Expert

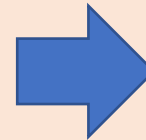


Objectives of the activity and overview of the proposed actions:



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Strengthen the capacity of a selected water utility to target the reduction of NRW and to continue its efforts to improve the monitoring and performance of NRW management



Inception phase

Collection of network and customers' data

Designing the permanent leakage control system by dividing the network in a number of zones and implementing a hydraulic model of the pilot city

Calculating the water balance in the selected zones

Preparing the NRW reduction action plan for the selected zones



Inception Phase



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Kick-off meeting by video conference on 02-09-2020

Assessment of data availability

Agree on the targets of the intervention

Present the job profiles proposed for the members of the partner team (NRW, and GIS)

Identify the stakeholders



Objectives



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Workshop Objectives

- Introduce the speakers and referees
- Present the results of the inception phase
- Communicating the data situation
- Sharing a common understanding of the actions to be taken
- Sharing a common understanding of the timetable of actions
- Discuss constraints (physical, financial, institutional) and establish solutions / ways forward



Presentation of the results/conclusions of the inception phase



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NRW Section – **Walid Elbarki**

GIS Section – **Zakaria Yehia**

Integration of GIS into NRW analysis – **Paolo Rufini**



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Presentation of the **Inception phase**
results/conclusions
NRW section

Presented by: Walid Elbarki, Local non key expert NRW



Summary



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- OVERVIEW OF NRW
 - Definition
 - NRW management
 - Technical indicators
 - Data gathering
 - Data availability assessment
 - Conclusions of the start-up mission
 - NRW Unit / Presentation / Profile / Mission

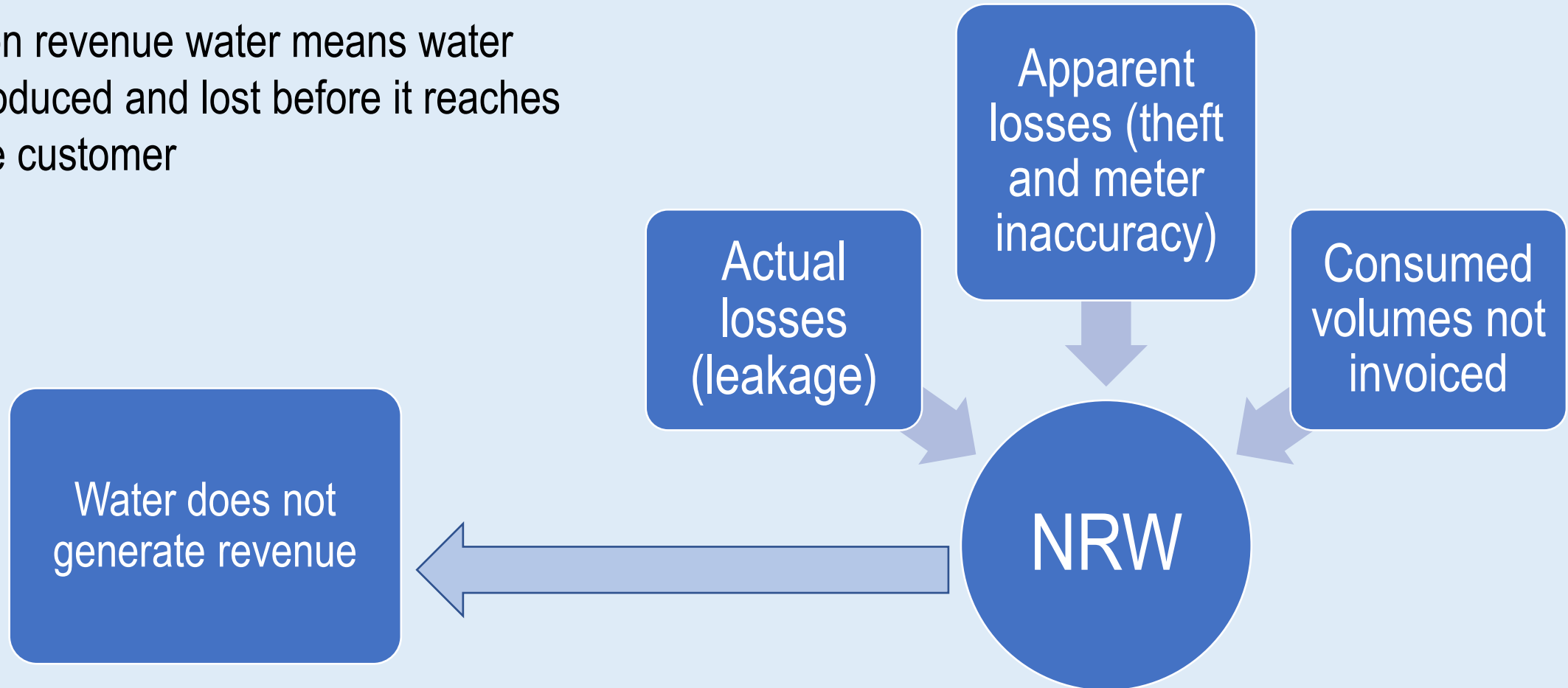


NRW overview / Definition



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Non revenue water means water produced and lost before it reaches the customer



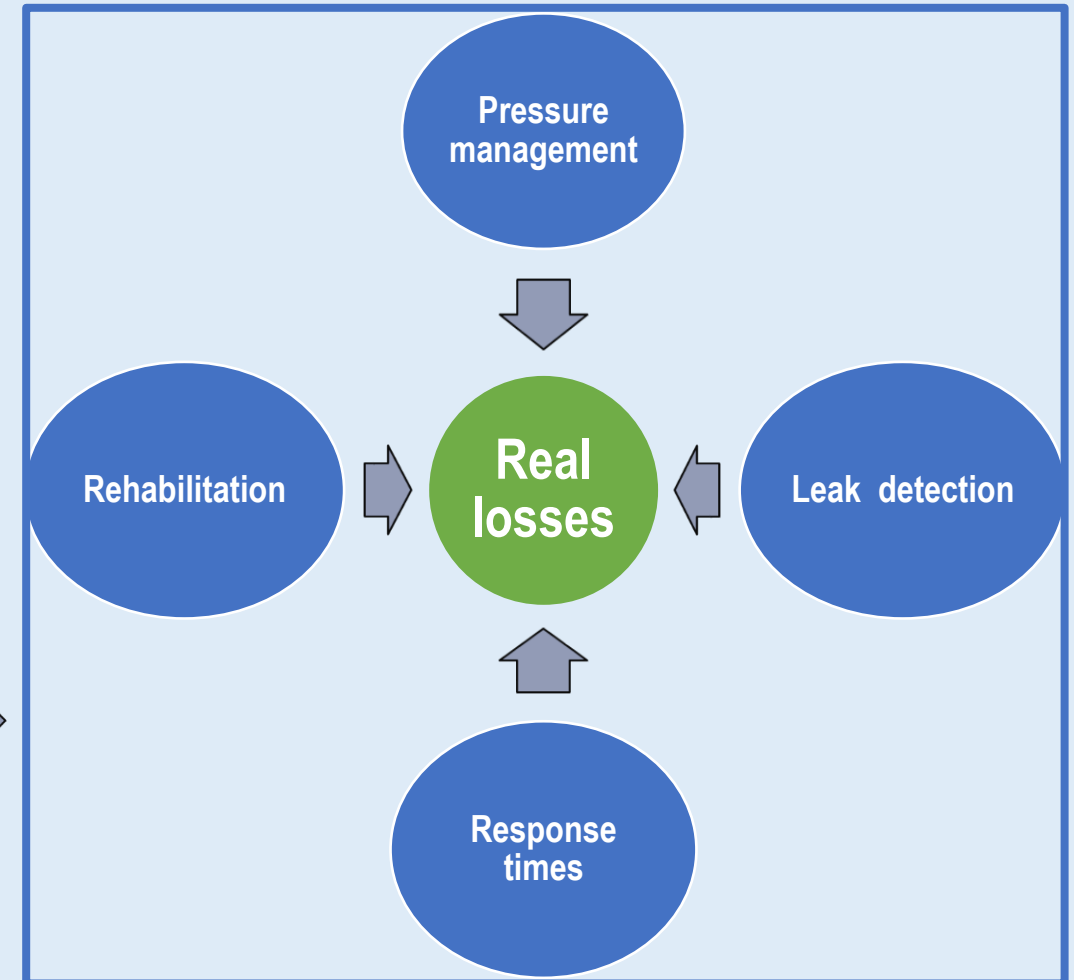
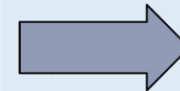
NRW overview / NRW management



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Apparent losses: are managed by improving the metering system and the actions against illegal connections

Real losses: are managed by four (4) essential keys



NRW overview / Technical indicators



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- The efficiency of the distribution network

$$\eta = \frac{\text{Counted volumes}}{\text{Volumes distributed}}$$

- The performance allows to monitor the state of a network by observing the variations from one year to the next

- Billed volumes
- Volumes distributed
- Loss volumes
- Linear network extension

- Infrastructure Leakage index

$$ILI = \frac{\text{Current Annual Real Losses (CARL)}}{\text{Unavoidable Annual Real Losses (UARL)}}$$

- The ILI helps guide the choice of the sections to be examined as a priority.



Data collection



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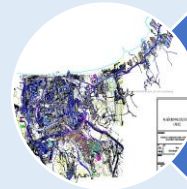
During this phase, the WES NRW and GIS experts carried out site visits in the study area to collect the data available at AWWC in Asyut.

