



International Water
Management Institute



Wastewater Treatment to Mitigate Pollution and Create Useable Water & the Required Enabling Environment

Dr. Youssef Brouziyne

IWMI Representative in the MENA region

Innovative water solutions for sustainable development

Food · Climate · Growth



**Workshop on Protecting Water Quality and
Biodiversity for Improved Water Management**
Beirut, 9-10 July 2024

IWMI's Strategy

WATER CHALLENGES

FOOD



Improve Food Security

Conserve Ecosystems & Water Resources

CLIMATE



Adapt to & Mitigate Climate Change

Build Resilience to Societal Disruption

GROWTH



Promote Sustainable Growth

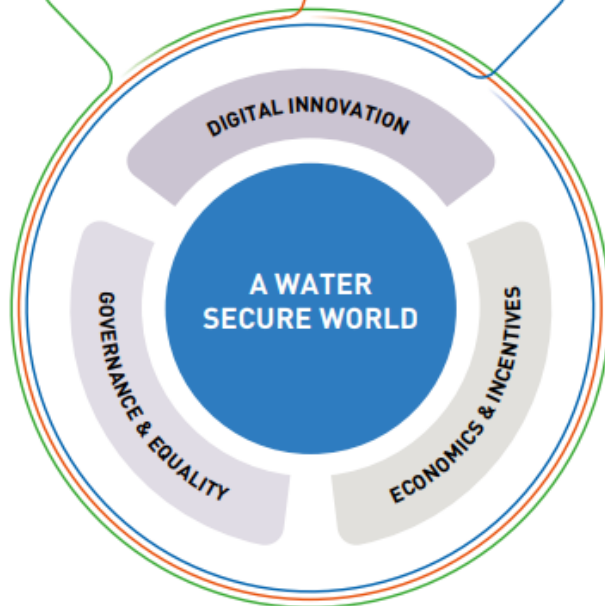
Achieve Gender Equality & Inclusive Societies

