

Under the Patronage of His Excellency **Eng. Abdulrahman bin Abdulmohsen AlFadley**
Minister of Environment, Water & Agriculture

منتدى المياه السعودي
saudi water forum

SWF 2024



Water Reuse in Egypt : Current Status & Future Strategic Vision

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Holding Co. for Water and Wastewater (HCWW), Cairo, Egypt.



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Hilton Riyadh Hotel & Residences
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منظم المياه
Water Regulator



المركز الوطني لكفاءة وترشيد المياه
NATIONAL WATER EFFICIENCY AND CONSERVATION CENTER
MAEE



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Outline

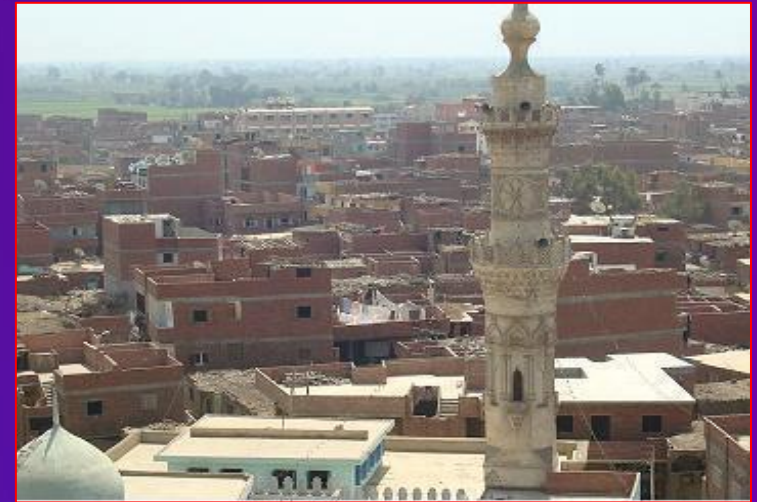
- Water Supply vs. Demand in Egypt: *Facts & Figures*
- Water & Sanitation Services Coverage
- Wastewater Reuse
 - ❖ Planned Reuse
 - ❖ Unplanned (De facto Reuse)
- Strategic Vision To Face the Challenges
- Conclusion & Recommendations

Egypt – More than 105 Million population in:

□ *250 Cities*



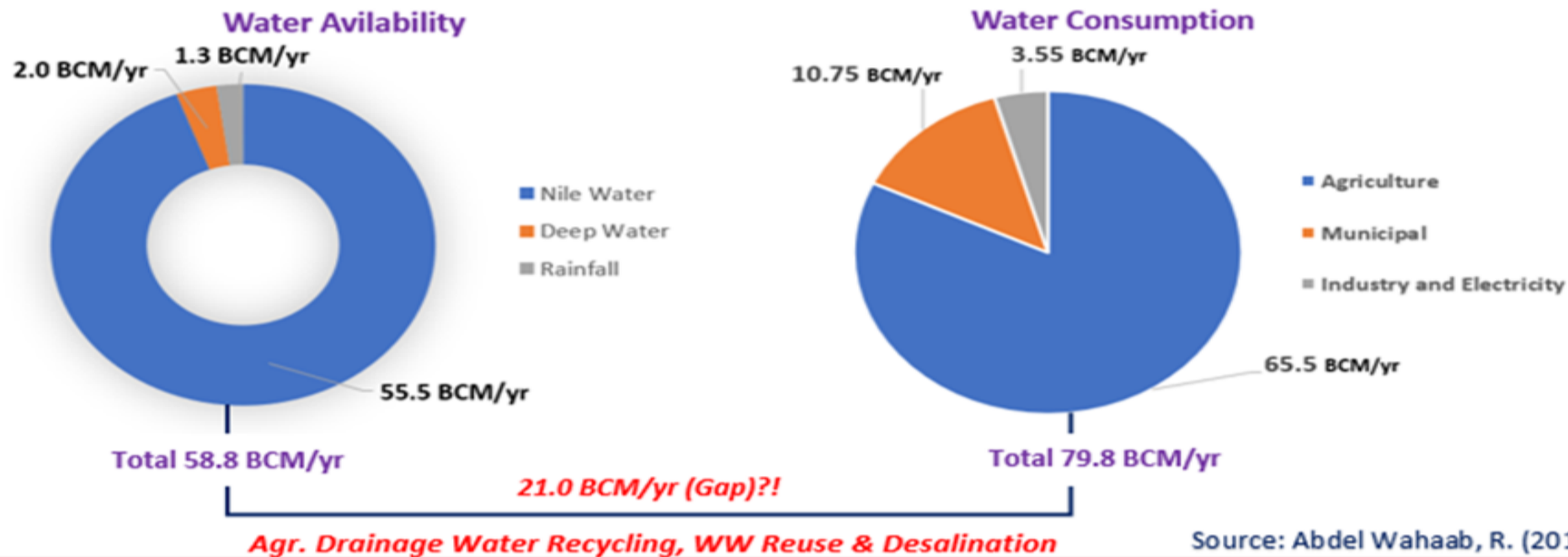
□ *4700 Villages*



□ *~35,000
Settlements
(Azba)*



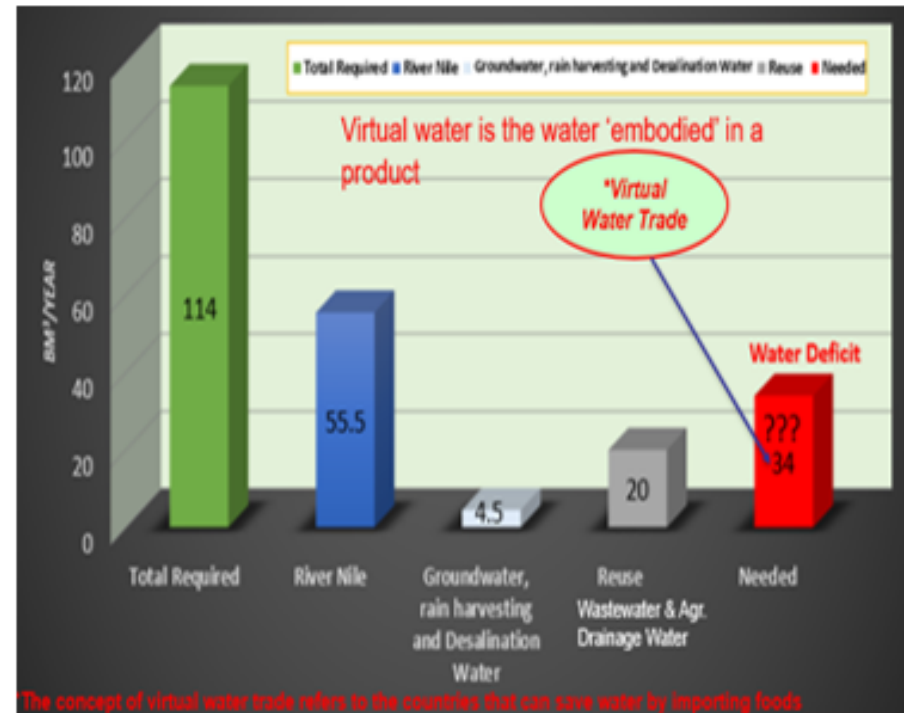
Water Balance In Egypt



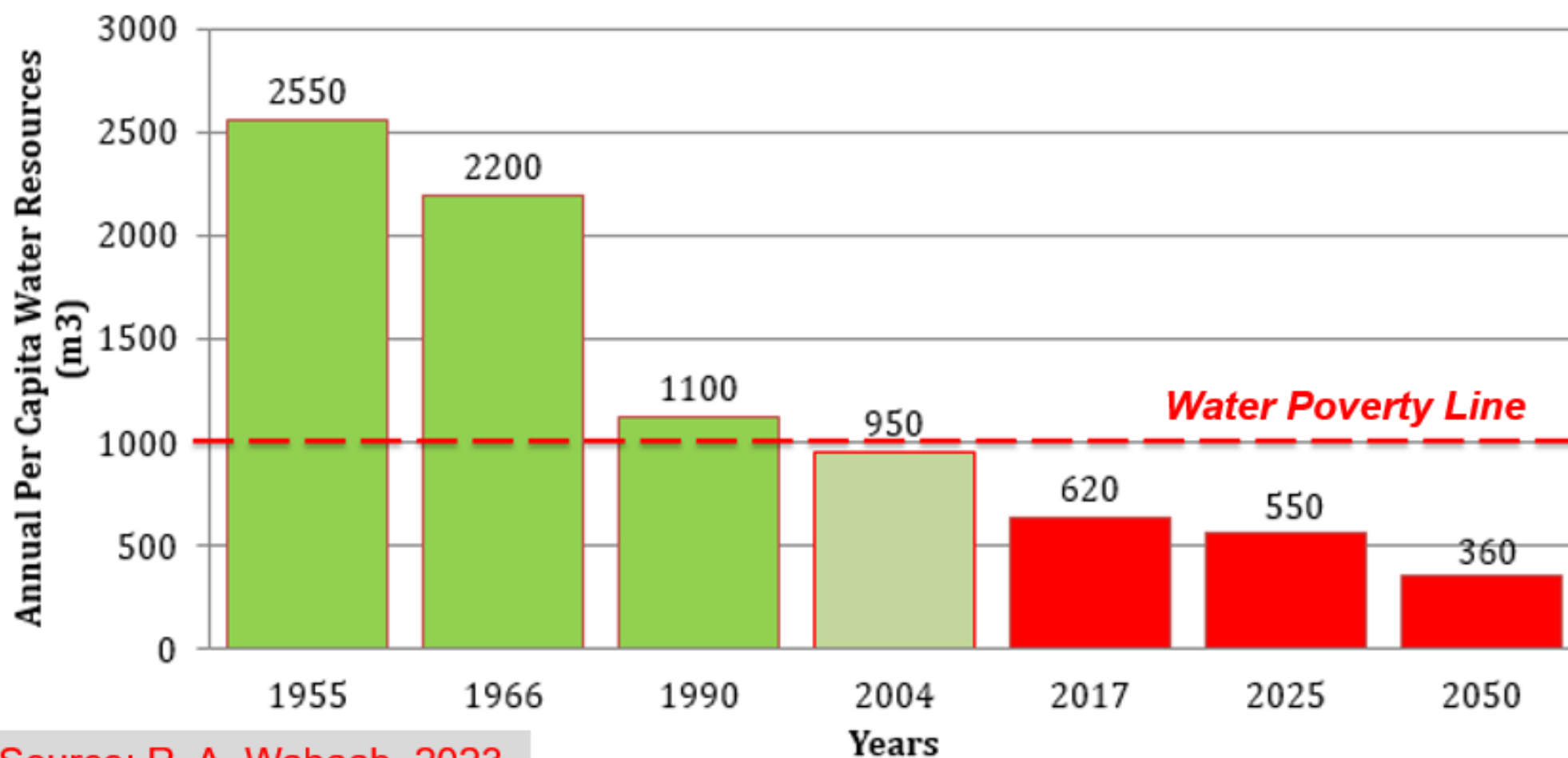
- ❑ River Nile is the only renewable supply source and provides ~97% of Egypt's total water resources (i.e., ~ 55.5 BCM/yr from the Nile)
- ❑ The gap between supply and demand is about 21 BCM/yr.
- ❑ Agriculture accounts for the largest share of freshwater in Egypt (i.e. ~ 82%).

Water Supply vs. Demand : Facts & Figures