After contacting local officials, a **preliminary inventory** of the existing data was carried out.

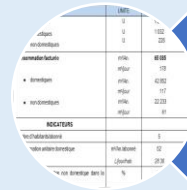
Data are available, but WES experts require a clearance to access them



GIS data



Network maps



Customers file



Monitoring equipment



Assessment of data availability



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Our Review during the mission showed the following:

- **On the GIS database**

- **On the current sectorisation plan in AutoCad/GIS format.**

(Incomplete information on location of the valves on the ground and lack of update in GIS)

(Incomplete information about the service connections in some neighbourhoods)

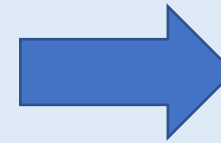
- **On the subscriber information and billed volumes for 2019.**

Problems with meters (Faulty meters + Estimated billed data)

Customers information not in GIS

Presently adding new subscribers and old subscribers to their database

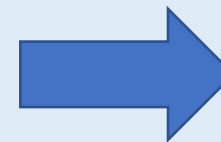
Incomplete information to carry out balancing



AWWC had oriented its choice towards the software ArcGIS



1200 mm to 1000 mm	2.6 KM
800 mm to 200 mm	119 KM
Diameter < 200 mm	163 KM



More than 106,899 customers



Conclusions of the start-up mission



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After having chosen the option where to address the project, an evaluation of the collected data should be undertaken, in order to better understand the water management situation in the area. Therefore it is mandatory that data (network, infrastructure and customers file) is provided



Need to establish a NRW unit

This work is the subject of Task 2 of the Work Plan and will be carried out jointly with the AWWC staff involved in this project.





It is the unit that will be in charge of the management of NRW activities, whose main tasks are:

- ❖ Processing and evaluation of network and customers data,
 - ❖ The implementation of the sectorisation of the network,
 - ❖ Monitoring campaign,
 - ❖ Leak Detection, →
 - ❖ Monitoring the status of the network
- Passive
Temporary active sectorisation
Permanent active sectorisation





NRW Unit / Profile

- Non-invoiced water activities have an important link between physical interventions (installation of monitoring equipment, valves, recorders), technical interventions such as leak detection and analytical work such as downloading recorders, data processing.
- It is therefore proposed that at least the following staff be provided by AWWC

Type	Number	Requirements
Network operation staff	2	Knowledge of the network, coordination of physical work
Leak detection	2	Knowledge of the network, basic understanding of leaks
Analysis of data	1	Good computer skills, basic understanding of supply and consumption data, understanding of network maps, ability to coordinate with GIS team
Team leader/NRW coordinator	1	Knowledge of consumption/invoicing data, their format, how to analyse, understand bulk metering and how to register



NRW Unit / Mission



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Type	Number	Requirements
Network Operations staff	2	<ul style="list-style-type: none"> ➤ Install flow meters and recorder, ➤ Pre-locate a leak at night,, ➤ Perform the leak localization at night,
Leak detection	2	<ul style="list-style-type: none"> ➤ Pre-locate a leak at night, ➤ Perform the leak localization at night,
Data analysis	1	<ul style="list-style-type: none"> ➤ Work in close collaboration with the GIS unit ➤ Analysis of production / distribution / consumption data,
Team leader / NRW coordinator	1	<ul style="list-style-type: none"> ➤ Work closely with production / distribution departments ➤ Analysis of production / distribution / consumption data, ➤ Establish sectorization, ➤ Define intervention priorities, ➤ Establish work orders for the leak search team



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Results / conclusions of the Inception phase
GIS section

Presented by: Zakaria YEHIA, Local non-key GIS Expert



Overview



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- Context
- Existing Situation
 - Assessment of data availability
 - Conclusion of the Inception mission & Recommendations
- Methodology
 - Business Technical Aspect
 - Training Aspect
- GIS unit
 - Presentation
 - GIS / Missions team
- GIS software
 - Presentation
 - Why QGIS



Existing Situation



**Water and
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Mission of 09/23/2020

Objectives :

- Initial data Assessment
- Data Evaluation - on site
- Selection of the GIS software



Existing Situation



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The AWWC GIS department consists of 4 persons

the AWWC GIS department:

- makes field survey to collect data **without taking geographical coordinates.**
- uses ArcGIS server 10.4
- did 11 DMAs until now (Last DMA has been implemented in June 2020)
- manually updates Map with “eyeball” accuracy
- uses the **Program satellite image as background**
- uses **SDE layers as the GIS format**
- AWWC **customers** until now are **not connected to the GIS**



Existing Situation



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Mission
27-10-2020 To 28-10-2020

Objectives :

- Equipment evaluation
- Data evaluation on site
- The GIS software
- Area Of Interest



Existing Situation



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the GIS department showed during the field mission:

- The GIS DB (geodatabase) in use
- The type of data stored in the GIS database
 - Network data (pipe and fittings)
 - Infrastructures data (water intake, WTP, PS, tanks, etc.)
- What AWWC normally does with the GIS software
 - Maps plotting
 - Selection of network elements by geographic criteria like tracing
 - Selection of specific section of network by setting parameters (DN, material, etc.)

the GIS department showed during the field mission:

- The type of data exported to the Hydraulic Model (HM)
- The type of data they normally give to the O&M Dpt.
- The type of procedures they follow to collect data from the field
- From where they take the background data (road system, buildings and plots)
- The GPS devices they use to locate network components
- The field work procedures they adopt to localize underground pipelines and a description of the method they use
- Example of maps and attributes is taken and put in a folder (images taken from the GIS application), (waiting for data).



Data Availability Assessment



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Item	Description
GIS software	ArcGIS (vers.10)
Computer Architecture	The GIS software is installed in a network
GIS data	The GIS dataset is organized in one GDB (GeoDataBase)
GIS data format	GeoDataBase
GIS data Update	2019
Data model	No business data model in place



Conclusion



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- Some findings of the collected questionnaire are :
 - Availability of background cartography (both raster (satellite imagery) and vector (dwg files))
 - Availability of layouts of the WSS network with information on pipe material and diameters, location of valves and other fittings, etc.
 - Availability of information on the main infrastructures of the WSS like water intakes, WTP, pump stations, and storage tanks
- AWWC uses GIS data to plot maps and to support decision making by using attributes selection criteria.
- GIS data is also used by AWWC departments other than the GIS Dpt. such as “O&M”, “Leak Detection” and “Planning” for daily operations.



Recommendations



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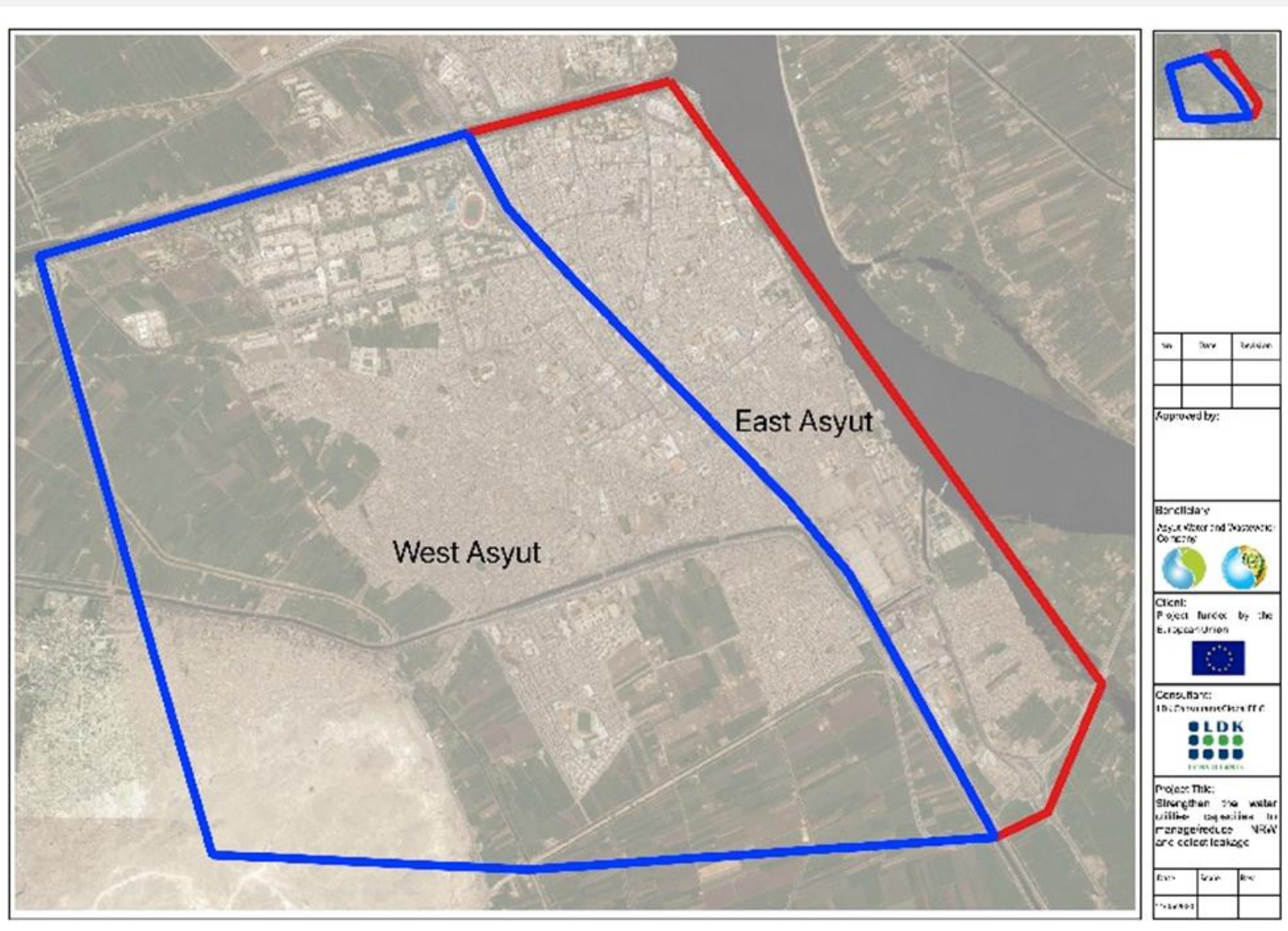
- Use shareware software like QGIS is recommended for Geographic Information System applications.
- Adding more GIS layers like house connections.
- Linking GIS to the customers database to add a “geographical” value to it
- Allow the geographic analysis of leaks and networks
- Build the capacity of the AWWC GIS staff **through** on-the-job training



Service areas: East Asyut – West Asyut



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Methodology



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Objectives

- ❑ Better knowledge of network assets and infrastructure, with the implementation of a GIS solution,
- ❑ Better database consolidation and updating procedure, including management and exploitation of leaked data.