IWMI'S STRATEGIC PROGRAMS

WATER, FOOD & ECOSYSTEMS

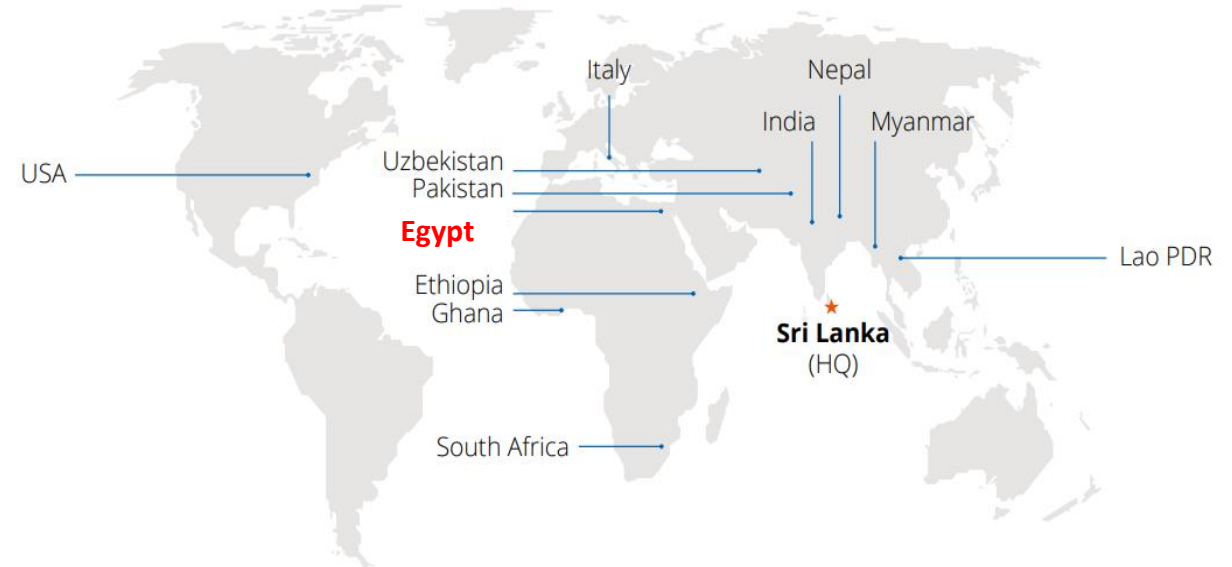
WATER, CLIMATE CHANGE & RESILIENCE

WATER, GROWTH & INCLUSION



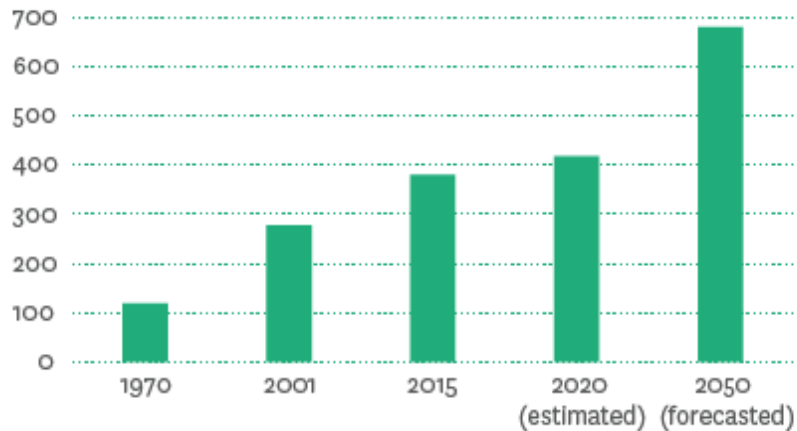
IWMI is an international, research-for-development organization, with offices in **15 countries** and a global network of scientists operating in more than **55 countries**. For over three decades, our research results have led to **changes in water management** that have contributed to social and economic development.

