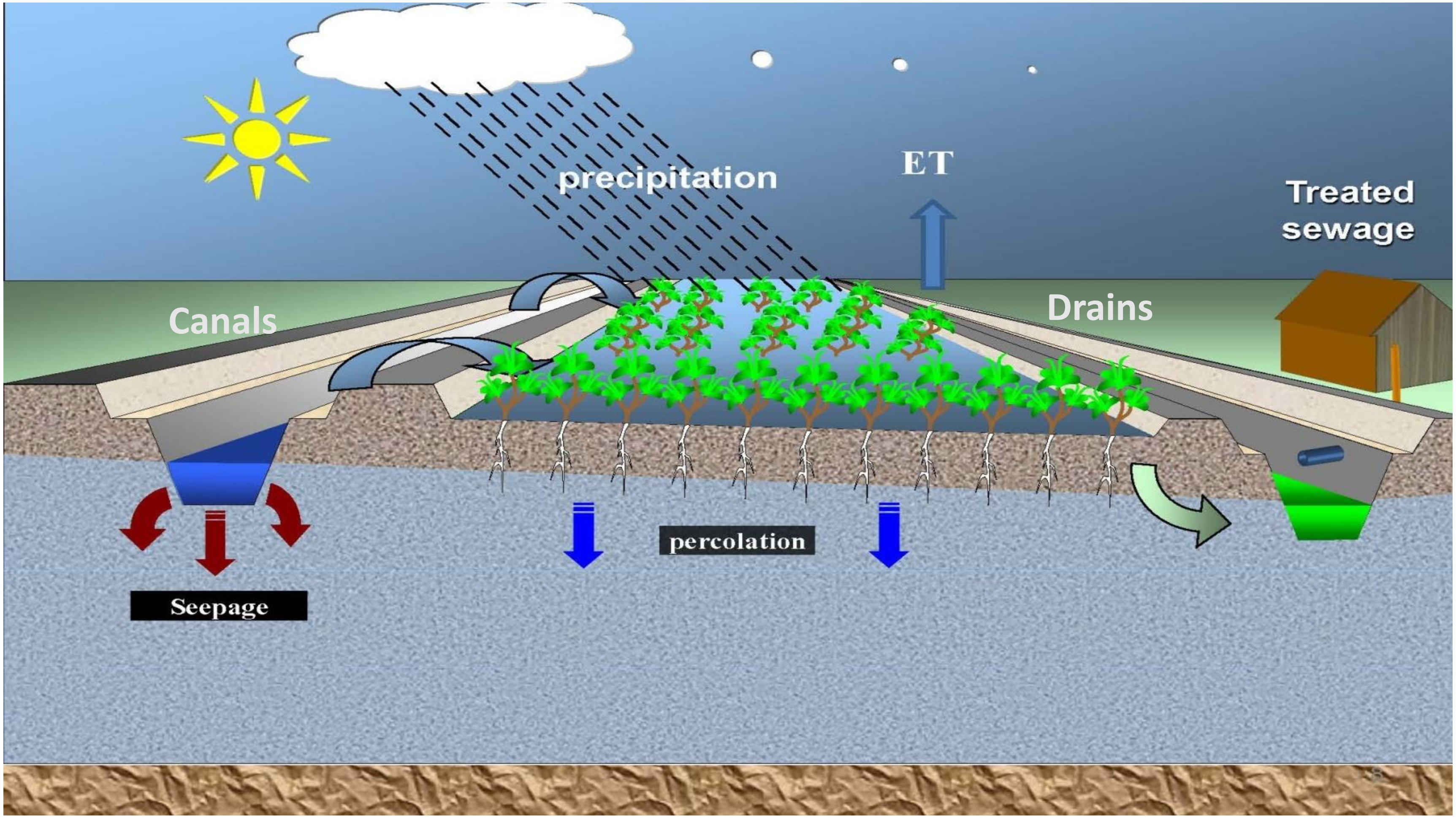
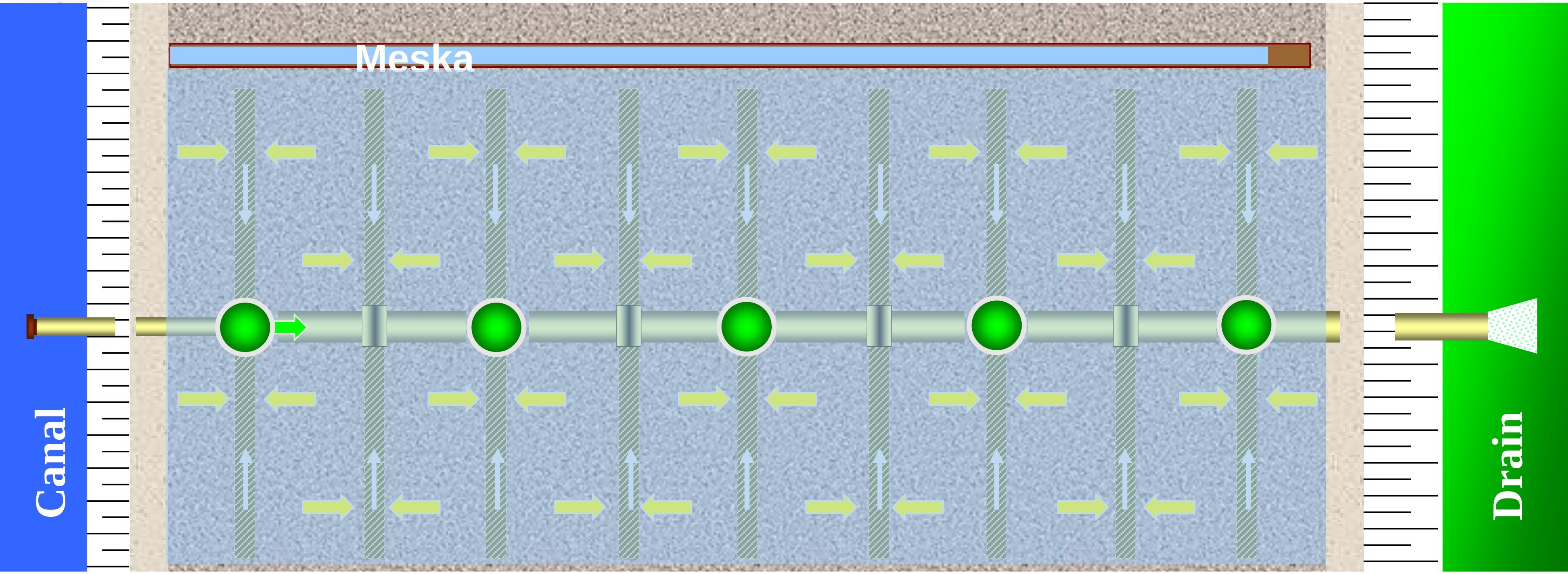
# Egypt’s efforts to modernize the management of irrigation system