The methodology should focus on

Technical Aspect

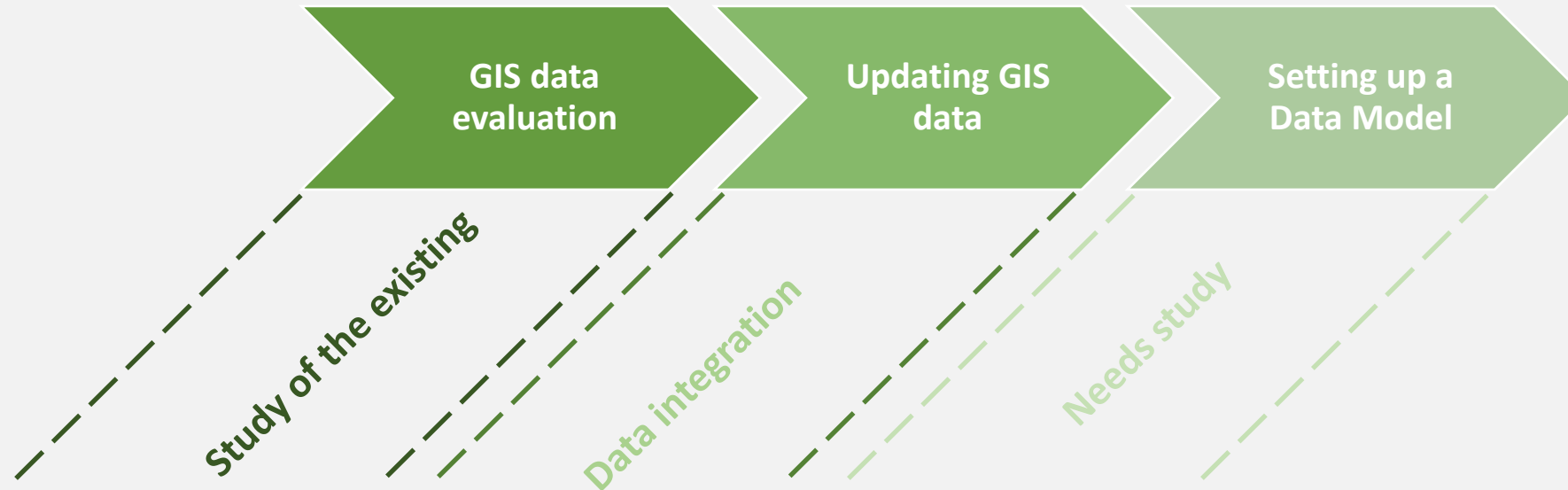
Training Aspect



Business Technical Aspect



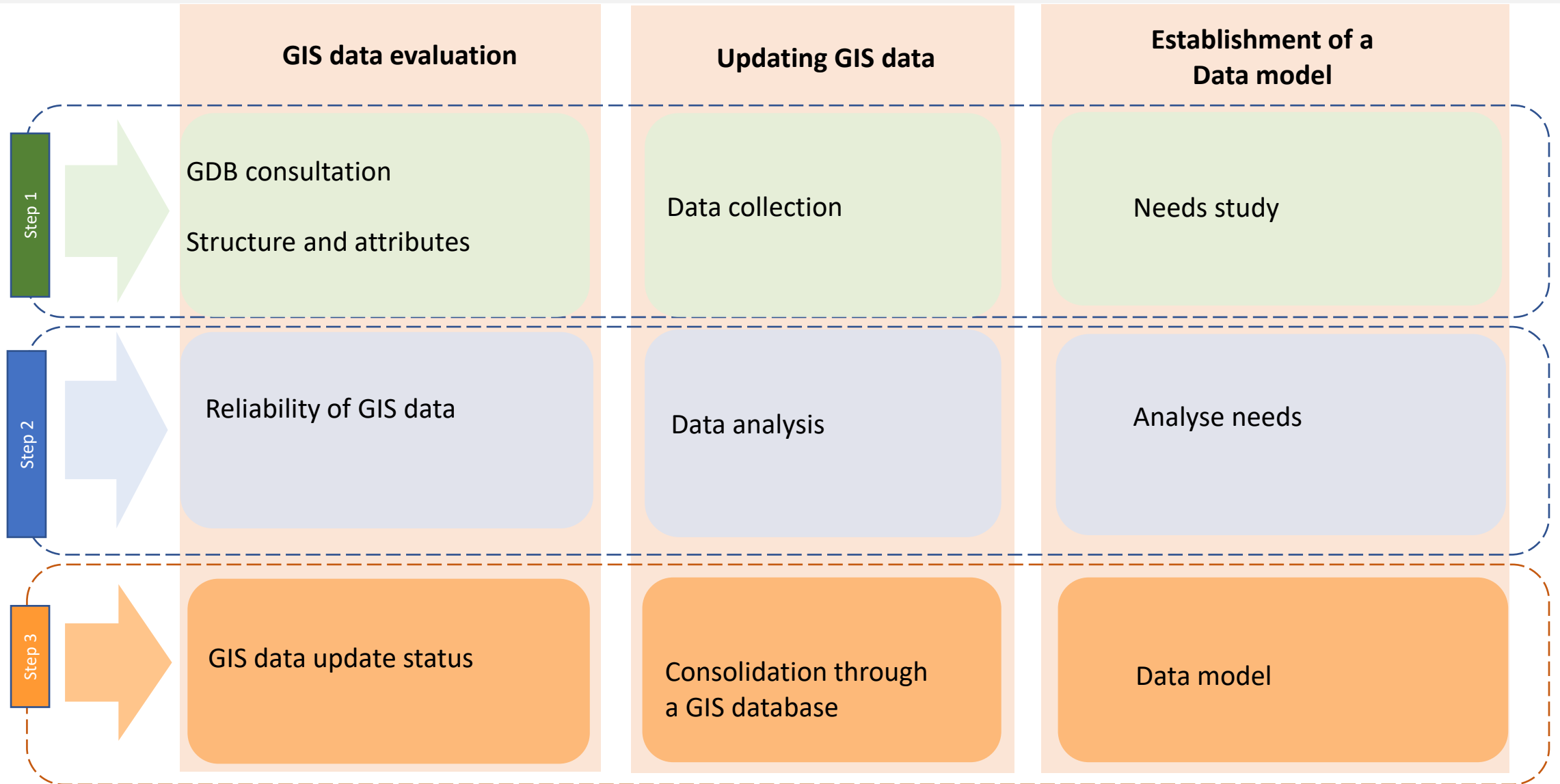
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Business Technical Aspect