- ❑ Egypt requires **114 $BM^3/year$** to cover the country's agricultural and industrial needs, as well as drinking and home usages.
- ❑ The River Nile , rain , ground water & desalination, only reached **59 $BM^3/year$** .
- ❑ Egypt suffers from a shortage of water at **~ 55 $BM^3/year$**
- ❑ Egypt currently covers shortages of water through reuse of agricultural drainage water, wastewater reuse which reached at **~21 $BM^3/year$**
- ❑ Meanwhile, the country needs **~ 34 $BM^3/year$** to produce food stuff.



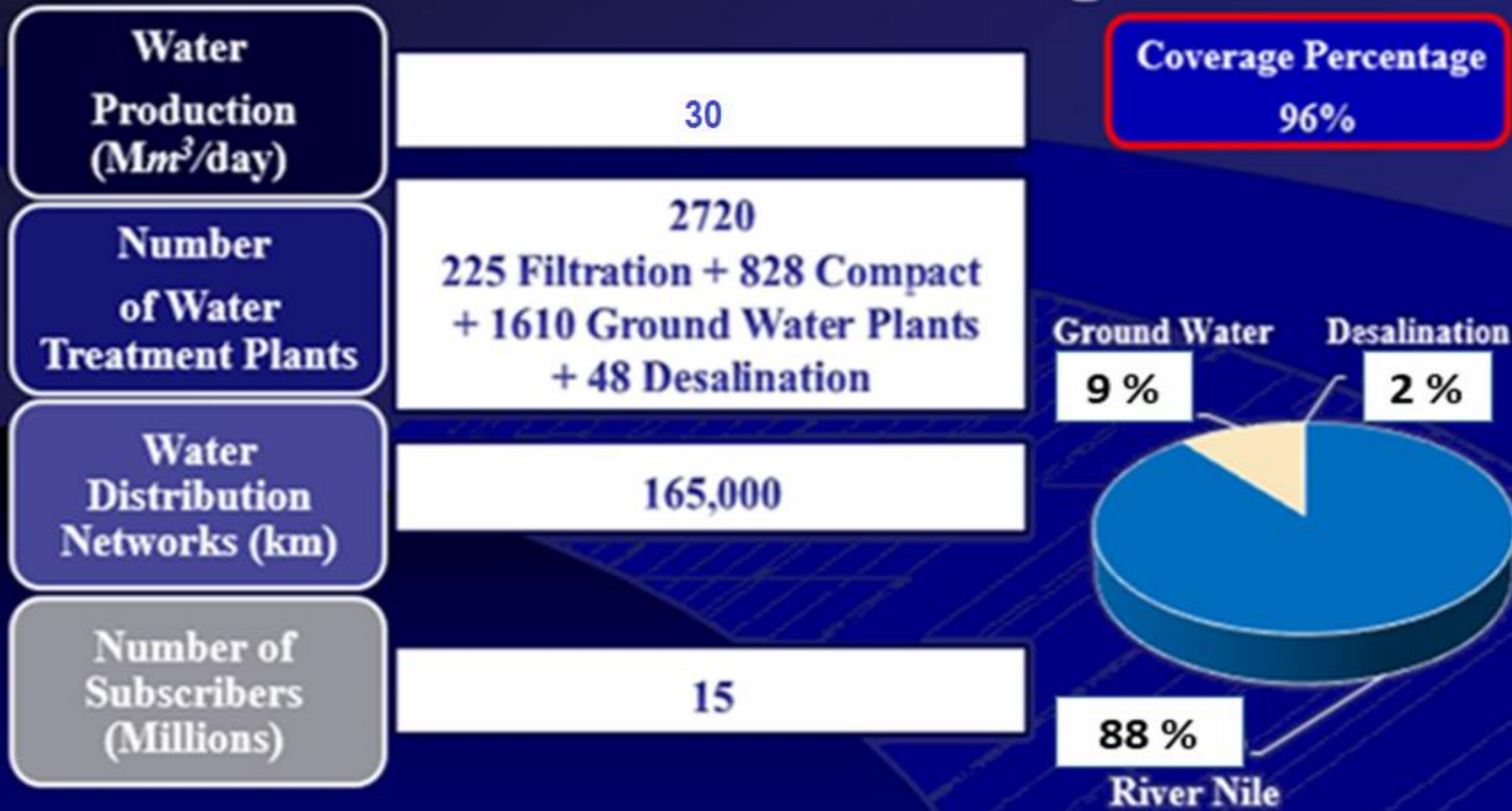
Overview of Annual Water Resources per Capita in Egypt (1955-2050)