IWMI Offices

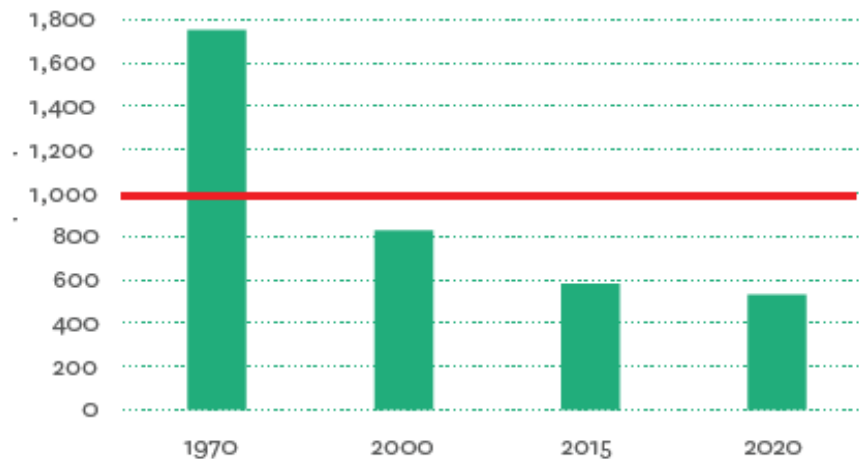




1-MENA faces a deep water crisis and we are not doing enough to solve it



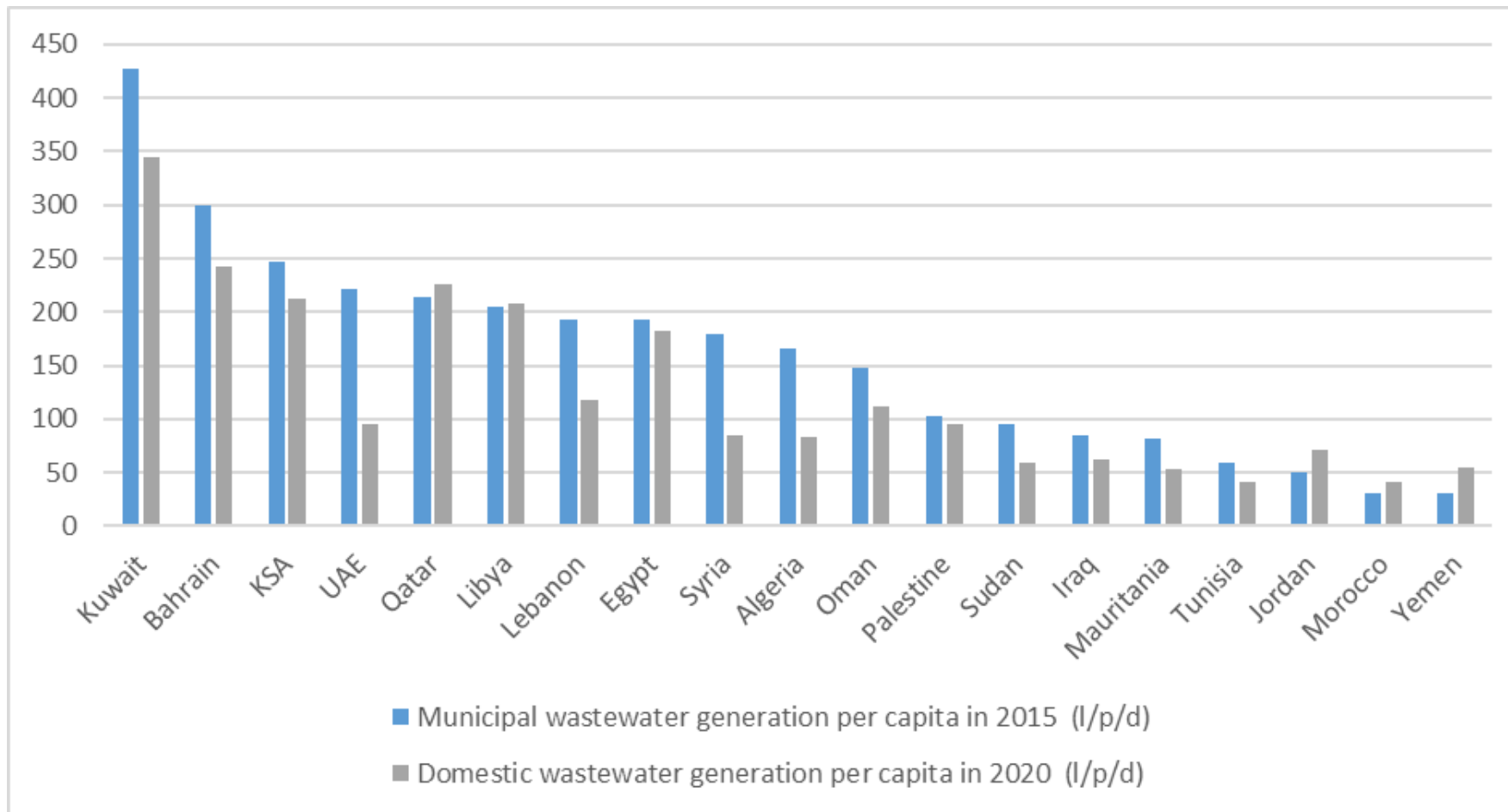
Population in the region (millions of inhabitants).
Source: UN 2019; UN 2018.