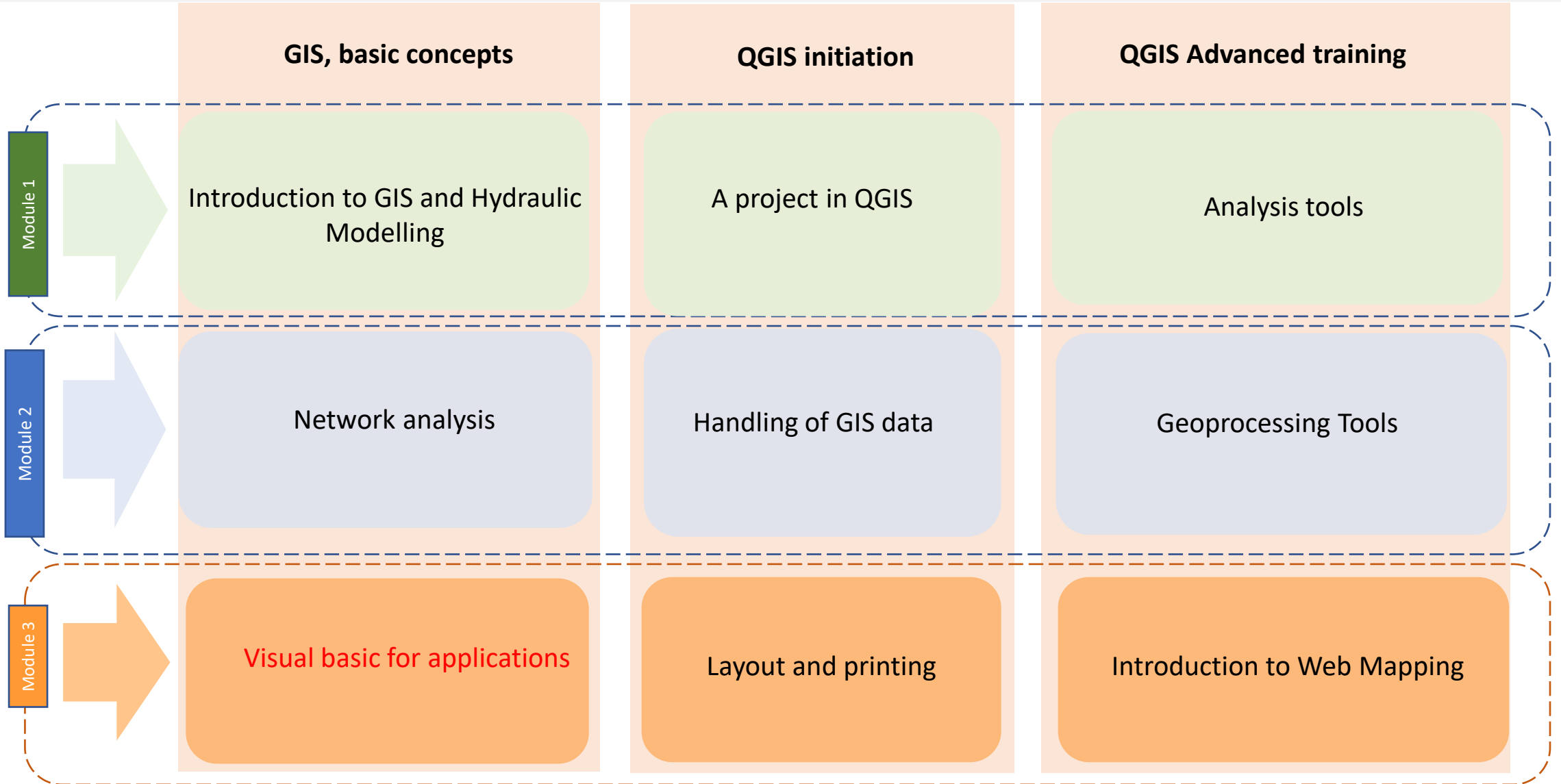
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Training Aspect



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This is the entity that will be responsible for administering the GIS activity, and providing GIS field services to benefit other departments.

Its mission:

- Production of thematic maps
- Production of GIS data,
- GIS data updating,
- Geographic Data Evaluation
- Highlighting business indicators through the GIS analysis





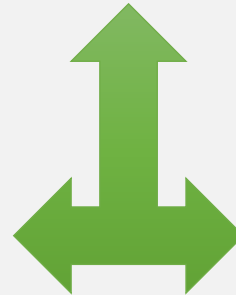
Director of the GIS

Guarantor of the good functioning of the Unit

GIS data analysts

Validation of GIS data and consolidation of GIS data, through a consolidated database

- *Improved data quality,*
- *Topology checks, attribute standardization, updates.*



GIS Designer / Cartographer

Collection and integration of data into the GIS

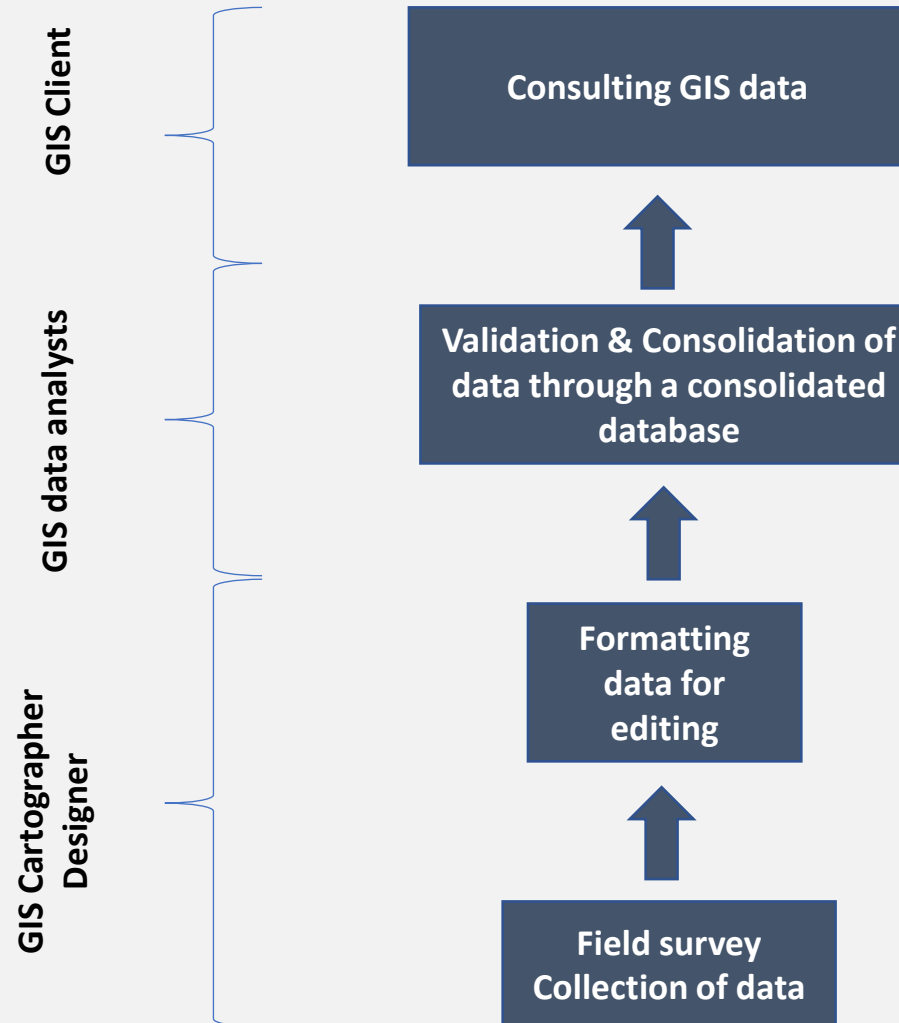
- *Network update,*
- *Basemap update,*



GIS Unit / Operation



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GIS Unit / GIS Team / Missions



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Profiles	Number	Missions
Director of the GIS	1	<ul style="list-style-type: none"> ✓ Responsible for the GIS entity within the unit, and responsible for its operation ✓ Provide technical assistance to services for the use of a Geographic Information System ✓ Monitor technology for the evolution of the GIS solution
GIS data analysts	1	<ul style="list-style-type: none"> ✓ Validation and updating of GIS data through a consolidated database ✓ Perform selection, processing and spatial analysis of geographic data ✓ Provide technical assistance to services for the use of a Geographic Information System ✓ Restore geographic information to other services ✓ Production of thematic maps on demand ✓ Manage the geographic database (data catalogs, ...)
GIS Designer / Cartographer	1	<ul style="list-style-type: none"> ✓ Carry out field surveys and collect graphic and alphanumeric data ✓ Format geographic data for map editing ✓ Integration of data into a GIS database



GIS software / Presentation



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Quantum GIS (QGIS) is an easy to learn geographic information system (GIS) for use on Linux, Unix, Mac OS X, and Windows.

QGIS supports vector, raster and database formats.

The Quantum GIS project began in earnest in May 2002 and has continued to grow through the many versions released until today.

QGIS has thus become a rich and diversified software environment making it possible to respond to the following issues:

QGIS



- Data visualization*
- Browsing data and creating maps*
- Creation, edition, management and export of data*
- Data analysis*



GIS software / Why QGIS?



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QGIS: The "Open Source" GIS solution

User-friendly and affordable
Easy to use, QGIS allows to play on interoperability and to be able to manage an impressive number of Raster & vector data formats.

Efficient solution
QGIS is today the most compact Open Source software in terms of functionalities.

Extensions
QGIS benefits from an incredible wealth of extensions, allowing you to take advantage of free cartographic support and link them with your data.

Free solution
No more need to depend on classic publishers, whose cost of acquiring licenses, as well as the annual maintenance of their solutions, are quite high.

OGC
QGIS is a compact, high-performance tool that meets the standards set by the OGC (The Open Geospatial Consortium).

