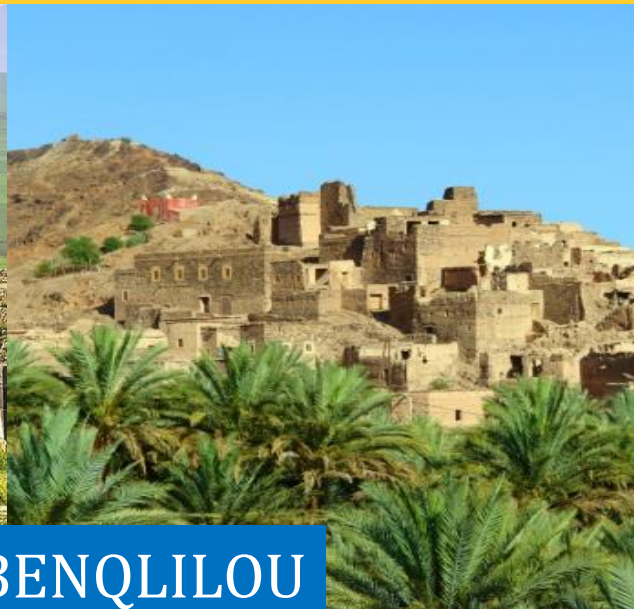


National Office for Electricity and Drinking Water (ONEE)
International Institute for Water and Sanitation (IEA)

Water education, heritage and knowledge sharing to face
water scarcity and climate change in Africa



Dr. Hanane BENQLILOU

Introduction

The scarcity and variability in time and space of water resources marked by climate change impact is a major challenge for drinking water access improvement in many African countries.

In this context, water education, heritage and knowledge sharing are very important to raise awareness on water in Africa.

My presentation will focus on:

- I. Models of water education and awareness in Morocco.
- II. Water Museums and heritage in Africa for knowledge water sharing.

Water Education / National Office of Electricity and drinking water ONEE

In the context of water scarcity, ONEE conduct water education and public awareness programs to rationalize the water use and for the water preservation against waste and pollution.

The education and public awareness programs concerns:

- Production of awareness materials,
- Production of awareness capsules related to the water cycle, wastewater and sanitation, water quality control and eco-gestures.
- Realisation of several activities on water education and public awareness for the benefit of schoolchildren.

World Water Day

On March 2022 ONEE celebrated the World Water Day under the central theme **“Groundwater: Making the invisible visible”**.

To raise awareness on the development of groundwater, the Office has organized at different regions of Morocco:

- Several socio-cultural programs,
- Artistic competitions and exhibitions,
- Educational visits to ONEE facilities

ONEE Summer camps

The Office is also carrying out a broad awareness program on water saving for the benefit of the children at the ONEE summer camps located in the south, the north and the center of Morocco

Through this water education and awareness campaign, ONEE-BO invites all citizens to join the national effort to preserve this precious resource in order to meet our current needs and those of future generations.

Bouznika “Clean Beaches” program.

Mobilization of civil society partners to carry out water education and awareness actions in particular The Mohammed VI Foundation for Environmental Protection through the sponsorship of the ONEE-Branche Eau to the Bouznika Beach near Casablanca which receives between 30 000 and 40 000 summer visitors per day as part of the “Clean Beaches” program.