Water resources per capita in the region; red line shows threshold for water scarcity. Source: FAO 2022



Per capita wastewater generation in MENA



Source: AWC 2019, WHO 2021

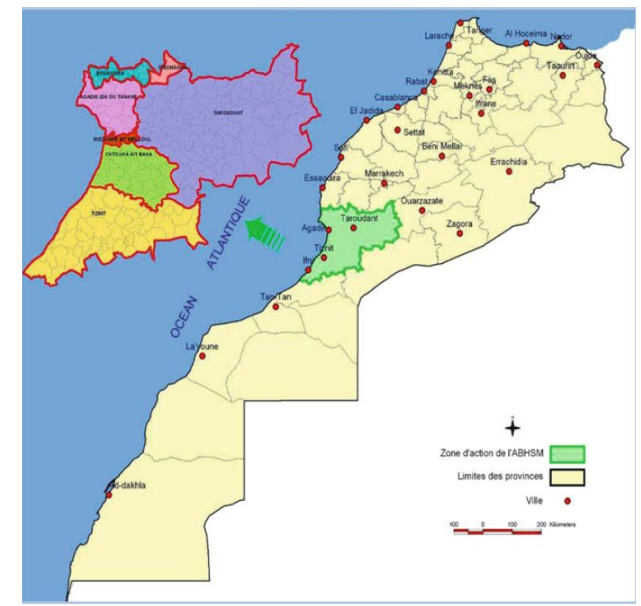
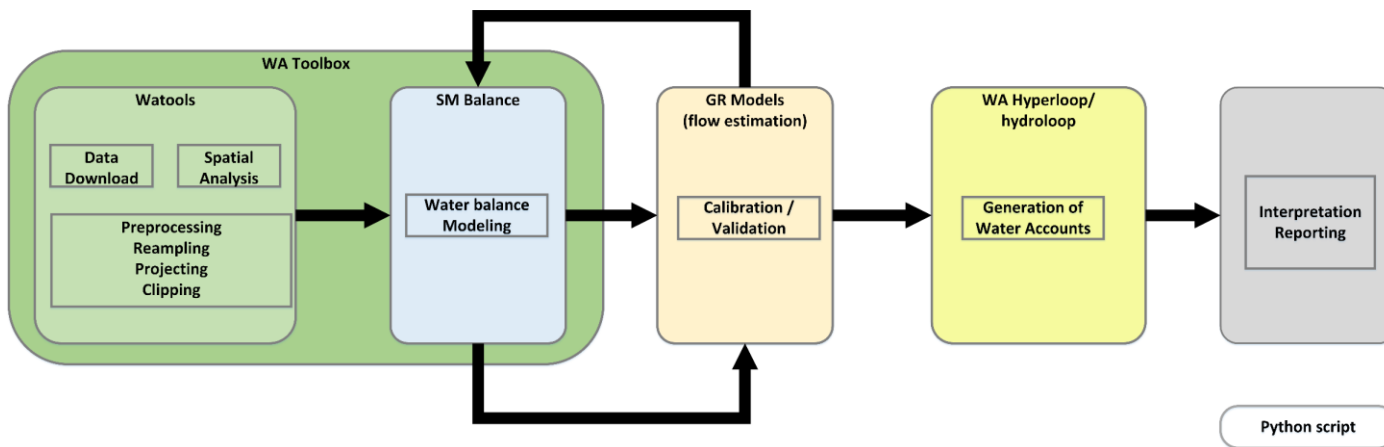
Water Accounting Plus