Easy installation & configuration
In just one click, QGIS can be downloaded from the official QGIS website.
Its installation and configuration is extremely easy

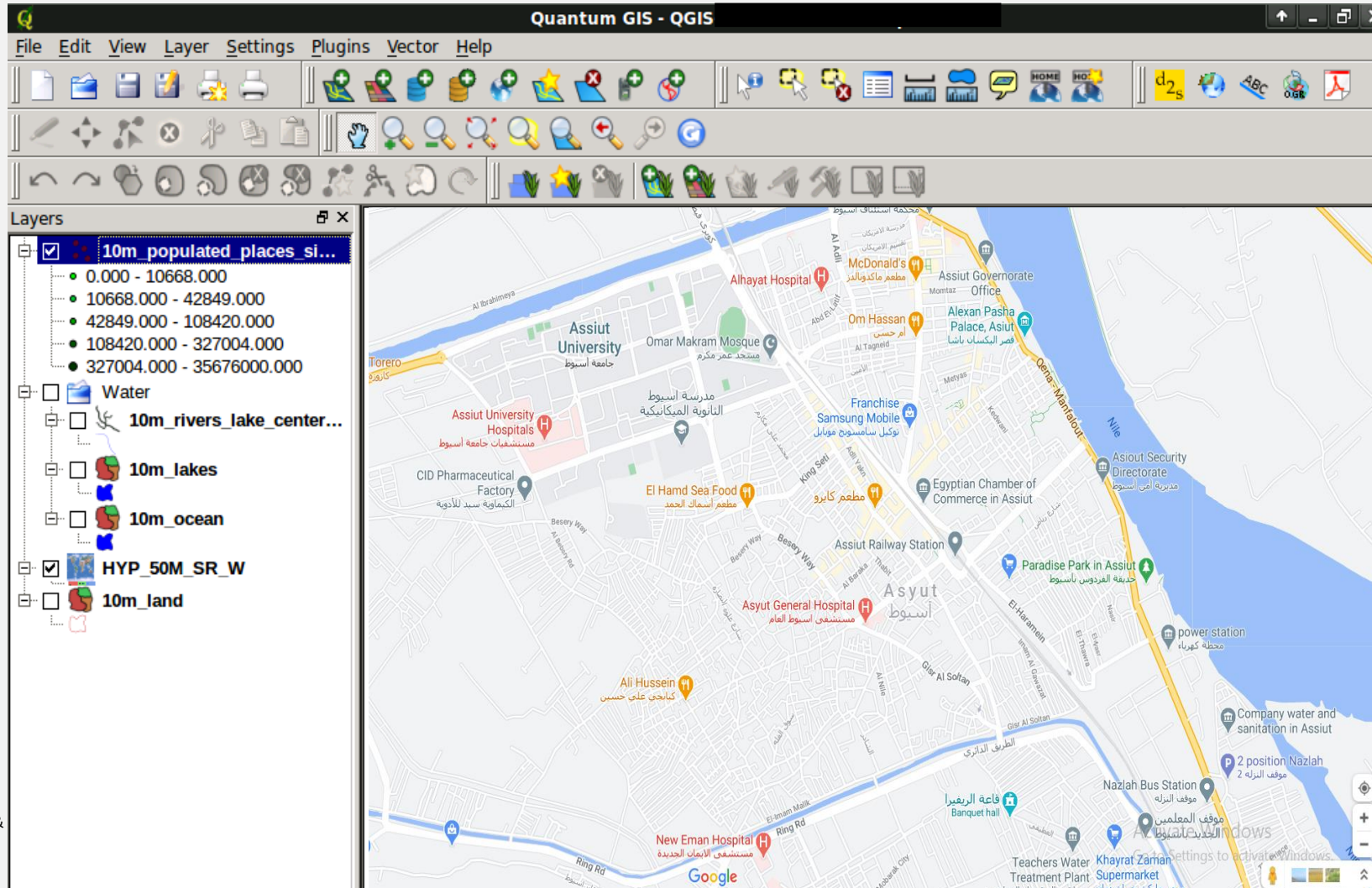
WebMapping
With QGIS you can easily set up a GIS Web Mapping application to share your GIS project with your employees.



GIS software / Why QGIS?



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Diagnosis of the performance of Non-Revenue Water (NRW) in a pilot public service:
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Integration of GIS tools in NRW analysis

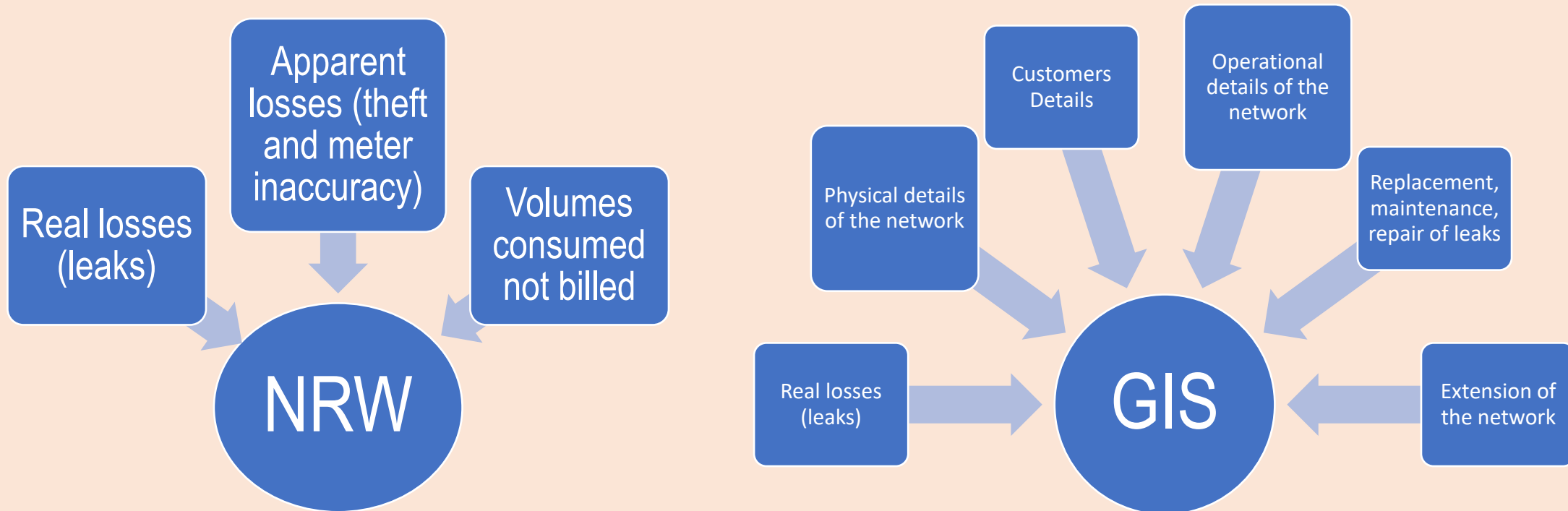
Presented by: Mr. Paolo Rufini, International NRW Expert



Integration of GIS tools in NRW analysis



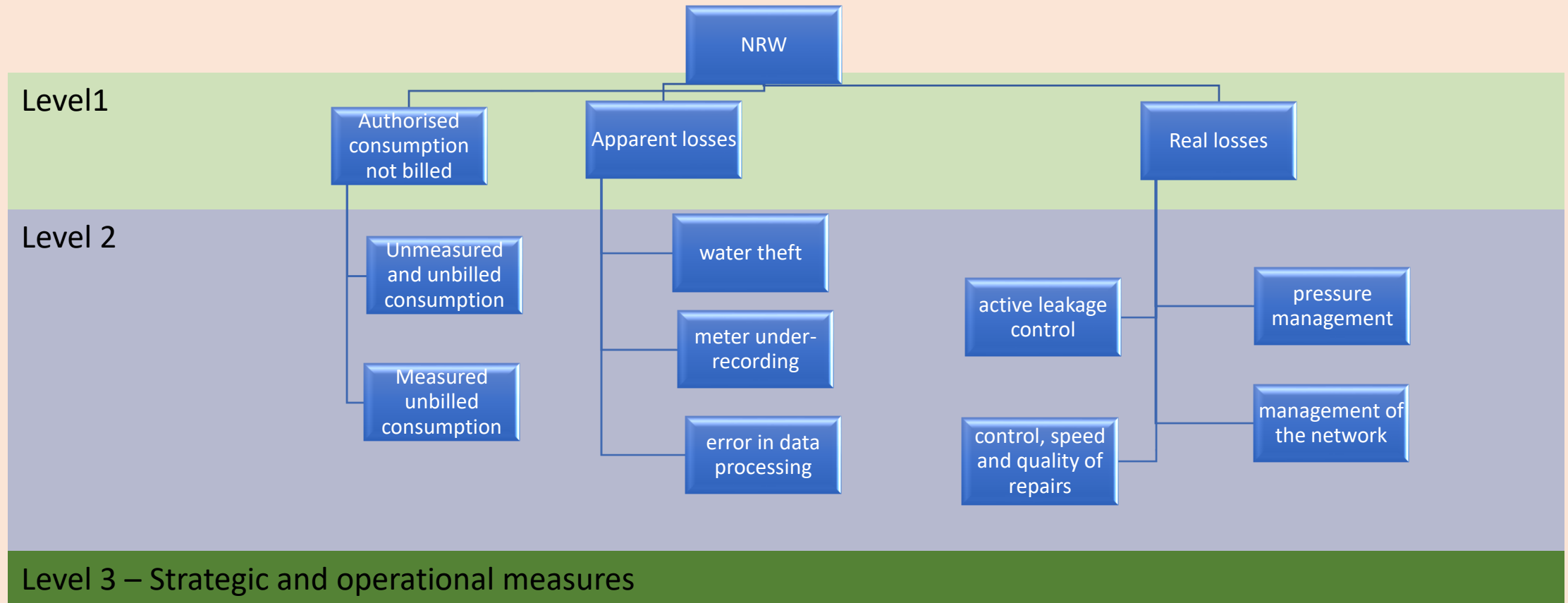
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Integration of GIS tools in NRW analysis