**Ministry of water resources and Irrigation**
**Planning Sector**

**Emad Mahmoud**

# Irrigation and Drainage System In Egypt




Meska
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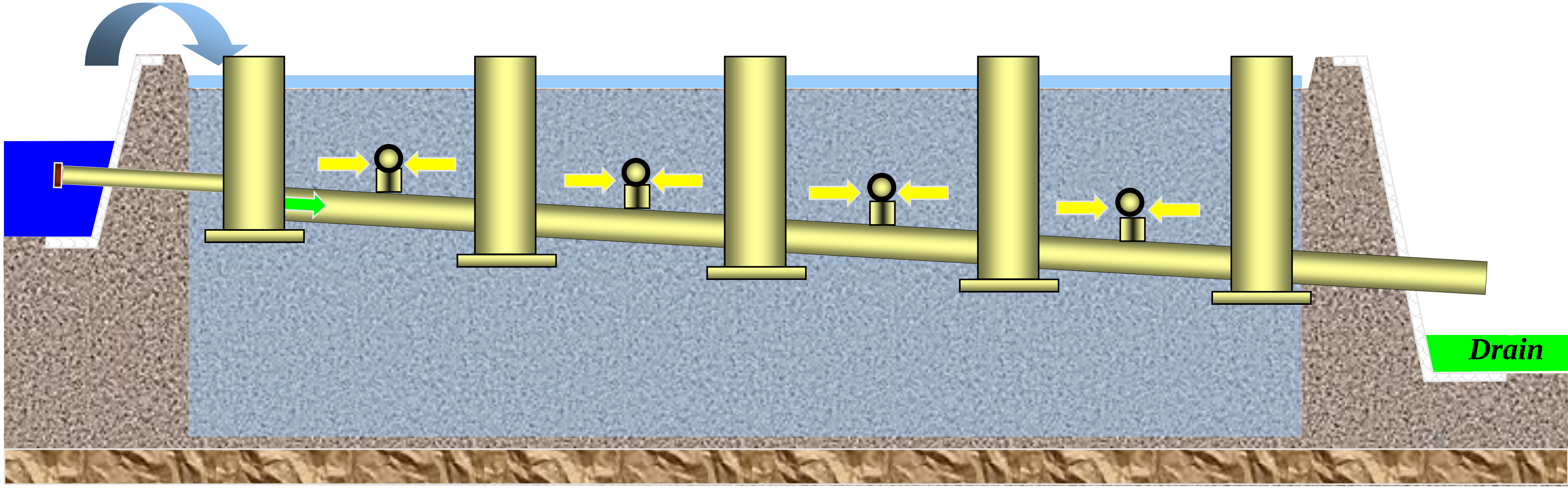
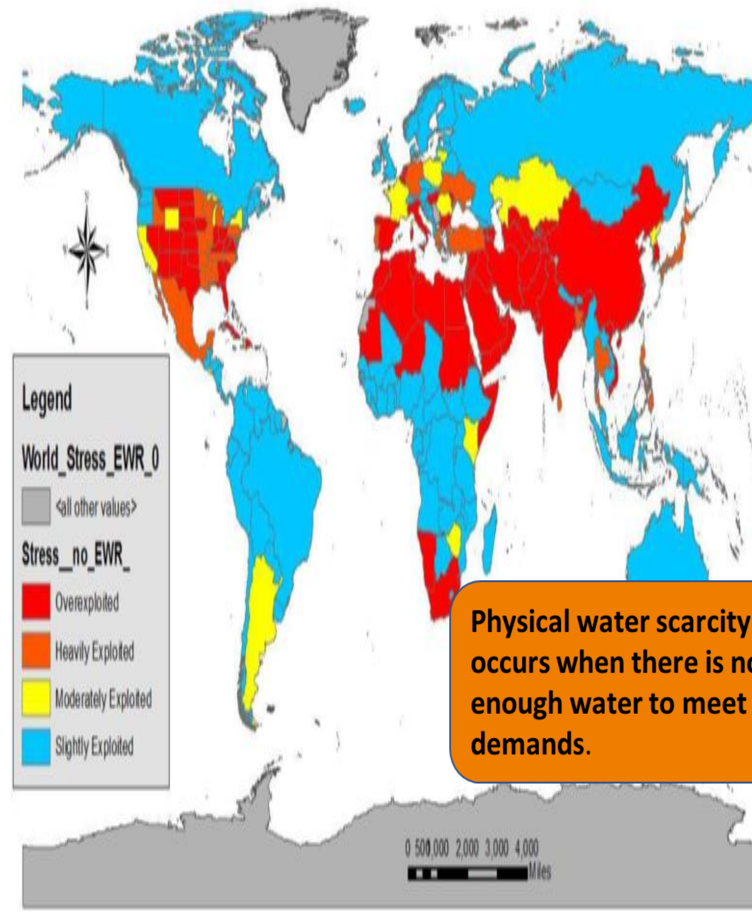

Drain

# Country profile

- Egypt is classified as a hyper-arid country, suffers from physical water scarcity. The fresh water stress indicator reaches 104% in 2021( which means fresh water resources is over exploited).

- A  fixed 55.5 billion m3/year represents 97 % of the country's total renewable water resources (Egypt's share from the Nile water), the remaining 3% being minor quantities of renewable groundwater plus a few showers of rainfall.

- Egypt's total cultivated land is about 3.6 million ha. included old and newly reclaimed areas.