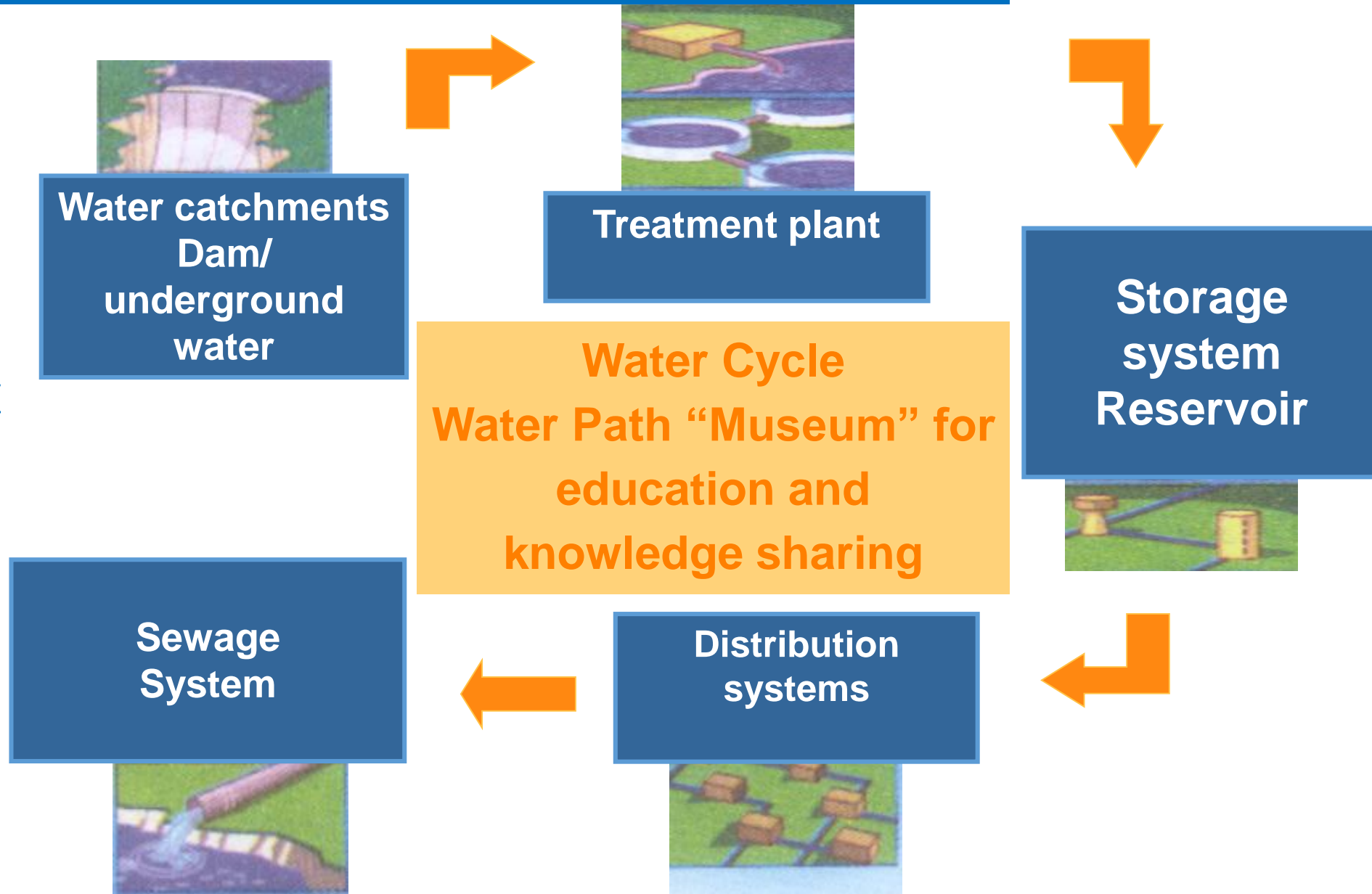
The wide water education and awareness program of ONEE includes:

- The diffusion of the ONEE capsules and awareness messages on the giant screen and on the beach radio set up by ONEE at the Bouznika beach.
- The organization of water education and awareness workshops on the rationalization of the use of drinking water for the benefit of summer visitors and education in the protection of water resources against pollution through waste recycling workshops.

Water Education / National Office of Electricity and drinking water ONEE

For the mobilization of young people and children who constitute the future of our country to raise their awareness on water saving ONEE organizes :