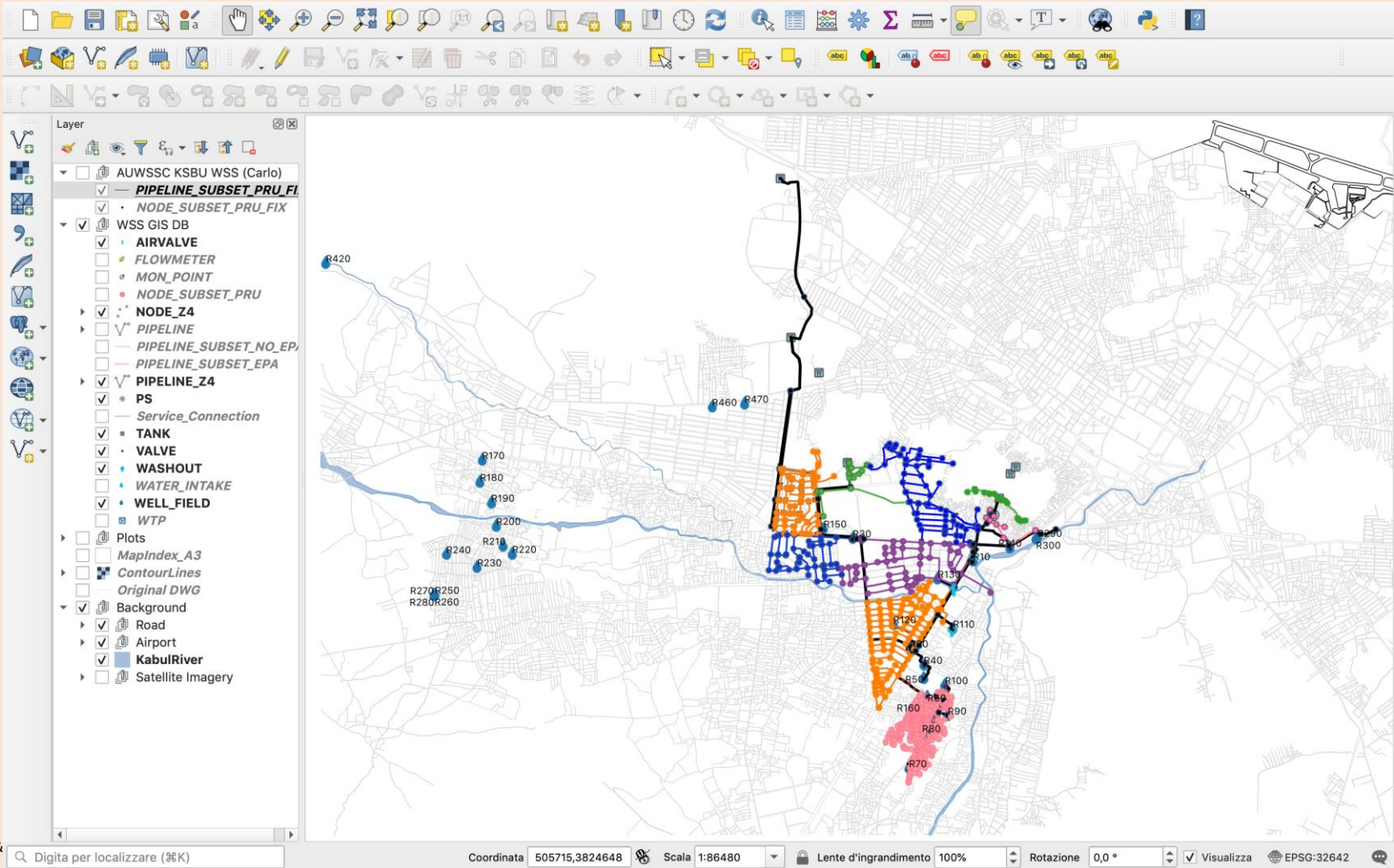
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Integration of GIS tools in NRW analysis



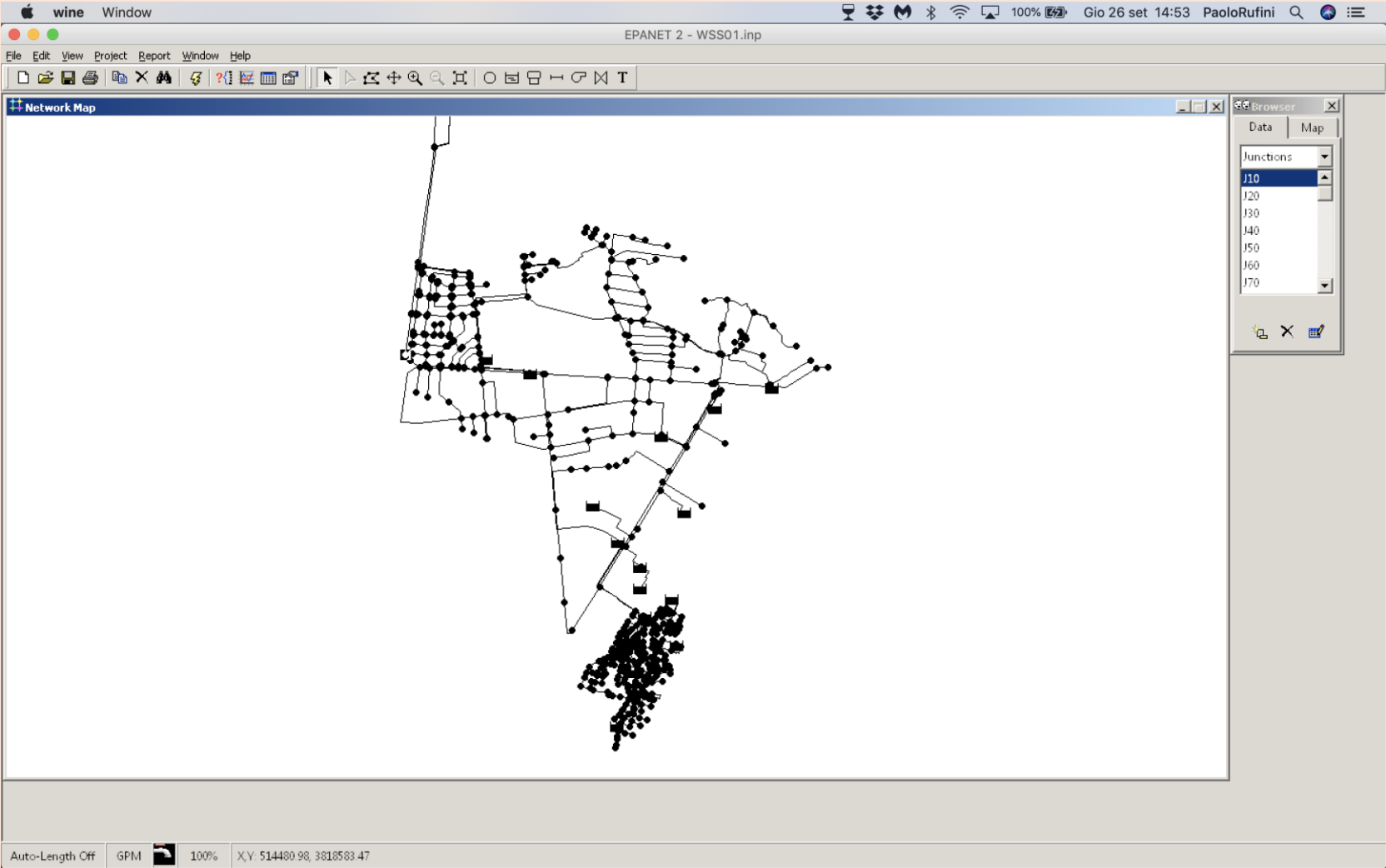
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Integration of GIS tools in NRW analysis



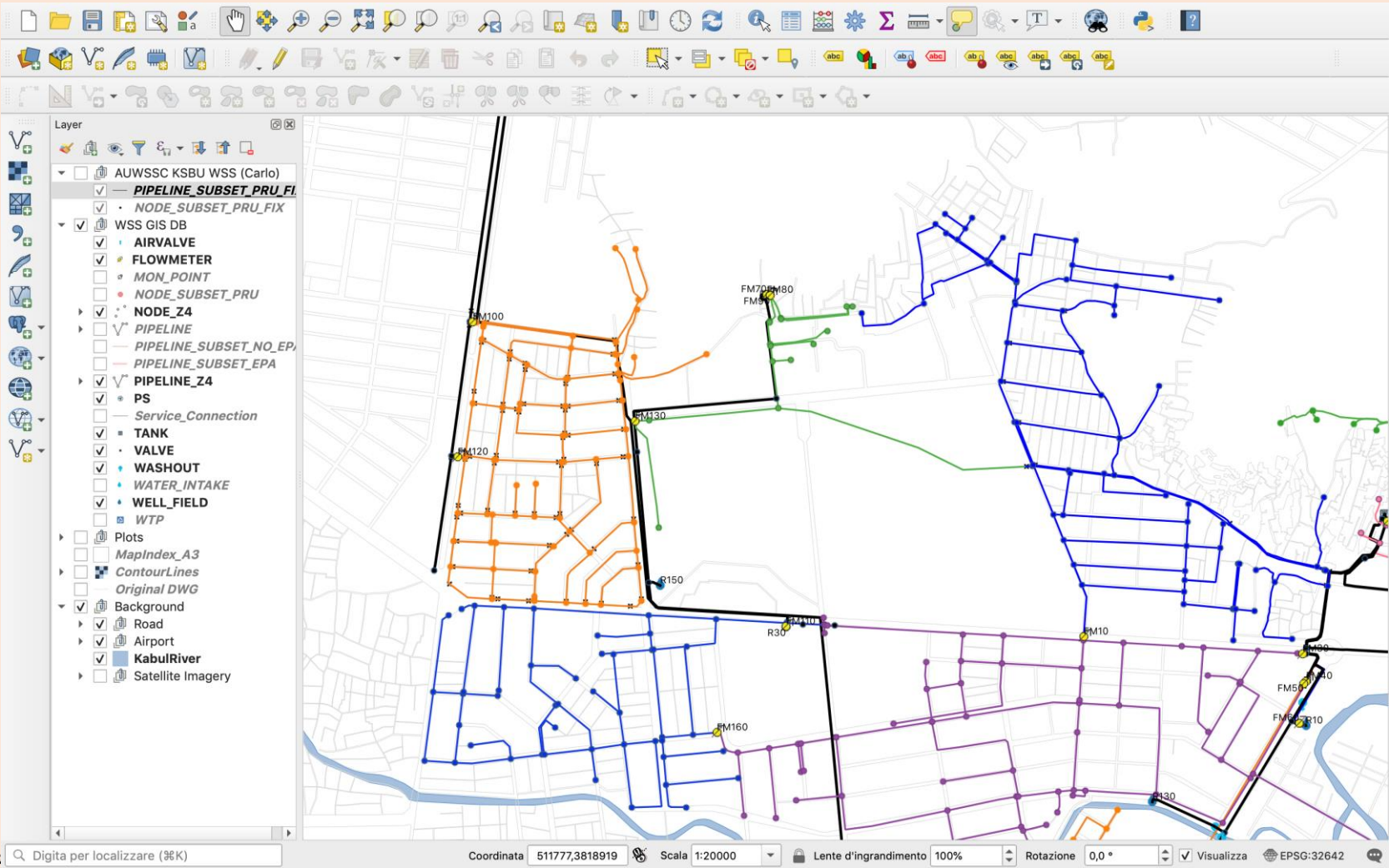
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Integration of GIS tools in NRW analysis