Understanding potential/risk:

Estimation of wastewater generation through water Accounting Plus tool

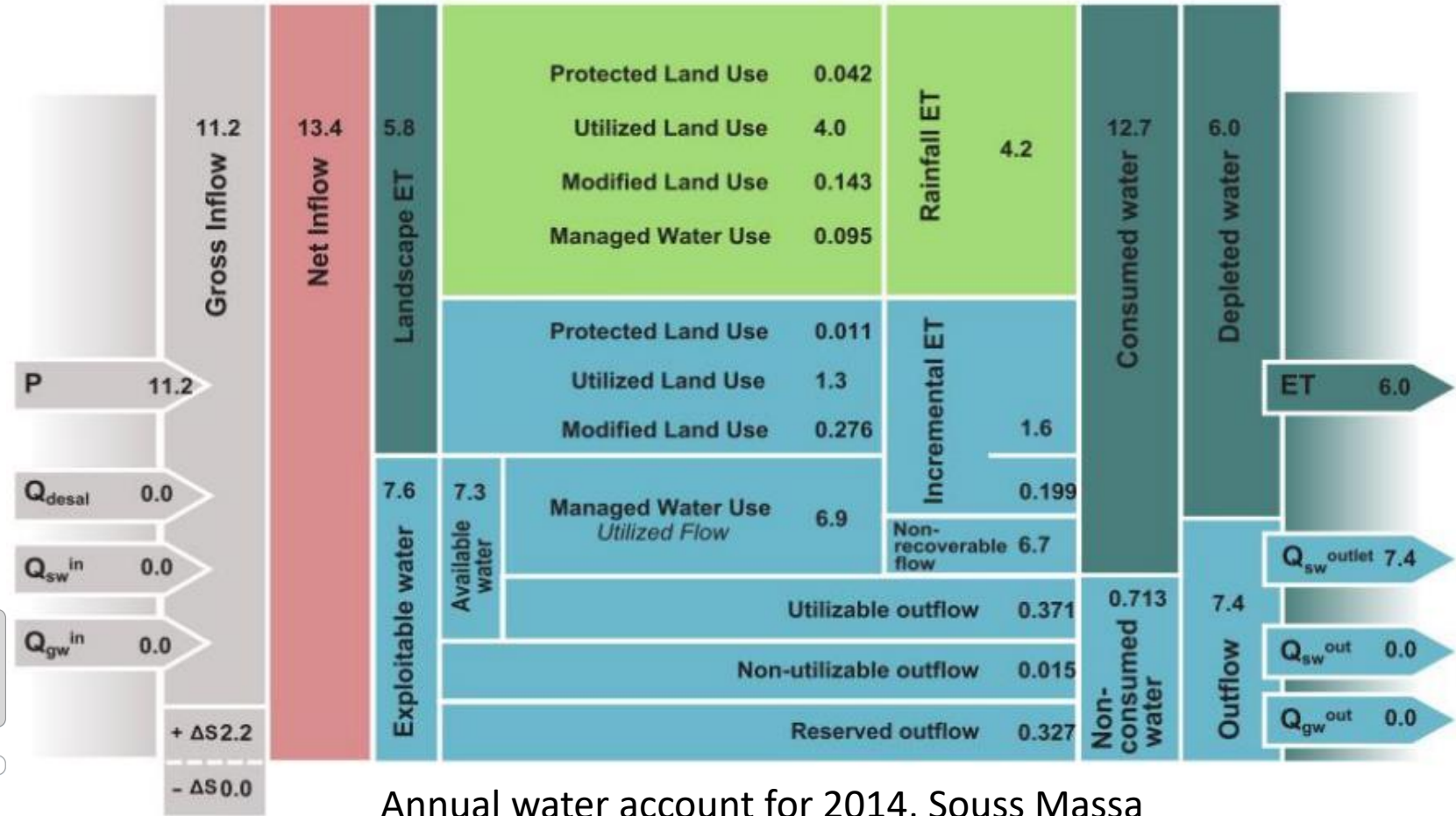
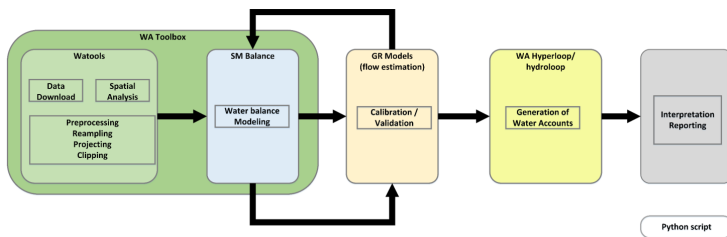
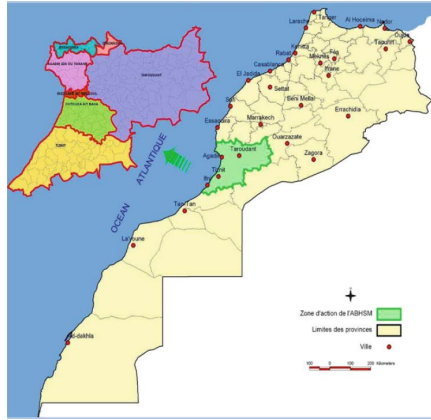