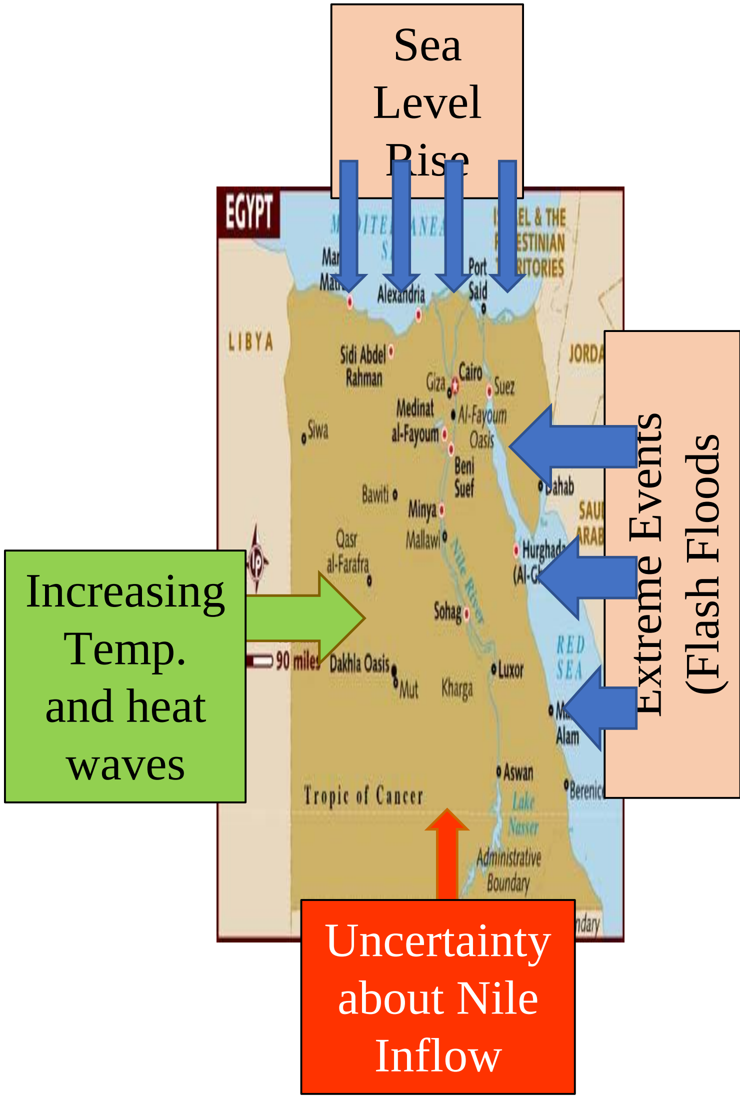



**Physical water scarcity occurs when there is not enough water to meet all demands.**

# Egypt Main Water Challenges

**Egypt's main challenge is to close the rapidly growing gap between the available water resources and the increasing demand.**

- **Impact of Upper Nile Developments in absence of cooperation.**
- **Impacts of climate change**
- **Water quality issues**



# Egypt National Water Resources Plan 2037

Egypt has developed its strategy for water resources management until 2050 and the National Water Resources Plan until year 2037 titled "**Water Security for All**" to support socio-economic development in Egypt and to face the water scarcity.

**Enhance Water Quality**

- Treatment Plants
- Sewage coverage
- Industrial Waste

**Rationalize Water Use**

- Canal Rehabilitation
- Modern Irrigation
- Smart irrigation and digital farming

**Develop Water Resources**

- Desalination
- Sustainable Use of GW
- Rainfall harvesting

**Create Enabling Environment**

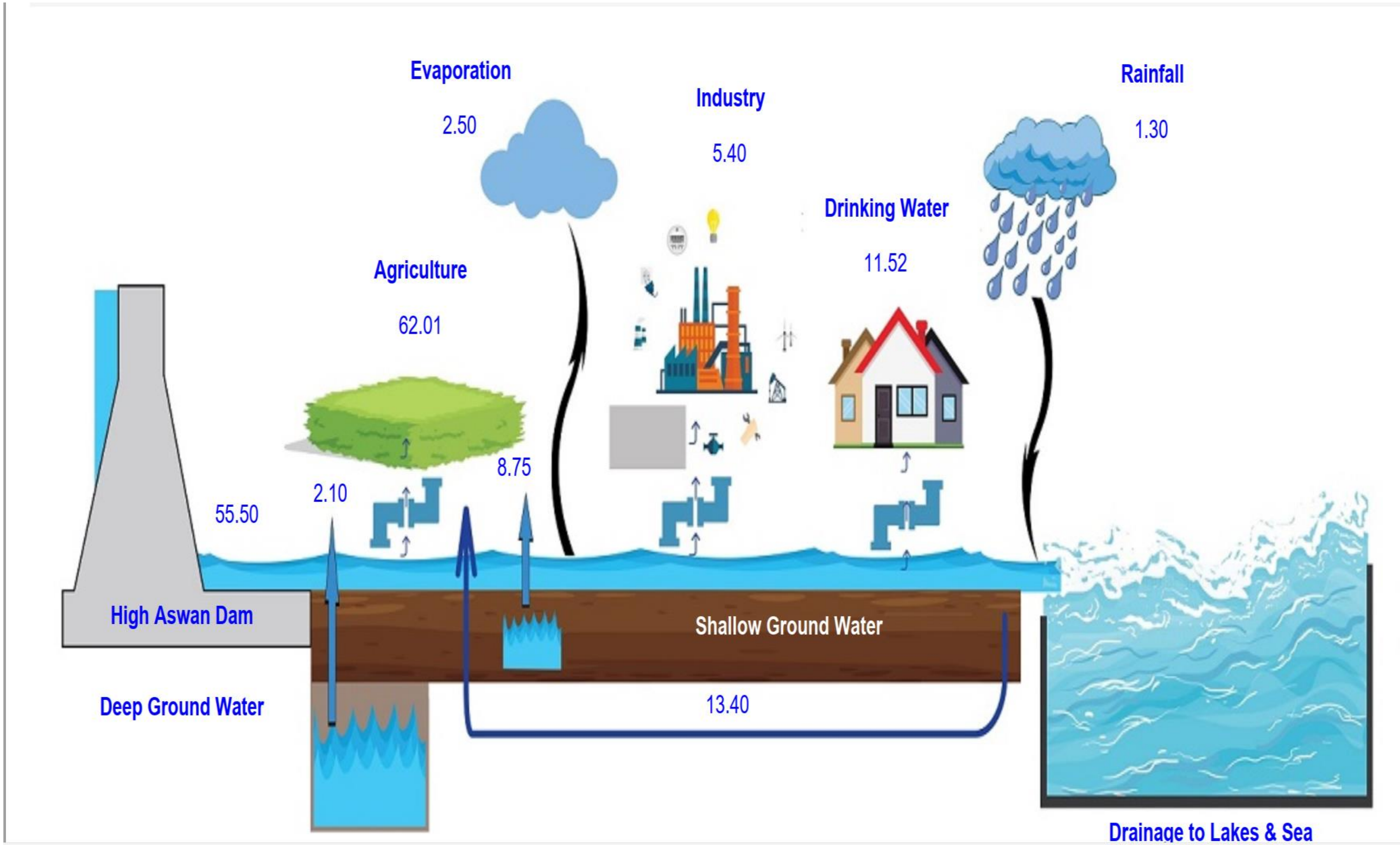
- Awareness
- Capacity Building
- Enhance cooperation