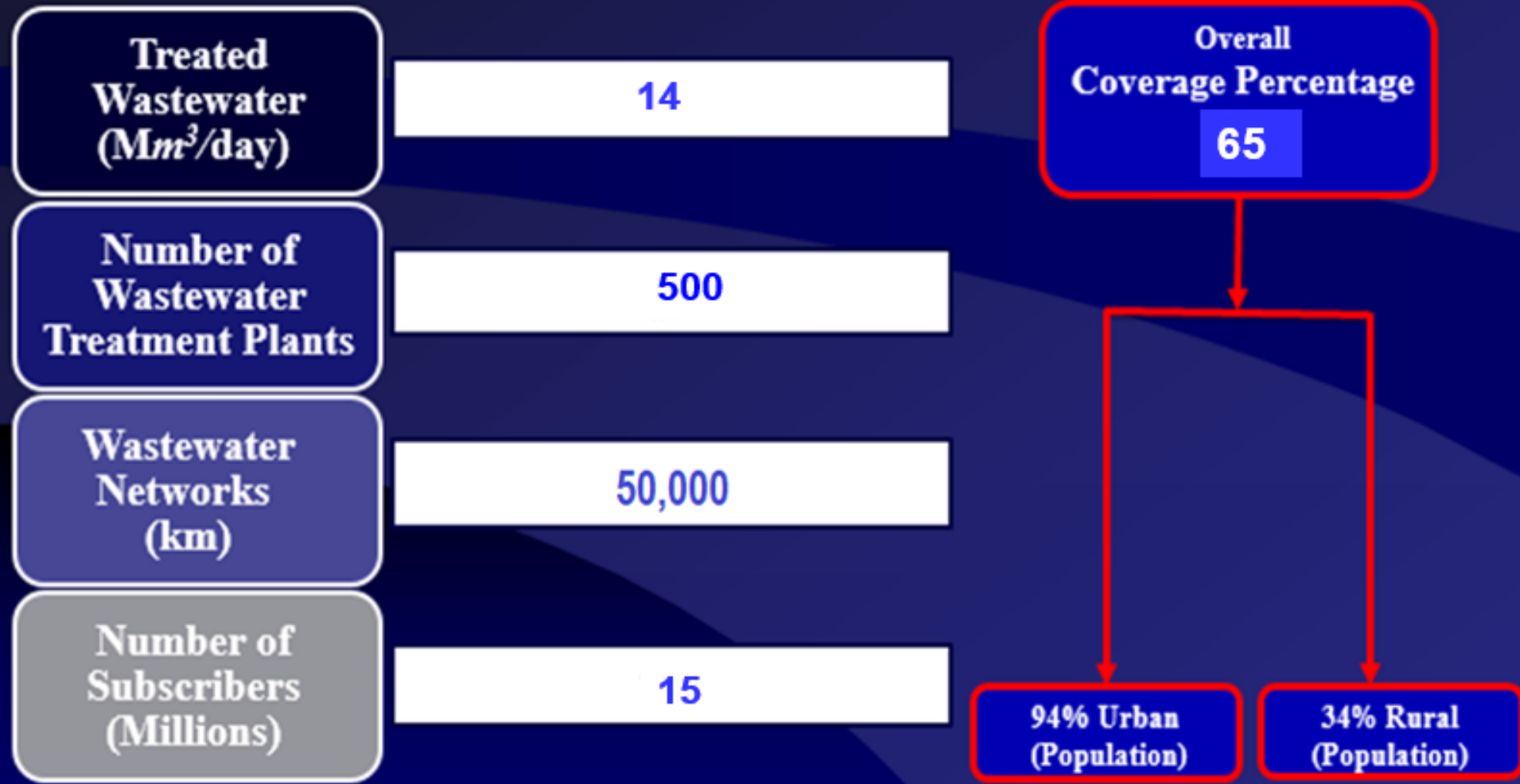
Source: R. A. Wahaab, 2023

Water/Sanitation Services Coverage

Water Service Coverage



Sanitation Service Coverage



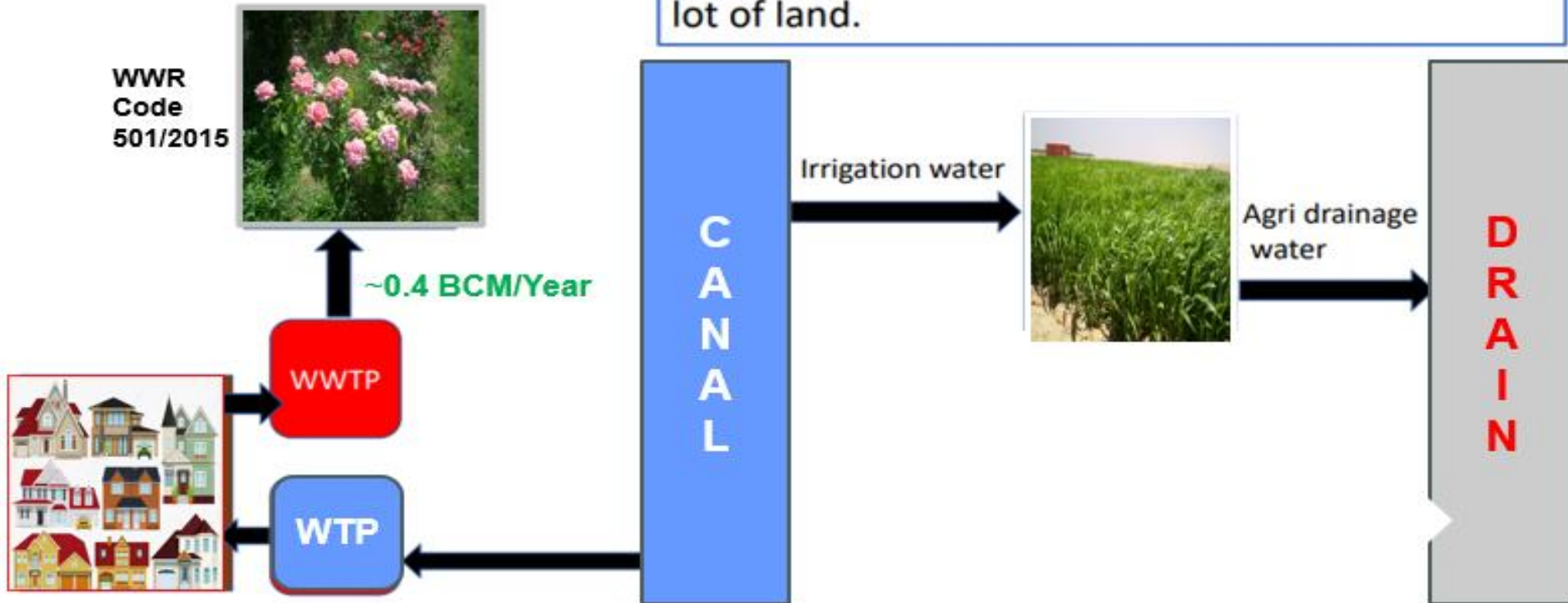
Wastewater Reuse in Egypt

- 1. Planned Wastewater Reuse (Wastewater with different degrees of treatment)**
- 2. Unplanned Wastewater reuse (defacto reuse)**

1. Planned Wastewater Reuse (Wastewater with different degrees of treatment)

Planned water reuse

Planned reuse means that the effluent from a specific WWTP is used for irrigation in a specific lot of land.



* In addition to municipal wastewater, pollution from industry, municipal solid waste which all contain Contaminants of Emerging Concern (CEC)

Wastewater Reuse-Egyptian Code (501/2015)

HCWW initiated the WWR code. The code developed based on the following :

- ❖ Degree(s) of wastewater treatment
- ❖ Specifying crops
- ❖ Irrigation methods
- ❖ Public health requirements
- ❖ Monitoring and control systems

Degree of Treatment Permitted for Agriculture Use*

Requirements & Limitations		Degree of Treatment			
		Grade A	Grade B	Grade C	Grade D
Physical & Chemical Standards	TSS	15	30	50	300
	Turbidity, (NTU)	5	Undefined	Undefined	Undefined
	BOD ₅	15	30	80	350
Pathogens Standards	<u>E.Coli</u> MPN/100 ml	20	100	1000	Undefined
	Intestinal Nematodes /liter	1	Undefined	Undefined	Undefined

* *FAO Guideline for chemical standards*

***Classification of plants and crops allowed for
irrigation with treated Wastewater***

Plants and Crops Permitted for Irrigation by Treated Wastewater

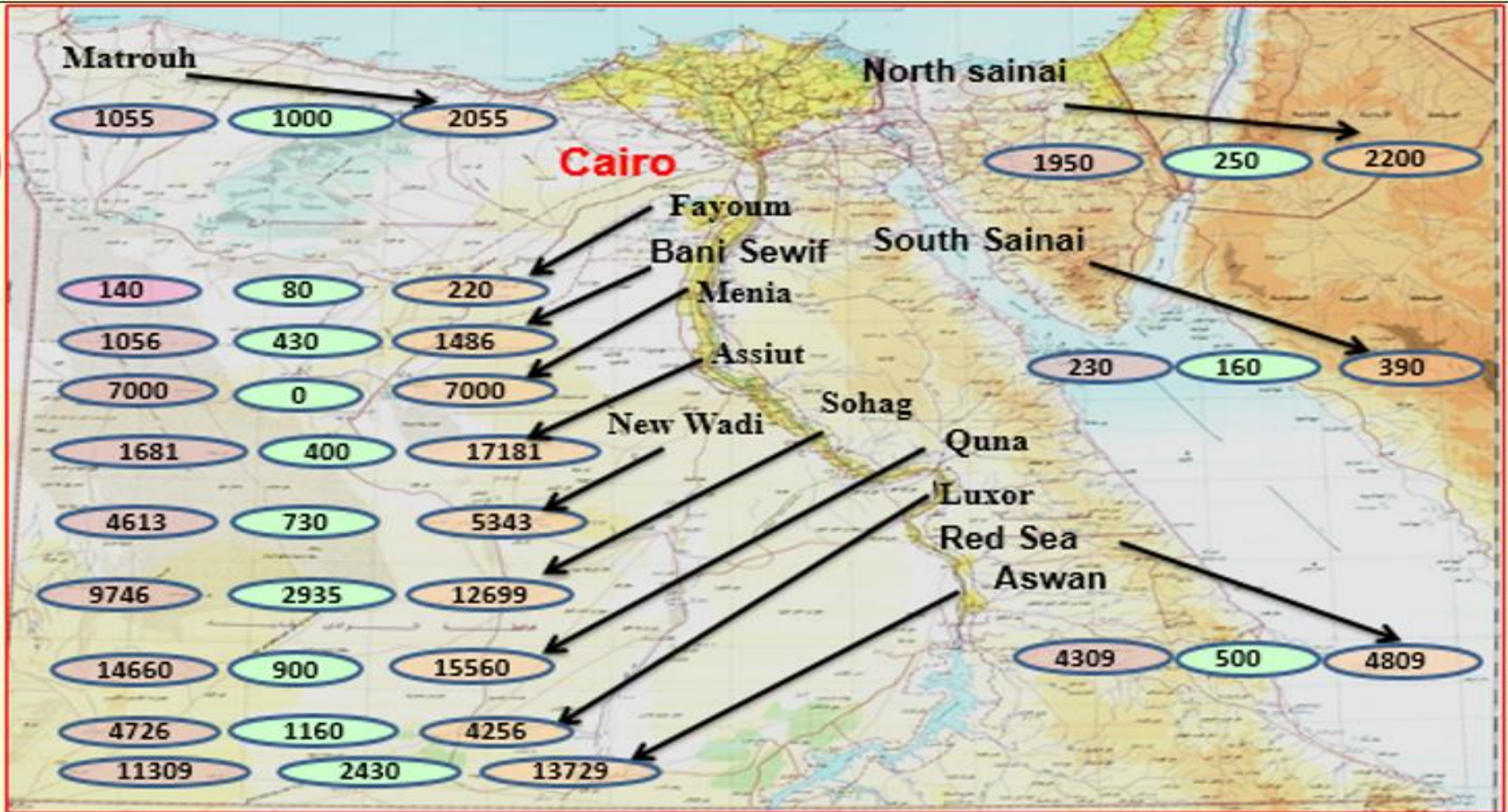
Grades	Agricultural Group (Taking into consideration the recommended Irrigation Methods)
A	Green landscapes, public and private parks المسطحات الخضراء ونباتات الزينه
B	<ol style="list-style-type: none"> 1. Dry grains crops, cooked & processed vegetables 2. Fruit Crops القمح والذره والشعير، الموالح، الينسون والكمون.... 3. Medicinal Plants
C	<ol style="list-style-type: none"> 1. Dry grain crops, fruits, medicinal plants contained group (B) 2. Non-food seeds (Propagation Seed) 3. All types of seedlings, transplanted impermanent fields البذور والشتلات 4. Roses and Cut flowers نبات الزينه والورد 5. Trees suitable for planting in highways and green belts النخيل والقطن، كتان 6. All types of fibre crops فول الصويا 7. Grassy forage crops and leguminous crops والأشجار..... 8. Mulberry to produce silkworm silk 9. All plants and ornamental trees nurseries
D	<ol style="list-style-type: none"> 1. Solid biomass crops الجوجوبا، الجاتروفا، الخروع وجميع انواع الأشجار 2. Crops to produce cellulose الخشبيه مثل الكايا والكافور والماهو جنى... 3. Timber trees