UK Government



Understanding potential/risk:

Estimation of wastewater generation through water Accounting Plus tool



Annual water account for 2014, Souss Massa

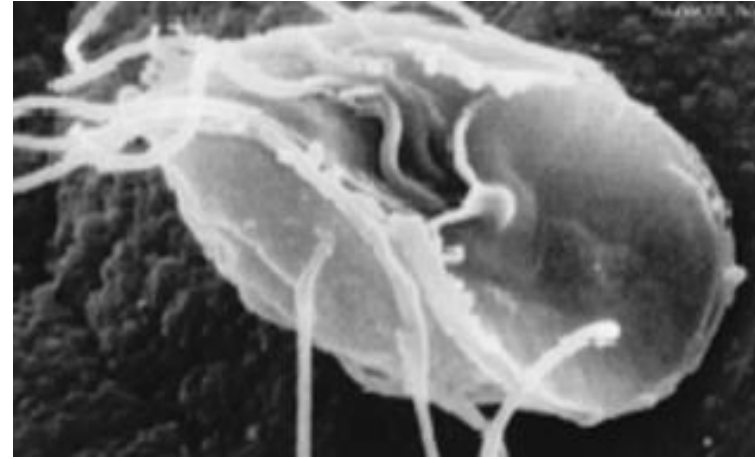
Water Accounting Plus

Understanding potential/risk

Organic matter



Pathogens



Salts and sediments



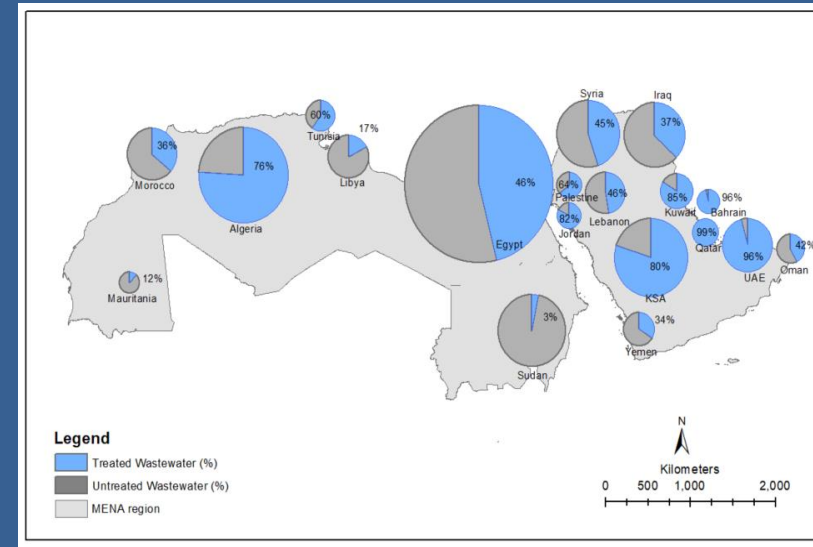
Emerging pollutants



Still a long way to go in wastewater treatment to catch up with population growth

Municipal wastewater produced
21.5 km³

Safely treated
60%



Source: AQUASTAT, AWC 2029, GWI, WHO 2021

Understanding risk

Even with wastewater treatment some pollutants are poorly removed

Average composition of raw and treated wastewater and associated removal in MENA

	TSS	BOD	COD	T-N	T-P	F.C	EC	TDS	Ner of cases
Raw WW	296	285	523	55.2	13.2	7.15E+08	2.46	1,490	166
Treated WW	38	32	84	21	8.32	8.04E+05	2.16	1,336	211
Removal	87%	89%	84%	61%	37%	1-6 log	12%	10%	

Wastewater is only a waste if we decide to waste it:

The potential for resource recovery from municipal wastewater in MENA is still untapped