- Visits to ONEE's facilities.
- Visits to ONEE's Museums



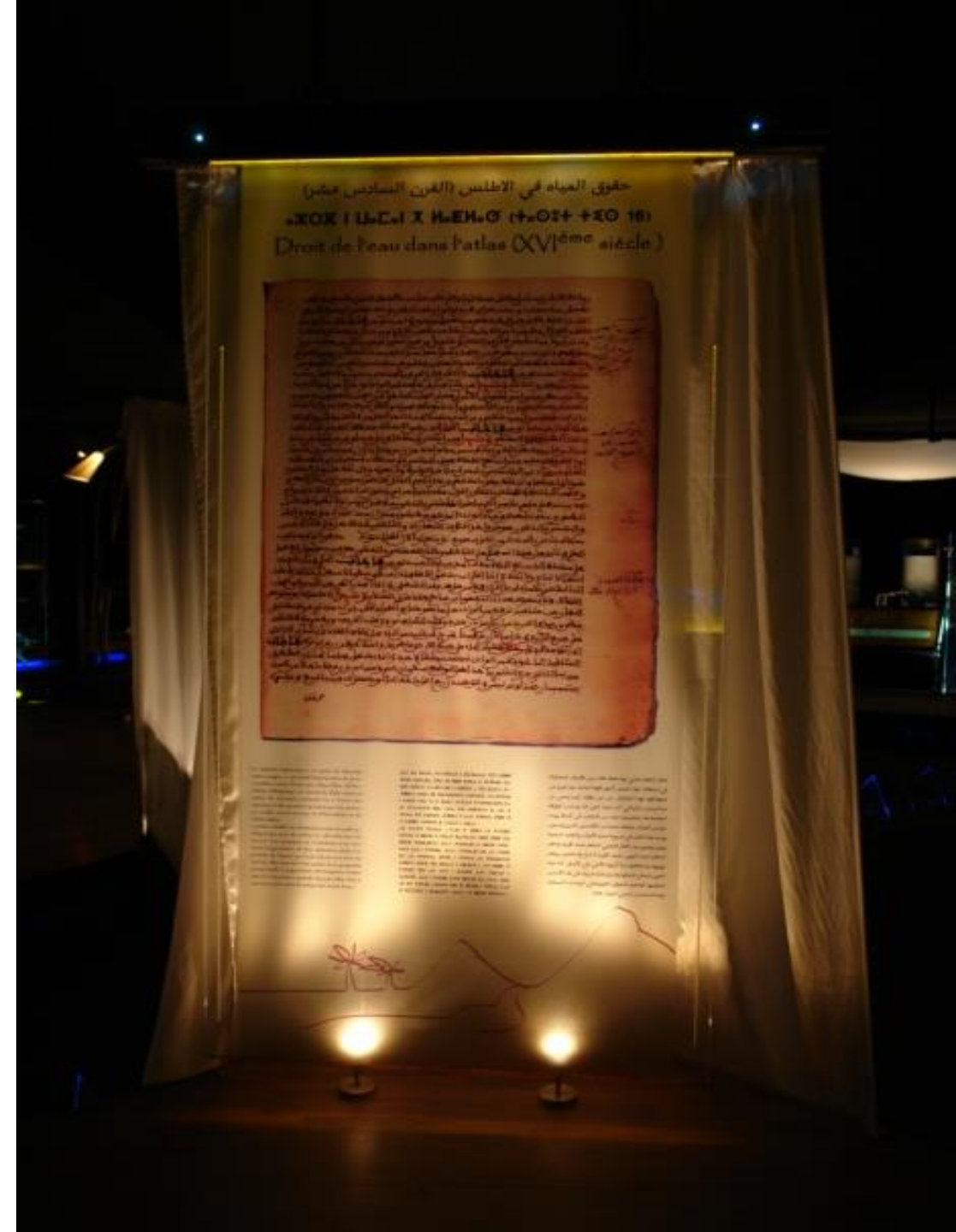




Water Museums and heritage in Africa

Morocco : « Esprit de l'eau » Museum/ Rabat

- Traditional water systems (Khattara, ...) underlies social, economic and political structures.
- The water management by local shareholders and water division among the farmers is according to customary laws.
- In the Museum “Esprit de l’eau” many ruling texts on water ownership and water division systems are exposed :
 1. Ownership of water along with land;
 2. Ownership of water independent from land





The "Memory of nomads" museum located in the heart of the Tighmert oasis (literally; The corner), forged its name from a memory fragrant with memories of nomads as well as caravanners who crossed the Oued-Noun towards West Africa. the West.



To measure the irrigation shares the ancestral population have invented a water clock for timing irrigation (time unit).

The water clock consists of two bowl made of copper, one of which is so small that it can float on the surface of water in the large one and has a tiny hole at its bottom through which water can enter the bowl and gradually fill it up.

After being filled, the small bowl sinks and the unit of time is over.





« Sources de Lalla Mimouna » Museum is a partly outdoor private African Art museum encompasses the fizzing, magnesium-rich springs of Lalla Mimouna and is the passion project of Tinejdad native Zaïd Abbou.

Artefacts collected over 30 years – including agricultural implements, textiles, pottery, **water and construction tools**,...