DIRECT WASTEWATER REUSE-PROJECTS MAP

Total
91,700
Feddan

Cultivated
10733
Feddan

Uncultivated
80967
Feddan



Plantation & Crops Projects

Castor

Ornamental Plants

Jatropha

Barely

Jojoba

kaya Trees

Flax

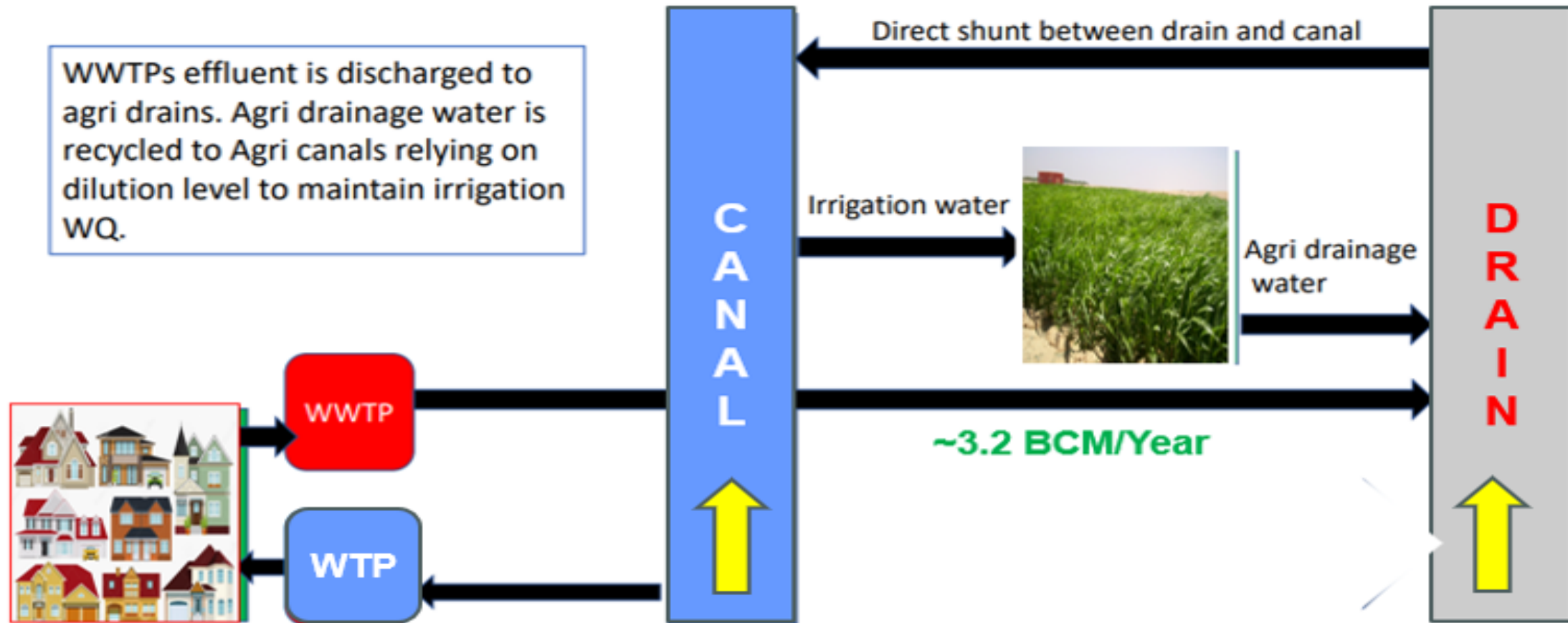
Olives



2. Unplanned Wastewater reuse (*De facto Reuse*)

Unplanned water reuse – configuration 1 ★

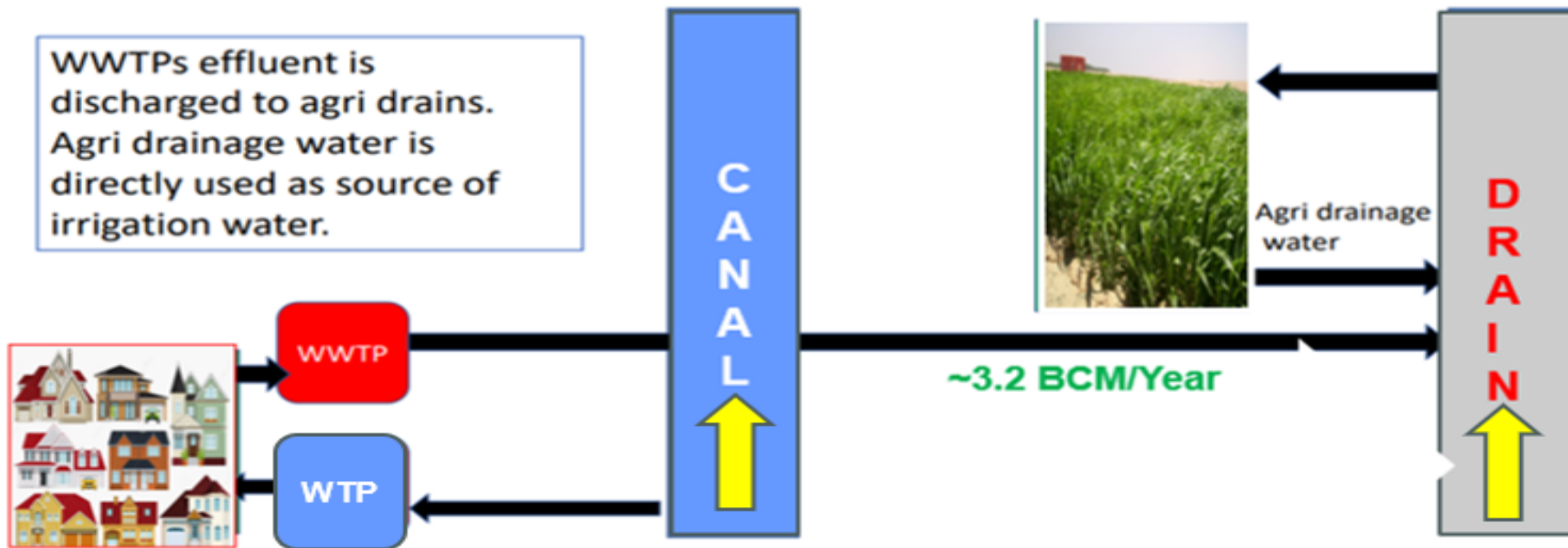
WWTPs effluent is discharged to agri drains. Agri drainage water is recycled to Agri canals relying on dilution level to maintain irrigation WQ.