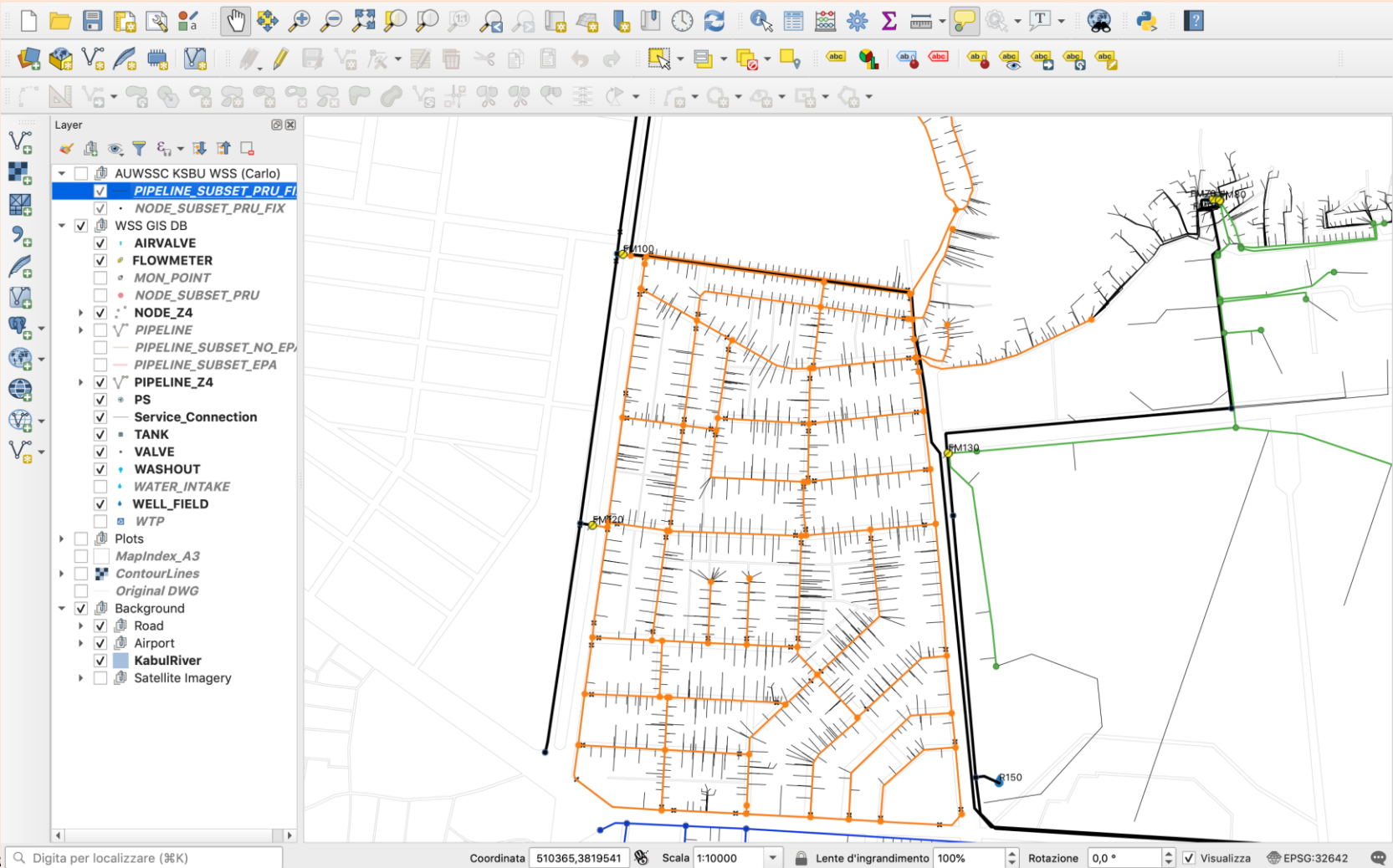
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Integration of GIS tools in NRW analysis



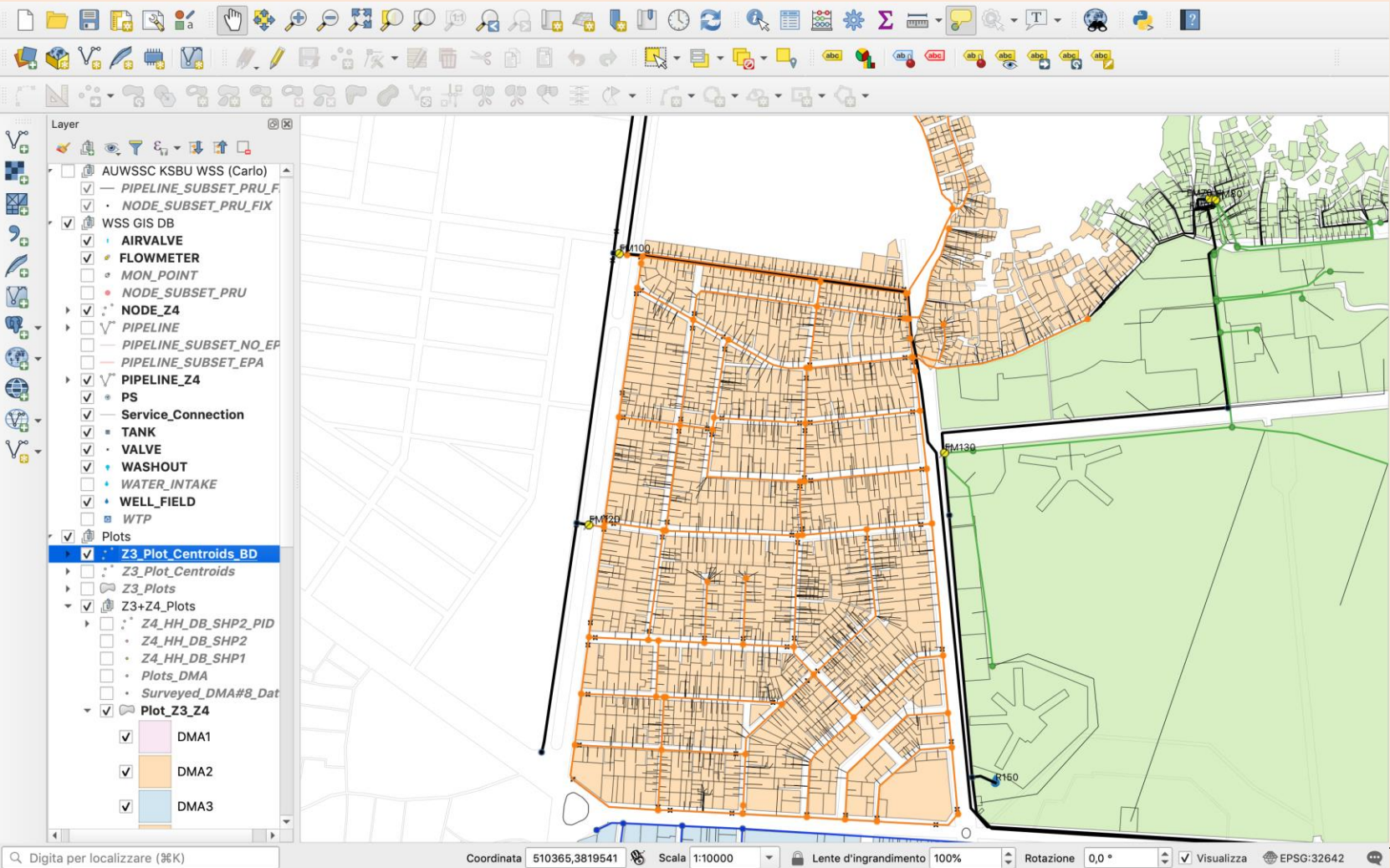
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Integration of GIS tools in NRW analysis