# Egypt's Available Water Resources

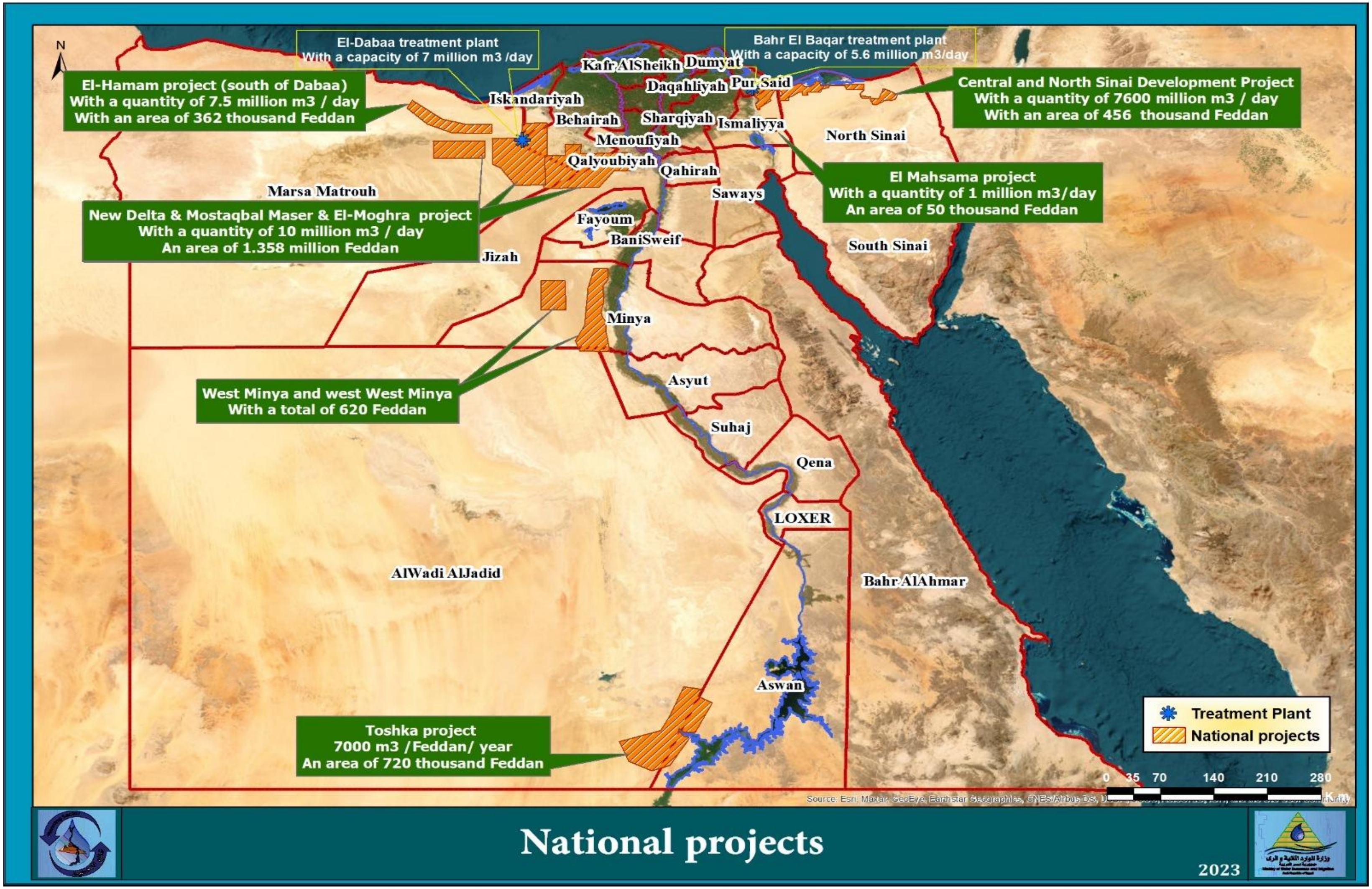
- **water resources** — 81.43 BCM
  - **Conventional water resources** — 58.9 BCM
    - The Nile River — 55.5 BCM
    - Precipitation — 1.3 BCM
    - Deep Groundwater — 2.1 BCM
  - **Non-Conventional water resources** — 22.53 BCM
    - Agr. drainage water+ Shallow G.W — 15.78 BCM
    - Treated wastewater — 6.4 BCM
    - Desalination water — 0.35 BCM

* MWRI 2021

# Water Usages



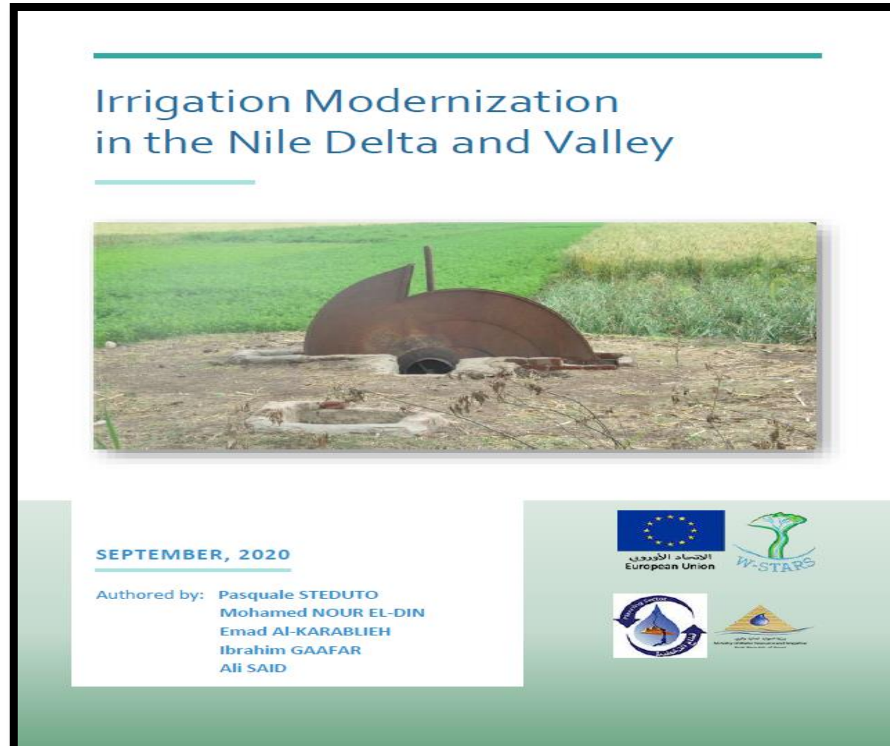
# Mega project of Drainage water reuse



# Irrigation Modernization

## Benefits from Farm Level Irrigation Modernization

- Stated increases in yields ranged from 20-30%
- Increases in income ranged from 10-20%
- Reductions in labour costs ranged from 30-40%
- Reductions in fertiliser costs ranged from 30-40%
- Reductions in energy costs ranged from 10-20%


Irrigation Modernization
in the Nile Delta and Valley

SEPTEMBER, 2020

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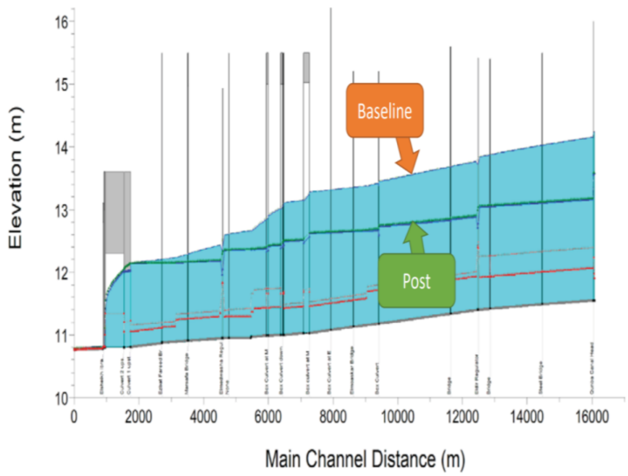
Ali SAID