★ **Upper Egypt:** Drainage water returns to the Nile itself and gets reused indirectly downstream.

Unplanned water reuse – configuration 2★

WWTPs effluent is discharged to agri drains. Agri drainage water is directly used as source of irrigation water.

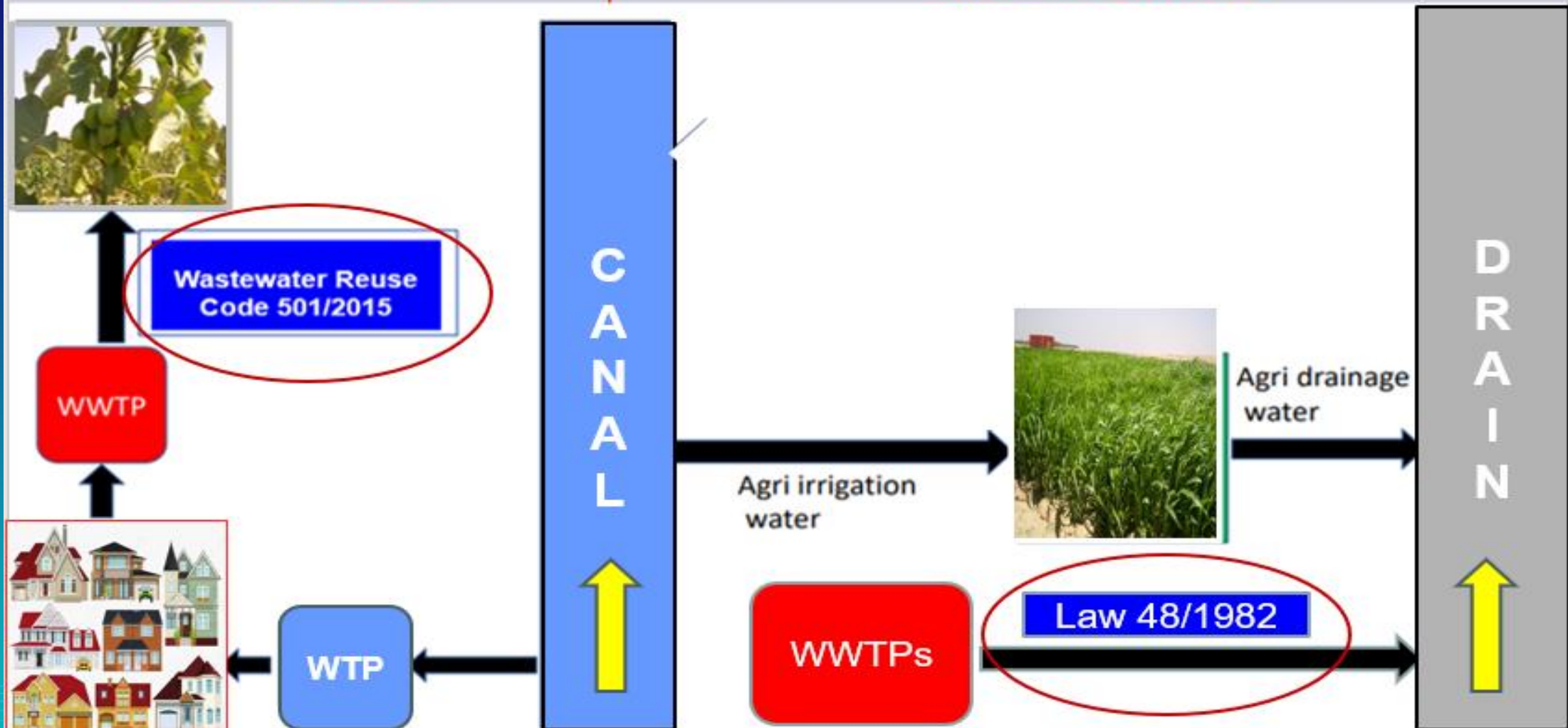


★ **Delta Region:** Wastewater is discharged into nearby agricultural drains, mixed with other water sources and used for irrigation. **Agricultural drainage water** presently being reused (estimated to be ~12.5 BCM/year).
Drainage water in Delta is used more than one time!