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Integration of GIS tools in NRW analysis



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EasyCalc Water Balance

WB-EasyCalc SM

The free water balance software

Version 6.12 (18 March 2020)

Utility Name: Year:

The volumes used for this water balance are for a period of: 31 days

by courtesy of Liemberger & Partners
... because the best things in life are free! ...

check for updates on: www.liemberger.cc

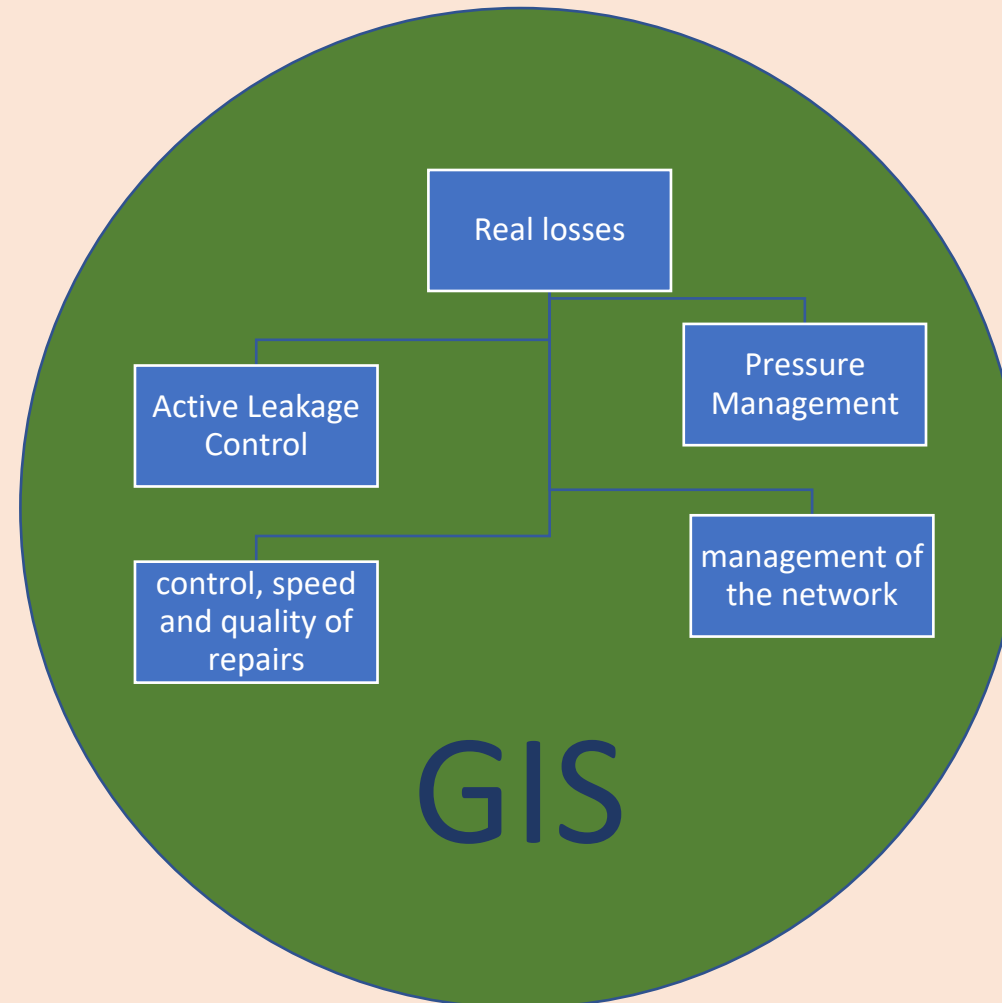
Data Entry	Getting Started
	Change Language
	1.) System Input Volume
	2.) Billed Consumption
	3.) Unbilled Consumption
	4.) Unauthorised Consumption
	5.) Customer Meter Inaccuracies and Data Handling Errors
	6.) Network Data
	7.) Pressure
Results	8.) Intermittent Supply
	9.) Financial Information
	A Water Balance in m3/year
	B Water Balance in m3/day
	C Water Balance for Period
	D Performance Indicators
	E THE "WHAT IF" TOOL
	F Historic data

For water balance calculation the Consultant is proposing to use the WB-EasyCalc software; the software is freeware and public. An important point characterizing this software is the estimation of the accuracy of all data input to the water balance. The objective is to start an annual compilation of the spreadsheet, keeping the historical data of the previous years so that the actions taken to reduce NRW can be evaluated.

Integration of GIS tools in NRW analysis



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Debate and discussions



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Diagnosis of the performance of Non-Revenue Water (NRW) in a pilot public service:
Activity N° : N-W-EG-1

Task 1: Launch Workshop
(by video-conference)

30 November 2020, Asyut, Egypt

Presentation of action plan for the activities for the three months

Presented by: Mr. Paolo Rufini, International NRW Expert



Presentation of action plan for the activities and for the three months



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No.	Task	Notes	Year 2020					Year 2021											
			Nov				Dec					Jan				Feb			
			45	46	47	48	49	50	51	52	53	1	2	3	4	5	6	7	8
1	Task 1: Inception Phase																		
1.1	Initial data assessment and evaluation																		
1.2	Selection of the GIS and HM software																		
1.3	1-day Inception workshop																		
1.4	Preparation of the Inception Report																		
2	Task 2: Verification of GIS Maps and Customers Database																		
2.2	Get Clearance to Data Access + Data collection																		
2.3	Network and Customer Data Evaluation																		
2.1	NRW Training - Day 1																		
2.4	Preparation of the GIS DB Conceptual and Logical Data Model																		
2.5	Preparation of the draft GIS DB + Customer DB Report																		
2.6	Implement recommendations for updating or digitising network and infrastructures GIS Map																		
2.7	Quality Control and GIS Data Import																		
2.8	Finalisation of GIS DB + Customer DB Report																		
	Critical Task																		
	Not Critical Task																		
	Project Milestone																		
	Project Report																		





Specific urgent actions

- Have access to Asyut Water Supply Network and Customer data
- Establish the local supporting GIS unit for preparation of WSS GIS DB
- Provide 1-day Training to the local GIS unit

Without these actions, it will be impossible to prepare the GIS conceptual and logical data model, to implement the GIS Database and to provide training on the job to Asyut unit.



Debate and discussions



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Diagnosis of the performance of Non-Revenue Water (NRW) in a pilot public service:
Activity N° : N-W-EG-1

Task 1: Inception Workshop
(by video-conference)

30 November 2020 Asyut, Egypt

Identification of the different stakeholders involved

Presented by: Suzan TAHA, WES Key Water Expert



Beneficiaries & Stakeholders 1/2



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Main beneficiaries

- AWWC
- HCWW
- MWRI
- The customers
- The environment & water resources

External Stakeholders

- Asyut Governorate
- Electricity Company of Assiut
- Directorate of bridges and roads
- Traffic Department
- Telephone Department
- Natural Gas Department



Beneficiaries & Stakeholders 2/2



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For the workshops, relevant stakeholders will be identified with the focal point and targeted as needed



- Environmental and water-related ngos,
- Academia,
- Local consultants,
- Consumer associations,
- Women's and youth organizations in the region,
- Representatives of local authorities (municipality , elected officials or local councils),
- Community representatives
- Media concerned with water issues at the local level.



Discussion



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Conclusions and Closure 1/4 - NRW Part



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Synthesis of results

Inventory of measuring equipment
Preliminary organisation of the DMA
Passive Leakage detection & procedures
Incomplete information to carry out balancing
The following data are needed:
Network Layout
Infrastructure information
Population data
Customers and billing information

Key recommendations and closure

- Creation of the NRW unit.
- Project to design the location and size of permanent flow meters for the proposed zones (depends on provision of network and customers data)
- AWWC to subsequently purchase and install

Next Steps

- **Data provision (AWWC)**
- Propose zones (WES)
- Updating network data based on the project proposed zoning (WES & AWWC)
- Update Customers DB (AWWC)
- Assessing the situation of non-revenue water management (WES & AWWC)
- Checking the correct operation of the existing set of monitoring equipment (WES & AWWC - task 3)



Conclusions and Closing 2/4 - GIS Part



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Synthesis of results

GIS Software & GIS Architecture



- Single-user installation
- Version 10

Database



- ESRI GDB format
- Single-user installation

Updating GIS data



- 2015 / 2016
- Context: Diagnostic study for the rehabilitation of the AWWC network of West Asyut Area



Conclusions and Closure 3/4 - GIS part



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Key recommendations and closure

GIS Unit



To perpetuate the GIS activity, through a cell nor entity, composed of a dedicated full-time unit

Database & Data Model



Set up a data model responding to the NRW issues

Updating GIS data



Set up an GIS implementation procedure, from data collection to updating and consolidation.



Conclusions and Closing 4/4 - GIS Part



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Next Steps

Tasks	Deadline
Evaluation of GIS data and networks	December 2020
Get full data availability of the water supply network of the service area.	
Get full access to consultation of the AWWC GDB of the water network	
Reliability of GIS data of the service area with the support of AWWC.	
Tasks	Deadline
Improving/Preparing the structure of the GIS database by developing the Conceptual and Logical Data Model	January 2021
Define and Implement Structures and attributes of the WSS GIS Data model	
Tasks	Deadline
Updating the GIS data of the service area	February 2021



Evaluation of the workshop



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All AWWC & ??? participants

<https://forms.gle/nfZm3JvTUuwzQmxe6>





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Thank you for your attention!