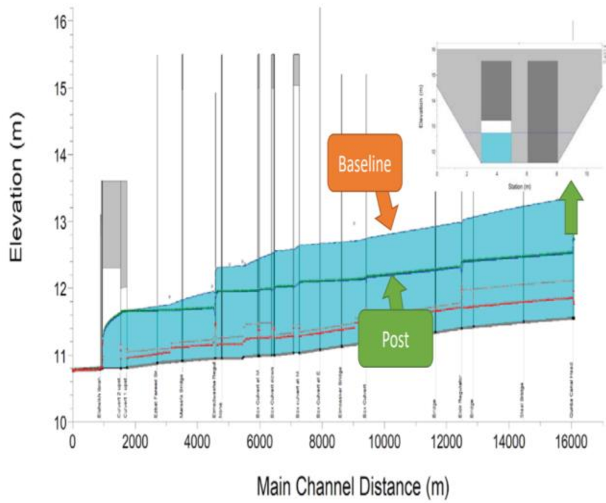


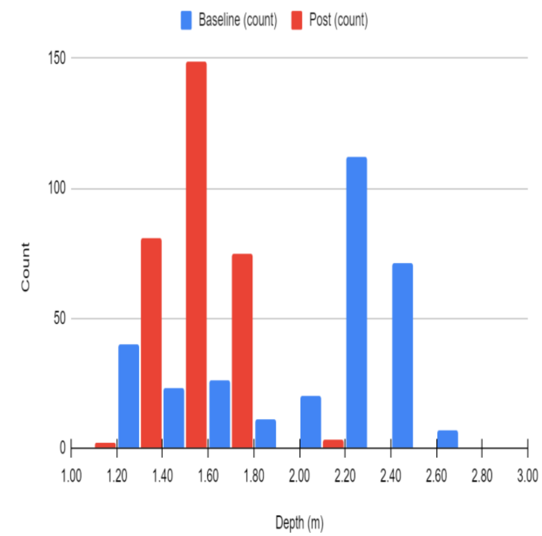
# Hydraulic Modeling for post rehabilitated canals

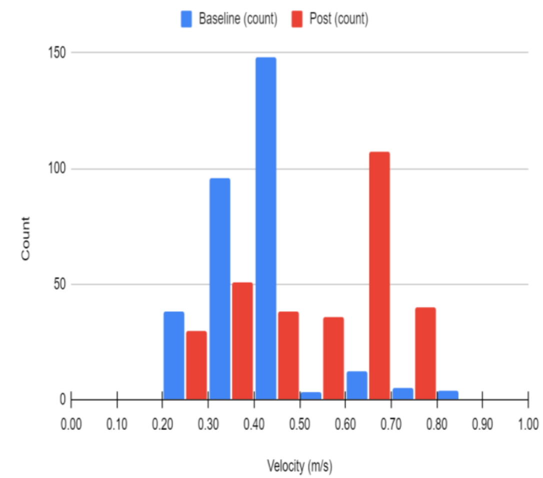
## Post-rehabilitation Conditions
## Design Flow = 9.6 $m^3/s$




## Post-rehabilitation Conditions
## Moderate Flow = 4.3 $m^3/s$



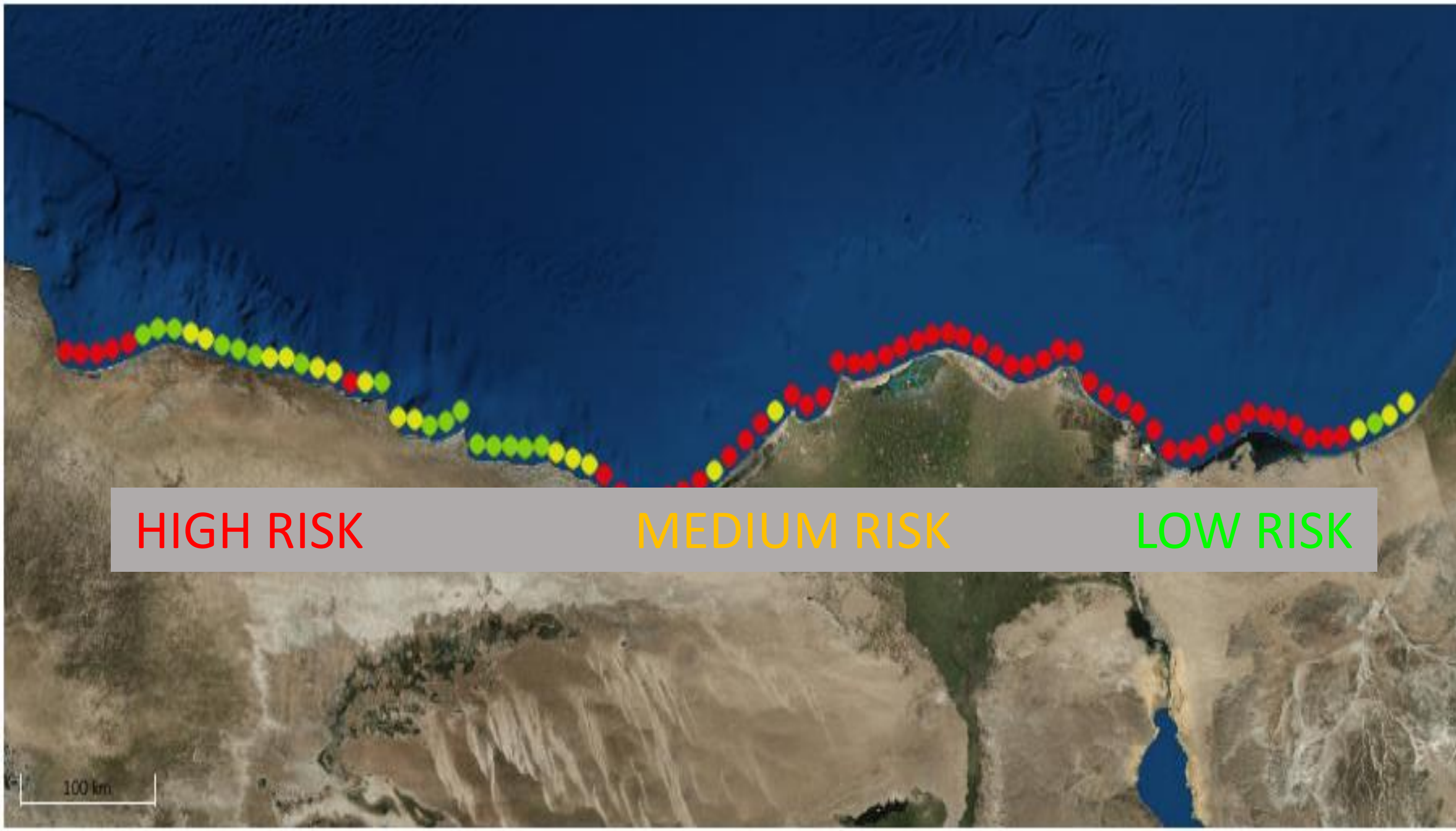




## Can we use wedge storage?

- Storage upstream of ElMedwasha Regulator =70,000$m^3$
- Time to fill storage ~2 hr at supply Q=9.6 $m^3/s$ and no withdrawal ... (actual filling time is longer)