Understanding Potential

2.6 M

hectars

Water and nutrients to irrigate and fertilize



8 M

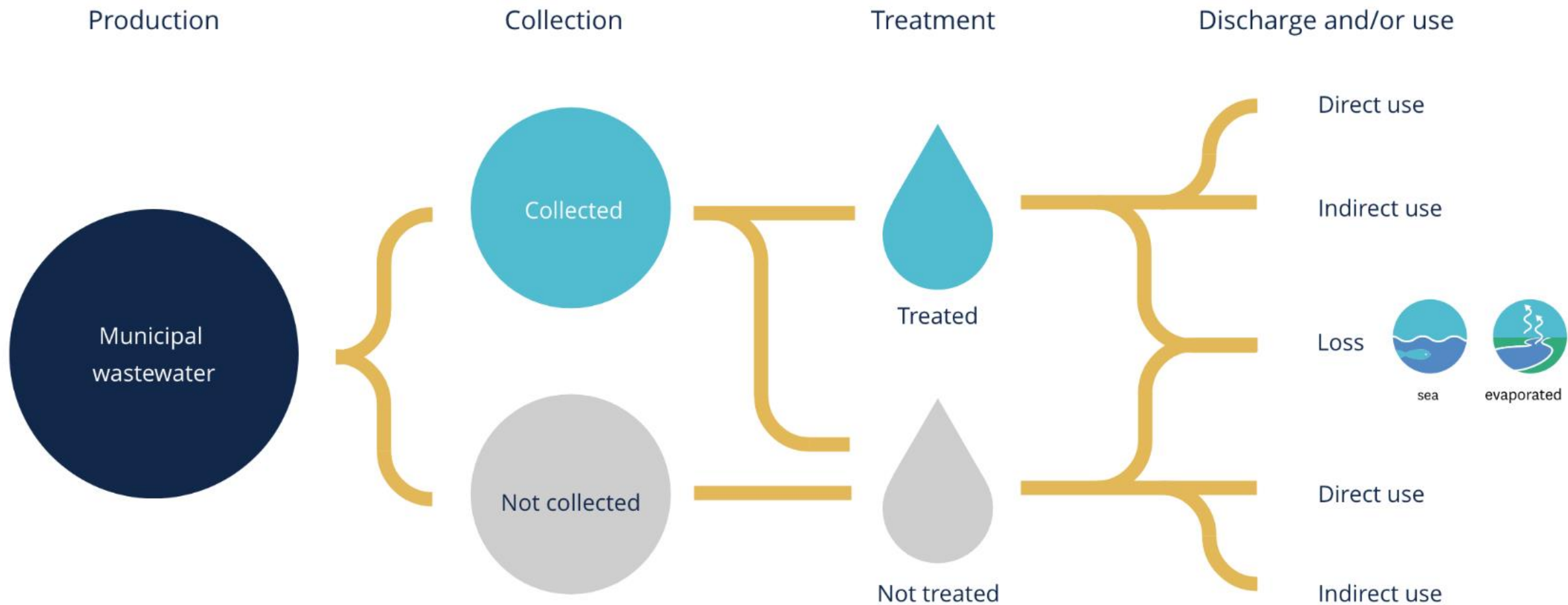
households

Carbon to produce methane with a caloric value to provide electricity

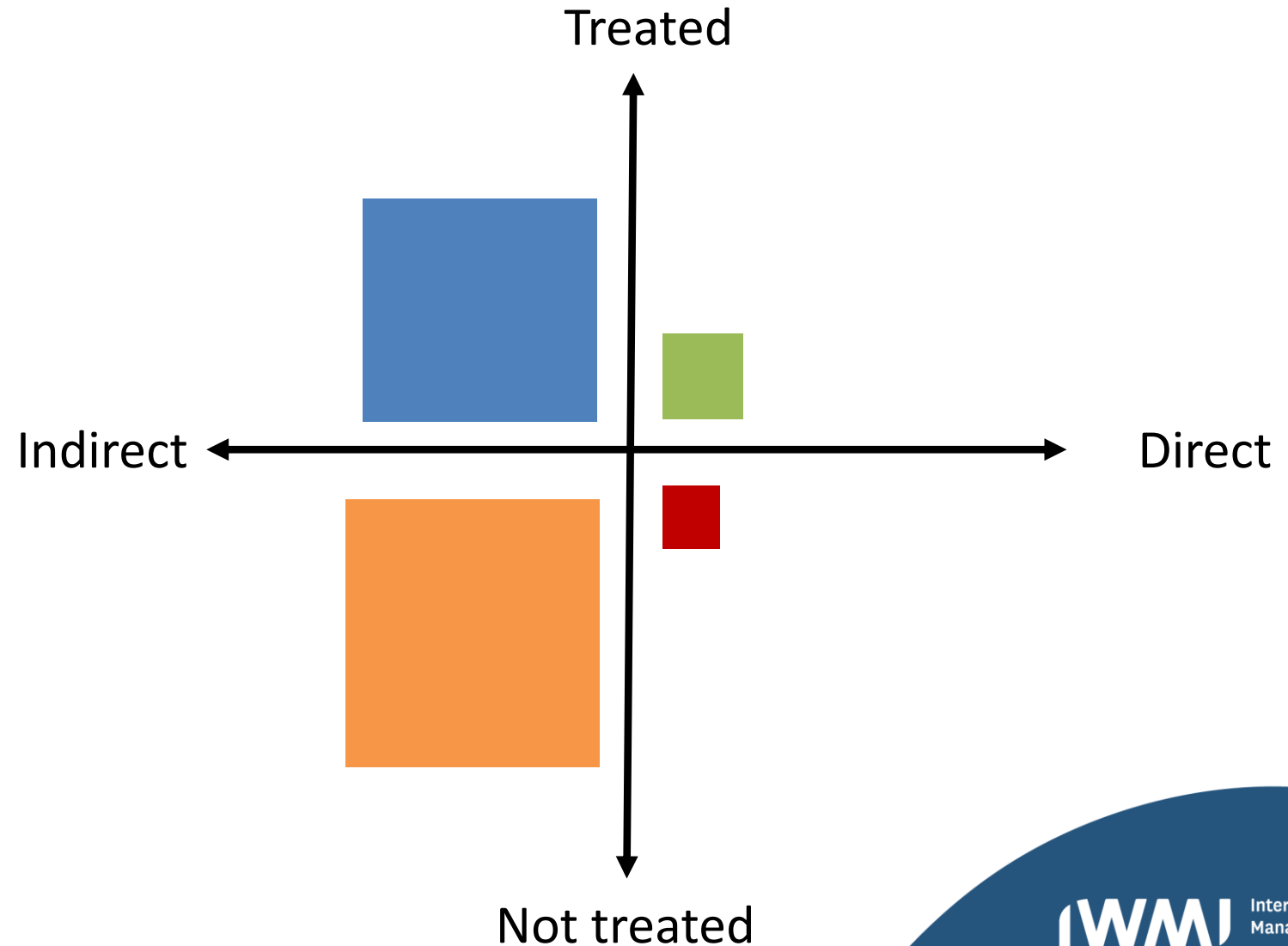


**Indirect use of untreated wastewater is a common reality in MENA:
health & environmental risks need to be assessed and mitigated**