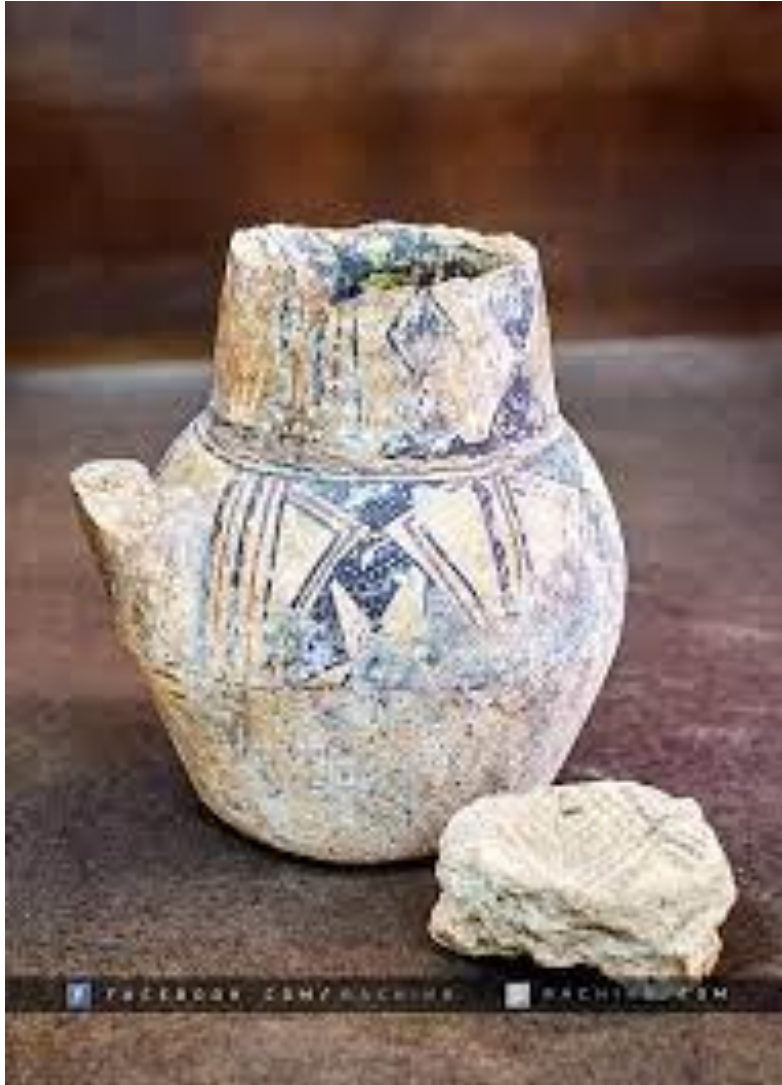


Water clock for
timing irrigation
(time unit).



Calligraphy tablets offer an insight into desert life and are housed in an unfolding series of spaces that encompass an internal garden dotted with words of wisdom from The Little Prince





The Nile Museum in Aswan is a new architectural masterpiece that the Ministry of Irrigation and Water Resources is adding to the archaeological sites in Aswan Governorate.

Work began on the establishment of the Nile Museum during June of 2004, but the museum did not achieve the required progress until 2014. The museum was opened to visitors **on January 10, 2016**, in the presence of the Prime Minister and Minister of Irrigation, and representatives of **11 African countries from the Nile Basin countries**.

- The museum is located on an area of 146 thousand square meters
- The museum includes exhibition and conference halls, a library, a VIP hall and administrative offices, in addition to a public site that includes Magra El-Oyoum area and green areas.
- The museum consists of 3 floors, and includes **hundreds of pictures** and exhibits that tell the history of the Nile and the Egyptian projects that were built on it.
- The museum contains a number of archaeological holdings, **including 250 artifacts**, recording the journey of the flow of the Nile from its sources to its mouth in the Mediterranean Sea.
- The Ministry of Culture also gifted the museum **61 important artistic paintings** that illustrate the most prominent aspects of the Nile River journey in Egypt.
- Inside the museum there is also a large part dedicated to displaying **the history of the High Dam and documenting its construction**, in addition to memorializing the martyrs who fell during the construction of the High Dam.
- The museum includes a presentation of the most important national projects of the Ministry of Irrigation, to which it contributed, starting with **the charitable arches during the days of Muhammad Ali**, passing through **the Salam Canal** and the **Toshka project**, and ending with the 4 million feddan project.
- It also includes the most important historical documents, including **the document of Agreement 59 between Egypt and Sudan, and the document for the protection of the Nile River**, which was signed by the President of the Republic and the Prime Minister.