# Risk Map

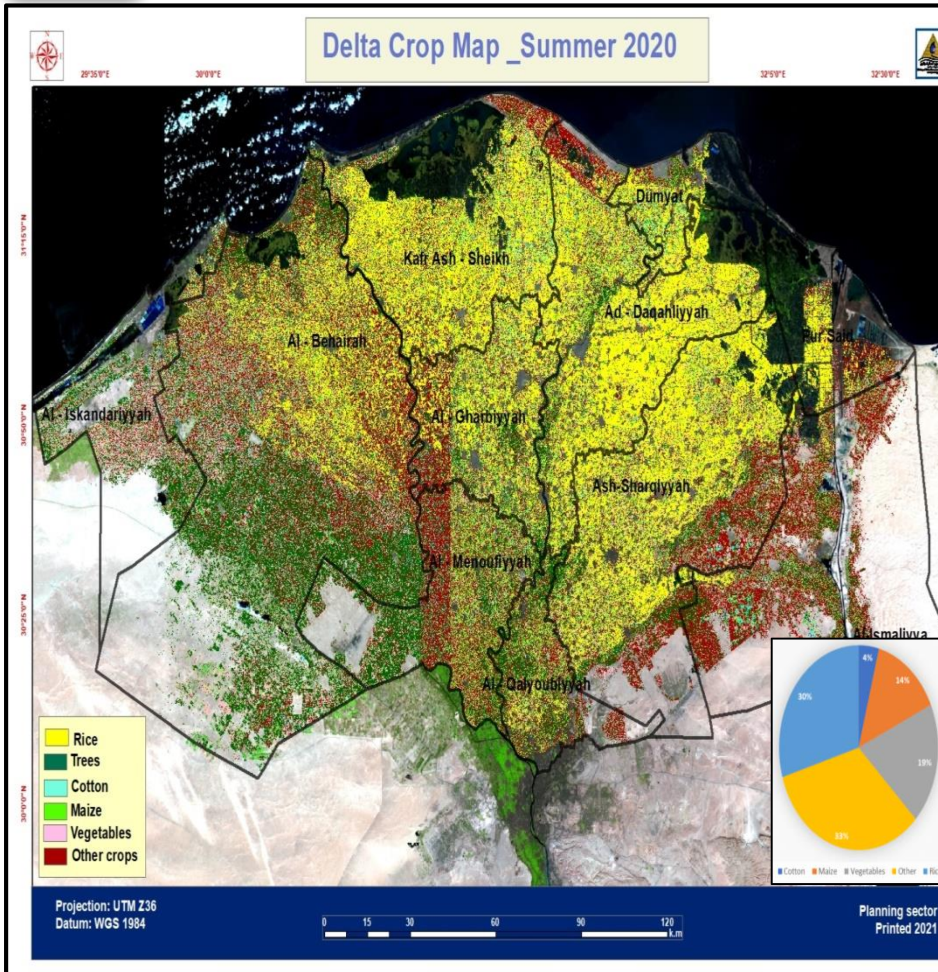


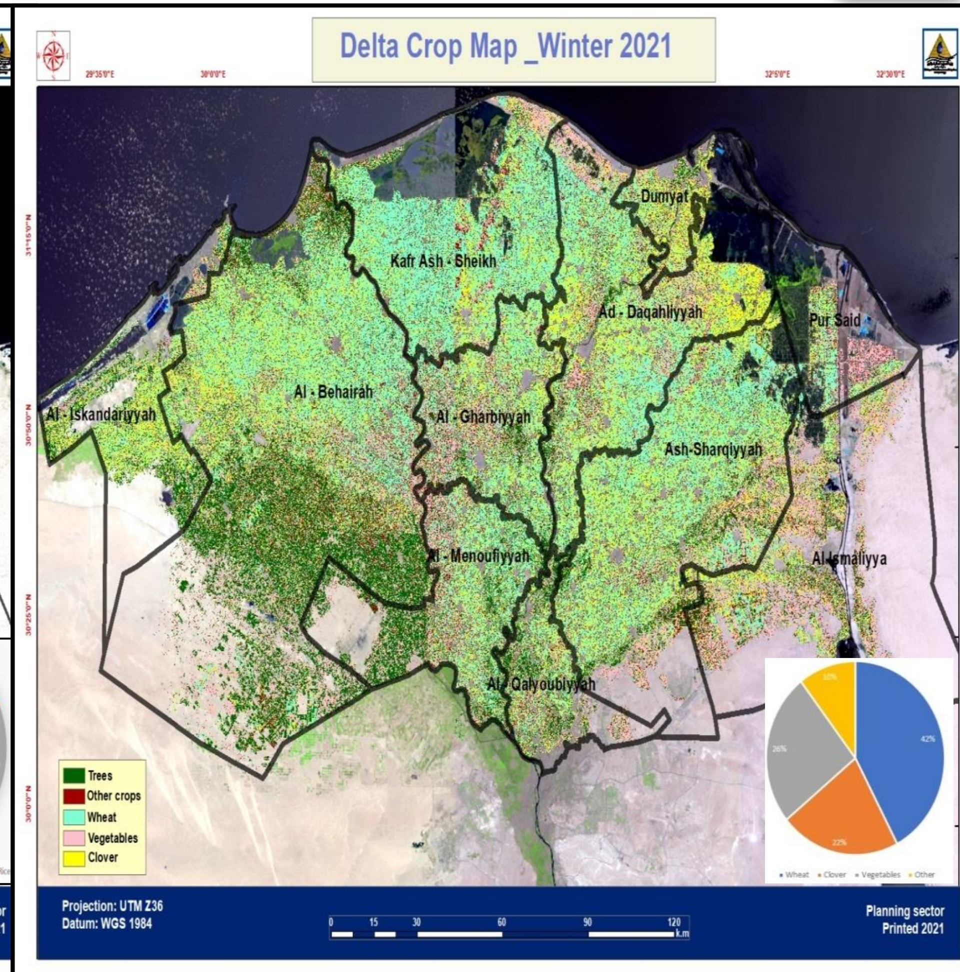
# Shore protection Works

# Water Accounting

- The MWRI decided to establish and implement a Water Accounting Unit (WAU) within the Planning Sector to create an independent, and scientifically sound water accounting system that serves Egypt's need, which helps improve water management, allocates water between sectors and users, boost agricultural yields and water productivity in all sectors.
- Water accounting is a systematic quantitative assessment of the trends and status in water supply, demand, allocation and uses, for certain domain producing information. Accurate water accounting is vital for understanding hydrological process, managing water flows, and future planning.