Applicable Egyptian Regulations

Planned Reuse

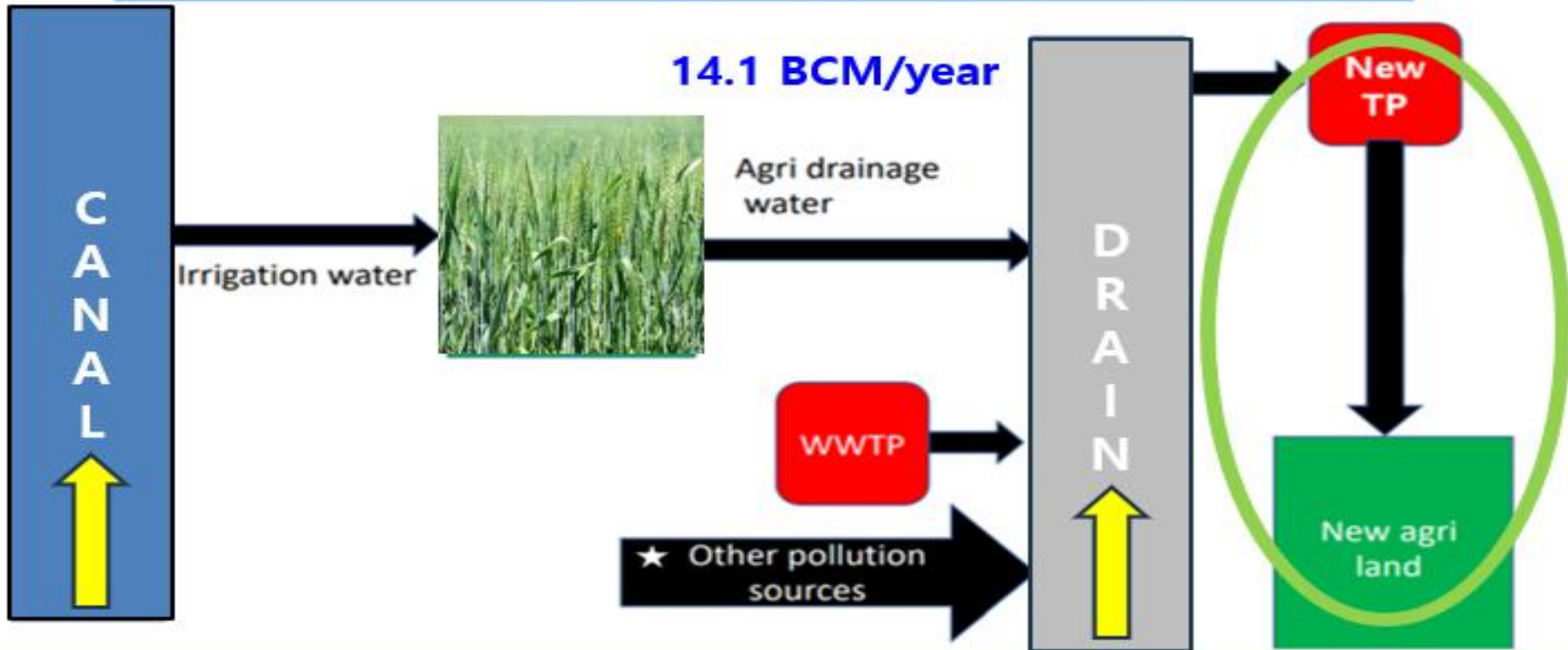
Unplanned Reuse



Strategic Vision To Face the Challenges: New Mega Projects

- Al Mahsama Agricultural Water Reclamation & Reuse Project
- Bahr Baqar Agricultural Water treatment & Reuse Project
- New Delta Water Reuse Project

Improvement of Agricultural Drainage Water (Mega Projects)



* In addition to municipal wastewater, pollution from industry, municipal solid waste which all contain Contaminants of Emerging Concern (CEC)

Drainage Wastewater Treatment & Reuse Projects (For Irrigation)

Construction Completed

Baher El Bakar treatment plant

Total capacity
5.6 million m³/d

awarded **3** Guinness world records certificates

Mahsama treatment plant

Total capacity
1 million m³/d

awarded the best world water recycling project in 2020

Under Construction

El Hamam treatment plant

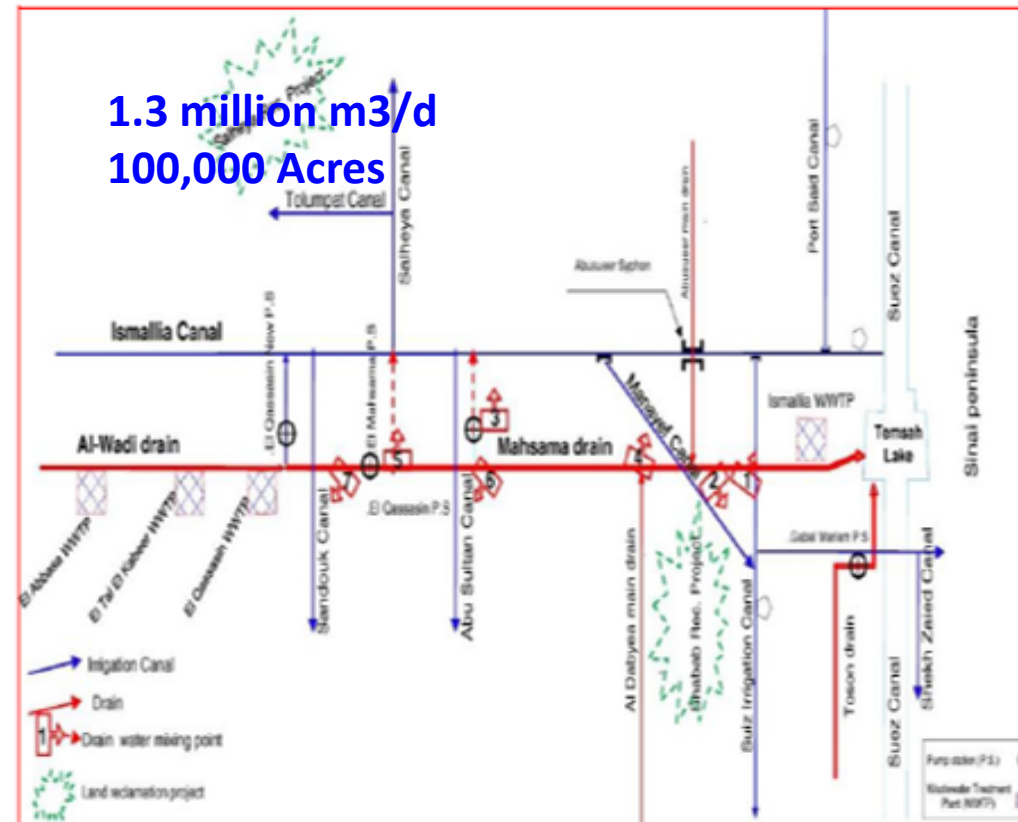
Total capacity
7.5 million m³/d

Total will be **14.1** million m³/d

* To reach **36.6** million m³/d total wastewater to be reused.