- The Irrigation Museum After the construction of the old Muhammad Ali Aqueduct in the middle of Al Qanater Al Khayriyah Gardens, it was a single showroom that included some simple models of irrigation projects.
- After the construction of the good delta barrages and other barrages on the Nile, a new museum for irrigation works was established, called the Revolution Museum.
The Museum of the Revolution was opened in 1957 during the era of President Gamal Abdel Nasser and in the presence of Engineer Ahmed Abdo Al-Sharbasi, Minister of Irrigation at the time.
- In 2006, the system of replacement, renewal and development of the Revolution Museum began on the latest architectural and technical style, and the creation of an improved cinema hall, a back theater, fountains and waterways covered with greenery.
- The museum is a unique civilized entity that contains many diverse archaeological models of different **irrigation systems such as the shadouf, the tanbour, the waterwheel and other irrigation tools** that express the Egyptian civilization in its splendid eras and tell the history of the Egyptian irrigation school through the ages and monitor the great Egyptian creativity that controls the waters of the Nile and the immortal river to benefit from It is the only lifeline for Egypt.



The Children's Museum of Water Sciences was established on a building whose roots go back to 1843 in Qanatir al-Khairia, which gave it the unique architectural character that characterizes this era of time.

Mathematical and physical models have been designed by experts with global experience in this field The museum was opened in November 2011

The Children's Museum of Water Science aims to simplify some mathematical and physical theories of water and some other sciences through the use of modern and developed technologies that simulate nature in the form of games and models that children can absorb at different age stages, which develops their ability to innovate and create