# Nile Delta - Crop maps 2020- 2021

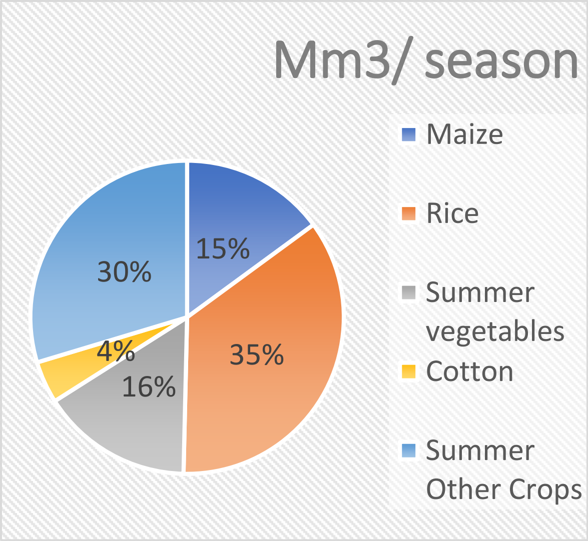


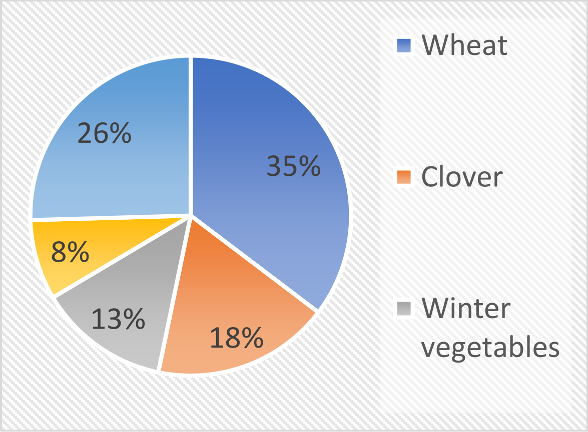




| Summer Crops | Winter Corps | Orchards |
|---|---|---|
| 1,921,143 ha | 1,964,525 ha | 445,781 ha |

# Water Consumed per crop

| Crop | Area | Water consumed | |
|---|---|---|---|
| | ha | mm/ season | $Mm^3$/ season |
| Maize | 269,846 | 667 | 1,800 |
| Rice | 568,816 | 1200 | 4,271 |
| Summer vegetables | 366,944 | 513 | 1,885 |
| Cotton | 79,771 | 656 | 523 |
| Summer Other Crops | 635,765 | 562 | 3,575 |
| Total summer | 1,921,142 | | 12,054 |
| Wheat | 831,232 | 598 | 4,964 |
| Clover | 427,943 | 588 | 2,516 |
| Winter vegetables | 500,962 | 370 | 1,856 |
| Winter Other Crops | 205,387 | 554 | 1,138 |
| Total winter | 1,965,524 | | 10,474 |
| Orchards | 445,781 | 896 | 3,996 |

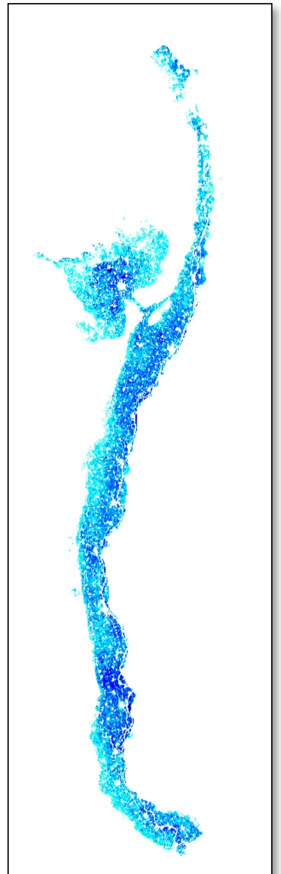


# Water allocation


# Actual Evapotranspiration

Delta



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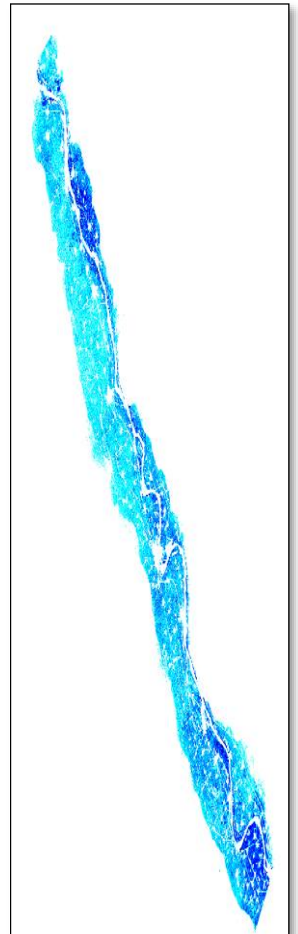
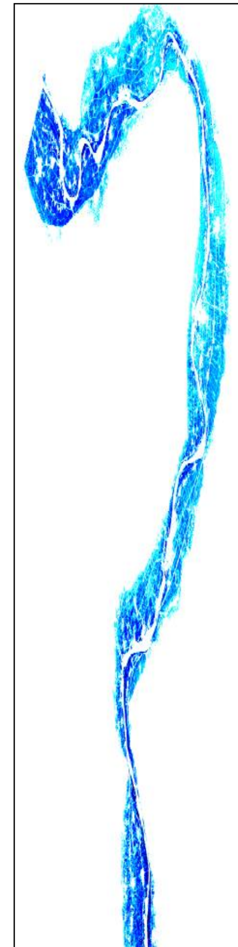


Naga Hamadi



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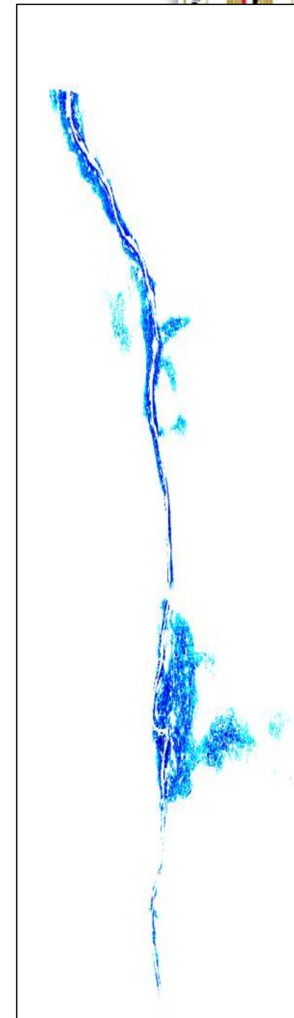