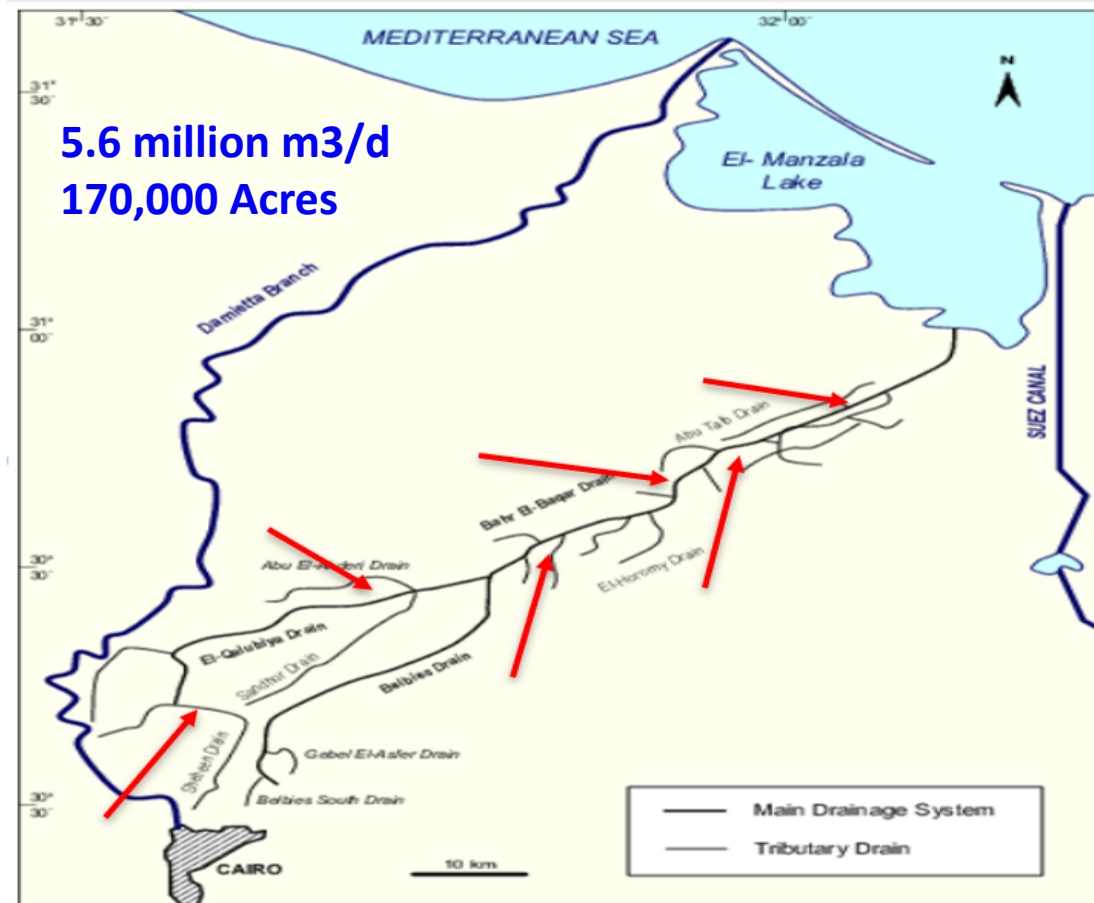
Al Mahsama Water Reclamation Project

- Al Mahsama agricultural drainage treatment project located on the eastern edge of the Suez Canal
- The project has a capacity of 1.3 million m³/day , with a total cost of \$100 million
- The latest technologies were utilized to produce suitable water for irrigation and land reclamation.
- The treated water will irrigate up to 100,000 acres of land in central Sinai.
- The untreated water was being released into Al Tamsah Lake, west of the Suez Canal.



Bahr El-Baqar agricultural drainage treatment, recycling and reuse project

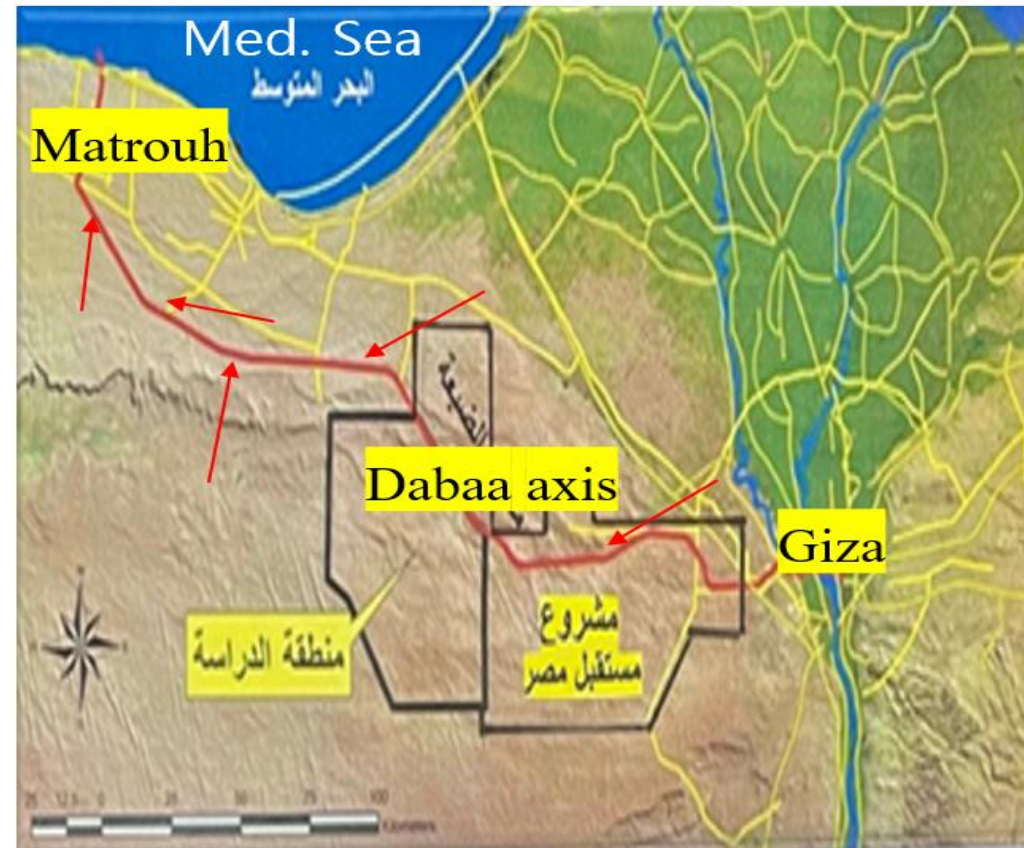
- ❑ Bahr El-Baqar project located in the Sinai, east of the Suez Canal.
- ❑ The plant collects domestic, industrial and agricultural wastewater that flows along the Bahr El-Baqar Drain, from 5 Governorates.
- ❑ The project is the largest in the world, with a capacity of 5.6 million m³/day.
- ❑ The project will provide water for the irrigation of more than 170,000 hectares of plantations in the Sinai Peninsula



New Delta project

7.5 Million m³/day

- ❑ The New Delta project is one of the mega projects in the agricultural field, and it is being built on an area of more than one million acres in the northwest coast
- ❑ The project will be located in the south of the Dabaa axis,, near the old delta and linking the administrative borders of the governorates of Matrouh, Beheira and Giza.
- ❑ The project aims to contribute to the water scarcity in Egypt & compensate for the loss of agricultural lands due to unjust construction.
- ❑ More than 90% of the area can be cultivated with the strategic crops topped by wheat, maize, vegetables and fruits.



***Upcoming concerns in
water reuse ?!***

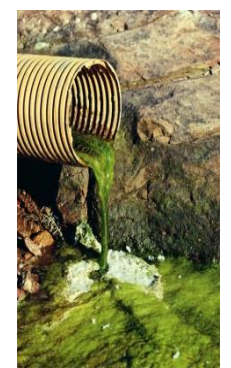
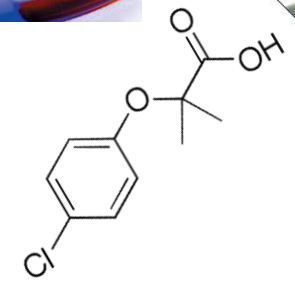
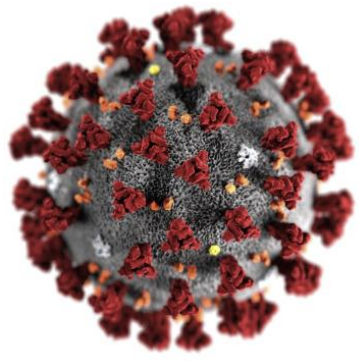
**Upcoming concerns
in water reuse ?!**



**Increased nutrients
(N & P)**

Micro-pollutants (incl. HM, Emerging Cont.)

**Pathogenic Organisms &
Viruses (COVID 19) ?**



Conclusion & Recommendations

- ❑ Wastewater reuse projects are currently designed as integral part of the overall wastewater network and water resources plan in Egypt.
- ❑ It is necessary to develop affordable and effective WWT technologies to improve the quality of the treated wastewater for reuse.
- ❑ Agri. Drains' water recycling in agriculture is one of the most promising ways in Egypt to enhance food security & to face water scarcity.
- ❑ Egypt has started to study and develop a map of “unplanned water reuse”- its *magnitude and impact*. Special attention will be given to “*contaminants of emerging concerns*”.
- ❑ It is essential to disseminate & exchange the successful cases of WWR in *MENA Countries* as guidance for replications & knowledge transfer.

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THANK YOU!



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