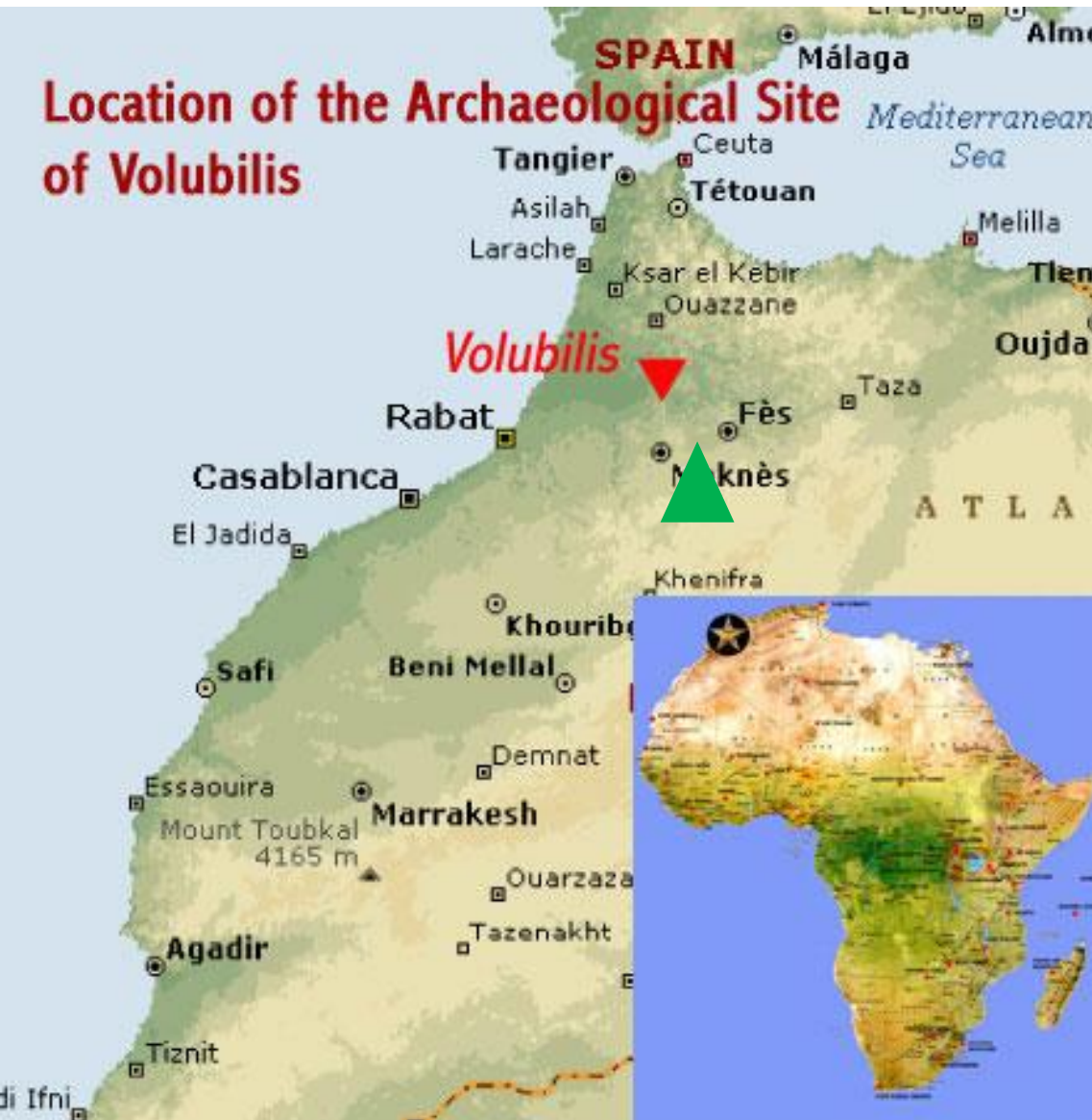


African water Heritage:

- Islamic ancestral hydraulic system (Morocco)
- Roman ancestral hydraulic system (Morocco/Tunisia)

African water Heritage constitute an interesting open ancestral water path “Museum” for:

- water education and awareness raising
- Knowledge sharing.



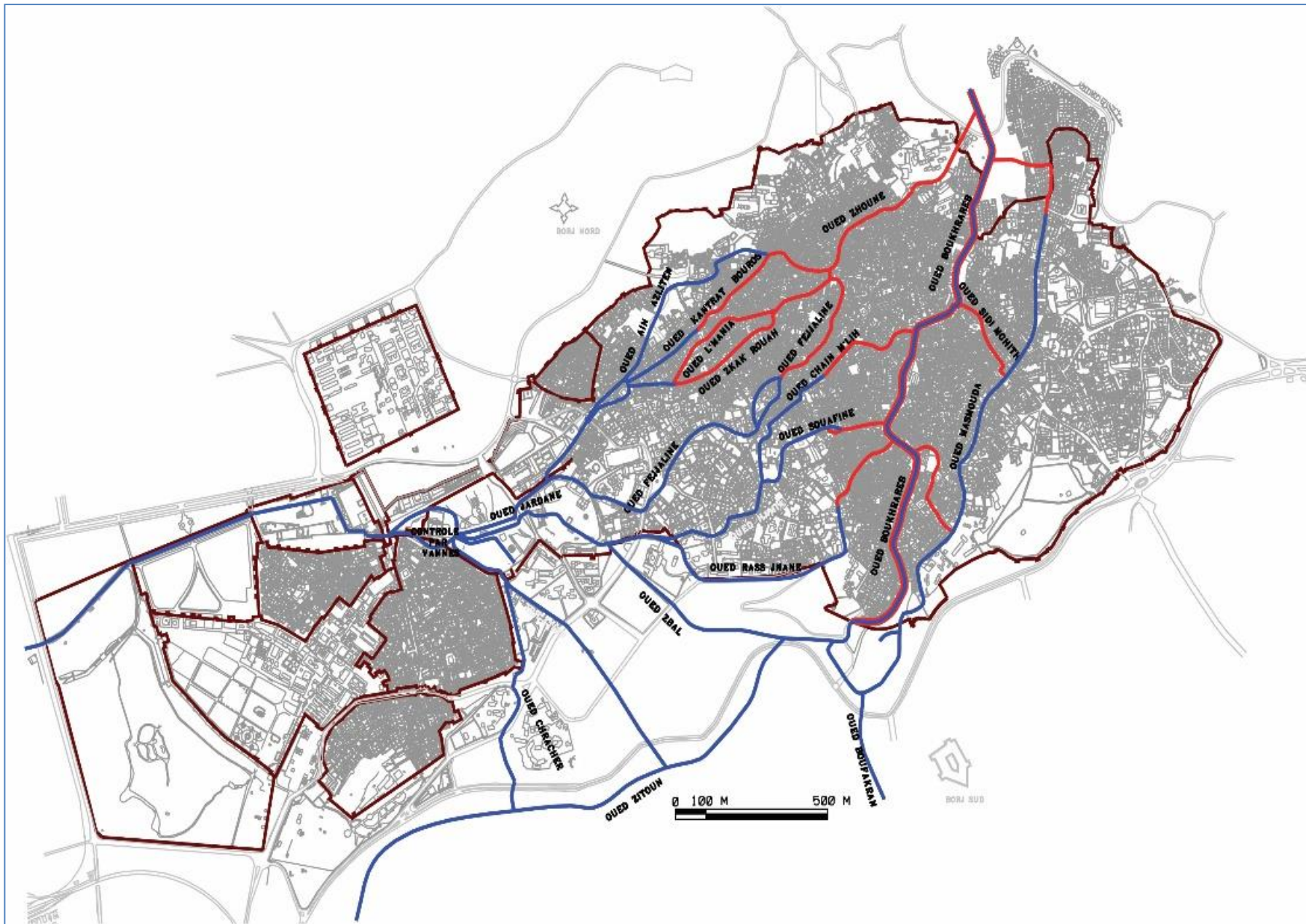
- The site selection for Fez foundation was done on the basis of abundance of water resources : **springs and rivers.**
- After prospecting on fertile land and rich water, the first Moroccan Muslim dynasty installed initially near Volubilis (a roman city), for his expansion have acquired **by purchasing the rights to water and land use to Moroccan native population and non by requisition as in the past.**
- Fez was constructed on the both banks of the river “Oued Fez” and provides an ingenious system of water channels draining springs and rivers by gravity.