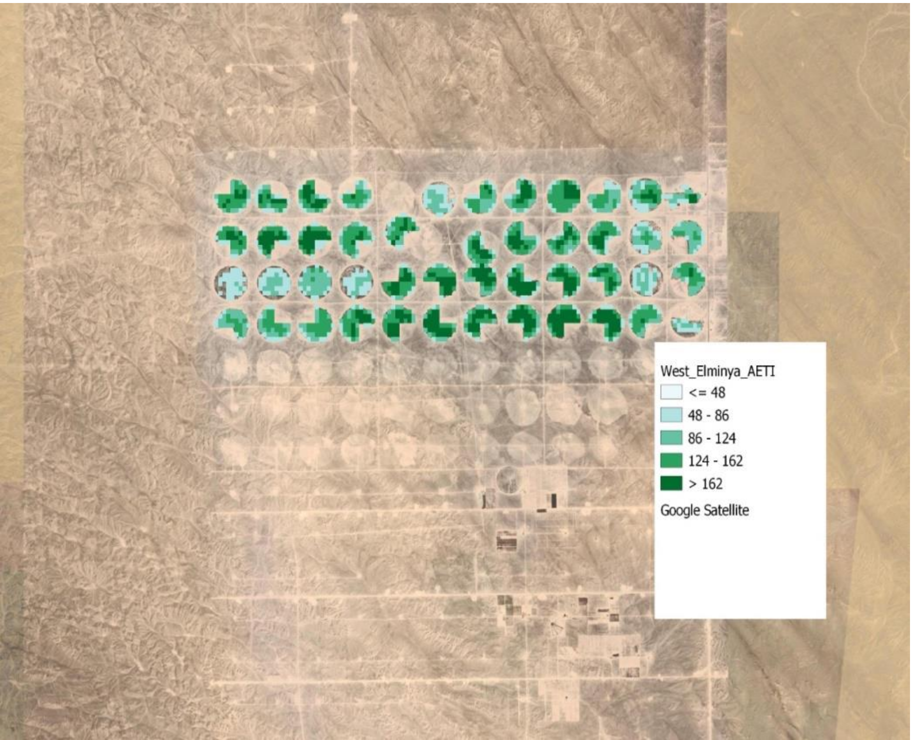
Aswan

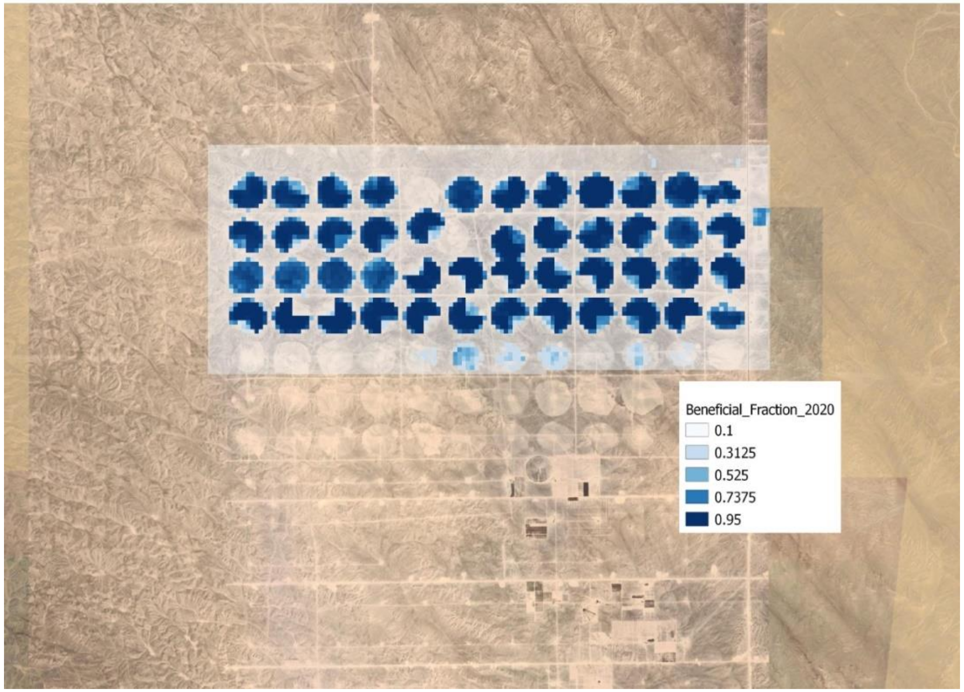
# Performance indicators for the consumptive use

Performance indicators for the WA+ consumptive use sheet provide key information on
the magnitude of beneficial use of water depletion in a basin. Water used by key water users in a basin is expressed in terms of fractions.

*Transpiration fraction* is the part of ET that is transpired by plants and it reflects an impact on bio-physical process in water scarce basins.

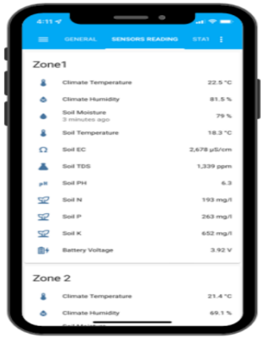
$Transpiration_{fraction} = T/ET$



# DIGITAL **FARMING** ELEMENTS

## Monitor




## Control


## Analysis


### Monitor

Monitor all soil and climate parameters using sensors to measure :

- Climate humidity and temperature.
- Soil (Moisture, Temperature, EC , PH, TDS , NPK) .

### Control

Connecting FARM ACTUATORS like:

- PUMP
- Control Valves

We can take immediate action by just one click.

### Analysis

The system stores sensors data on the local storage and make profile for soil parameters change over time which give the farmer

- better understanding and clear view for crop behavior in short and long term.
- can precisely calculate his running cost (power, water and fertilizers consumption).

# System Components

Sensors Node & Valves control

Soil Sensor

System Gateway & pump control

# Irrigation Efficiency

## Effective Efficiency: A Water Use Efficiency Concept for Allocating Freshwater Resources

**Andrew A. Keller and Jack Keller**

Egypt's Nile Valley irrigation system (NVIS) is an excellent example of a multiple use-cycle system with a high global efficiency but low local efficiencies. Egypt is interested in expanding the area irrigated by Nile River waters without reducing the high productivity of the present irrigated areas. To accomplish this will require an aggressive conservation program. However, directing conservation efforts toward areas where multiple use-cycles are possible, and thus $E_e$ is already quite high, will result in little real water savings.

Our estimate for the classical irrigation efficiency for the NVIS is $E_i = 41.2\%$. Thus there might appear to be considerable opportunity for conserving water by reducing water losses in the NVIS. Actually, however, the potential water savings are small because the effective irrigation efficiency for the NVIS (based on the cropland $U_{ci}$ and effective use, $U_e$, values) is $E_e = 91.3\%$,


Thank you