Water splitter allows regulation of surface water for domestic, agriculture and recreation supply according to the rivers flow



Water is distributed between the different districts and for various purposes by intermediate water splitters appropriately dimensioned.

The water splitters allows managing the principle of overflow and delays for the first proprietor to retain their priority.



Water channel draining river
and springs called Clean
River

Wastewater canal called
Wastewater River



Traditional sewer under houses

Canals wastewaters are located lower than those intended for drinking water and mosques. These underground canals built with local materials (bricks, sand, lime, ...) cross homes, places and mosques and are discover in different places

Water channel at the Islamic school Al Bû-nâniyya



For purification (ablution), in the Mosques and the Islamic schools, a wall fountain and a central basin are mainly supplied by pure water channels drained from water springs (safe water quality).

Latrines around a fountain at Al Bu-nâniyya

These water channels also supplied rectangular basins or fountains around which are arranged latrines available for students, residents and visitors of mosques and Islamic schools



Until today, the water sources continue to fuel tanks, basins and fountain of several "mosques" and Koranic schools.

The flow of water fountains and basins is done continuously for purification (ablution), for watering gardens and to help make flushing water into the sewer





In the basin supplied by source "Ayn Azlîtan" fish species are observed, which is an indicator of high water quality and quantity of the source a witness of traditional water system durability.

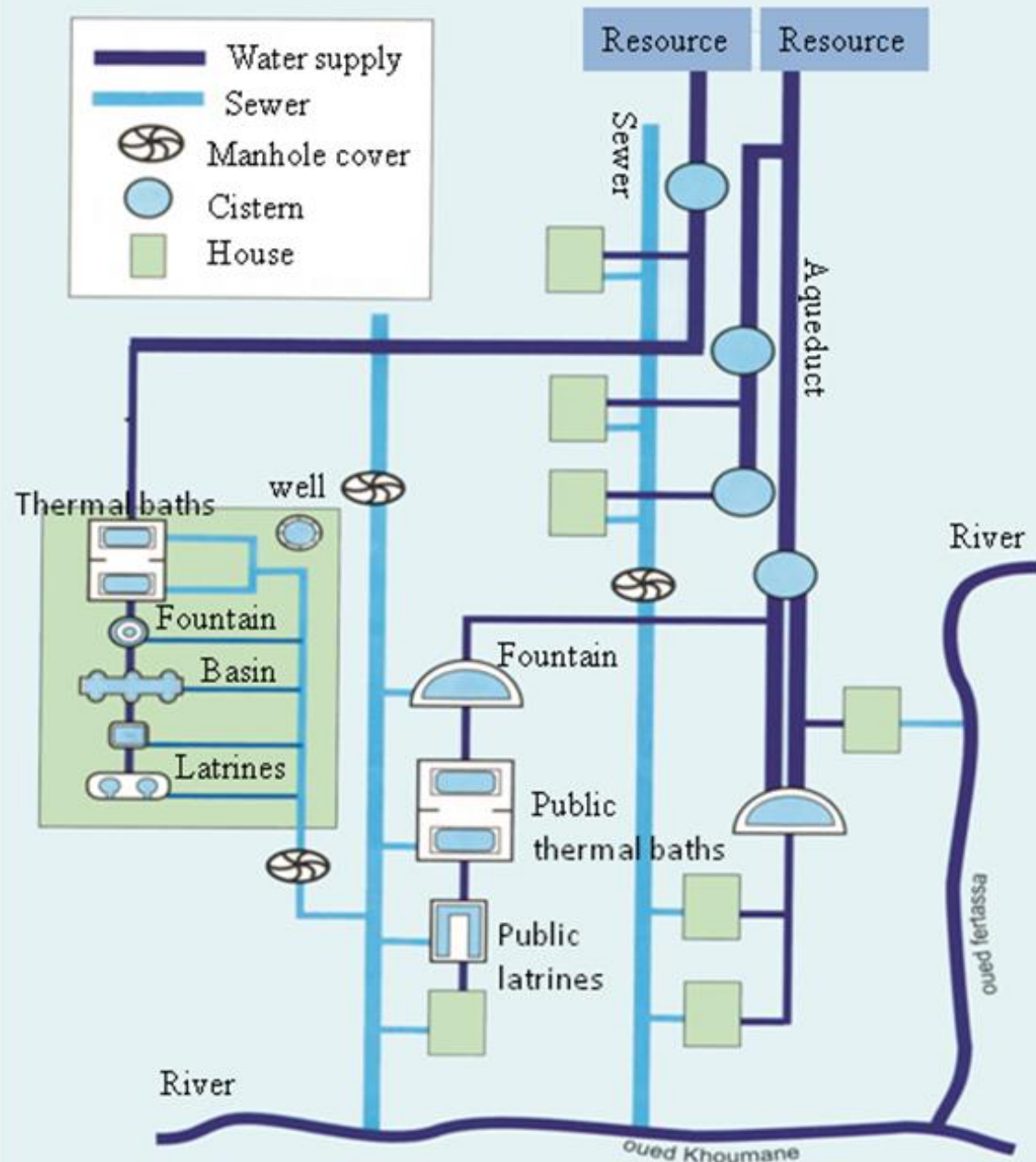
The Hydraulic Fez system presents an ingenious water supply and sanitation systems characterized by:

- A direct and continuous intake of water upstream (springs and rivers) without using pumping systems.
 - The distribution is made according to the piezometric level of resources recurring to a dispatching system in the different neighborhoods and buildings.
 - A small storage is just used at fountains.
 - The water excess is evacuated by flushing at the sewerage network, continuously.
 - Water is used for several purposes before being discharged into the sewage system, and only when it reaches its maximum level of pollution.
-
- The continuous flow of water in fountains, toilets and basins, ensures a continuous drainage of wastewater which limits the maintenance and management works of the sewerage network.
 - Participative management using defined quotas calculated on the basis of the distances of drinking water supply and sewage and not on the number of users ensures rigorous maintenance of water and sanitation systems.

These systems similar to veins of the human body, canals bring clean water rich in oxygen and discharge dirty water continually at the same drainage system, reflect ultimately the integration of the city to the water resources in a sustainable and integrated approach in terms of exploitation of clean water and wastewater discharge without using pumping systems.



Volubilis Hydraulic System (Panetier 2002).



Main wastewater canal

The Temple of Water Zaghouan Tunisia







Conclusion

- Water Heritage shows how to intervene in perfect agreement with the environment, highlighting its potential without exhausting it.
- Using water heritage does not mean directly replying the techniques from the past, but understanding the logical reasoning underlying the knowledge system and replying it in a creative way.
- These systems which influence in the past water and wastewater technologies development around the Mediterranean region can serve as a basis for the development of drinking water and sanitation for small low income communities due to the absence of excessive costs related to basic investments and operating costs and without energy
- Water Heritage allows a good tool for water education and awareness raising for African youth.
- Water path
- The establishment by UNESCO in partnership with the organizations concerned of water circuits at the level of the hydraulic systems of ancient cities (which are already classified as UNSECO heritage) can serve as “an open museum” for education and sensitization of young people to preserve water resources and share knowledge in the field of water.

Many thanks for your attention

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Maps, pictures: Conservation of the archaeological site of Volubilis, Walili, Morocco

Maps, pictures: ADER- FES: Agency for De-densification and Rehabilitation of the Medina of Fez.