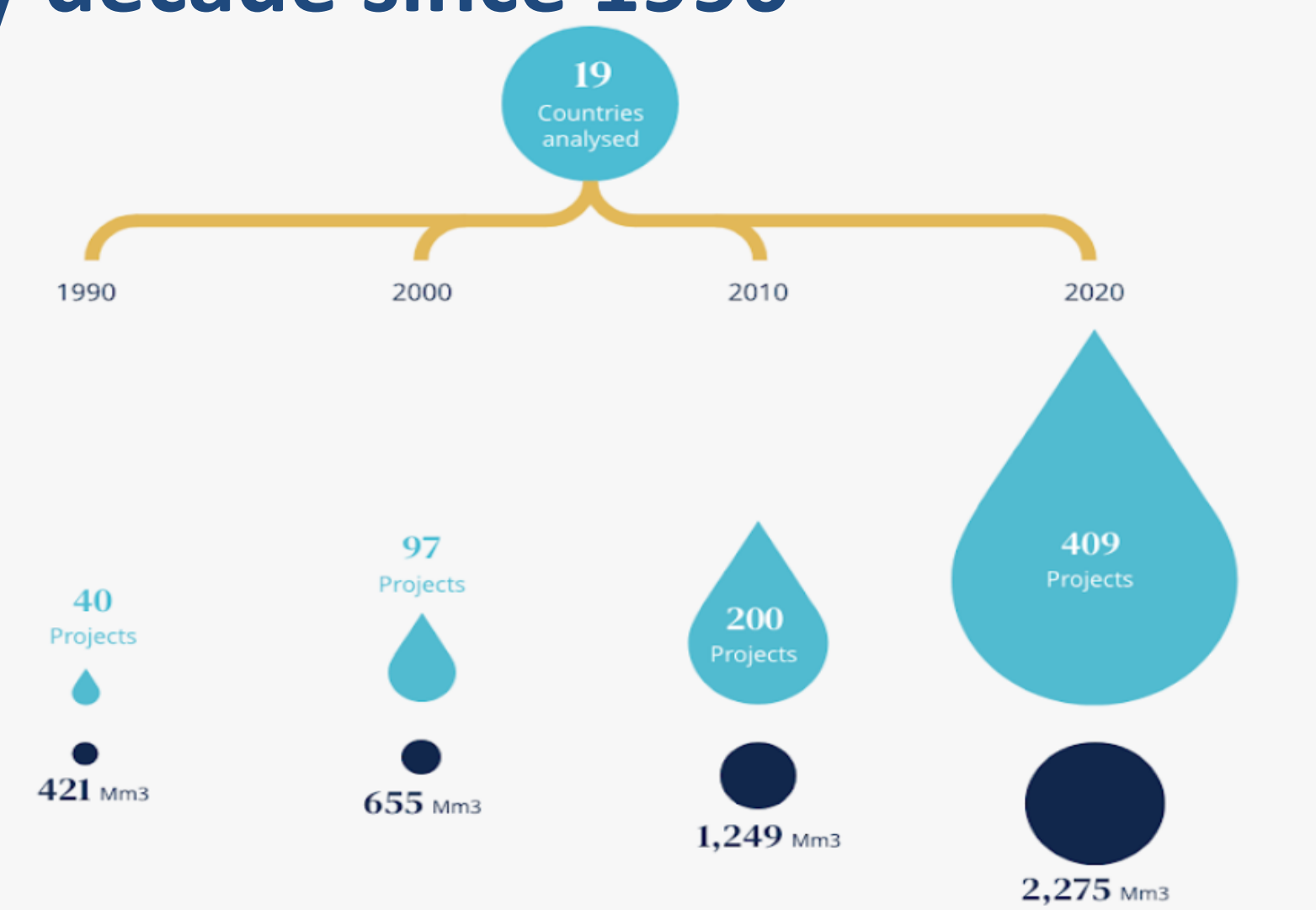
Wastewater fate



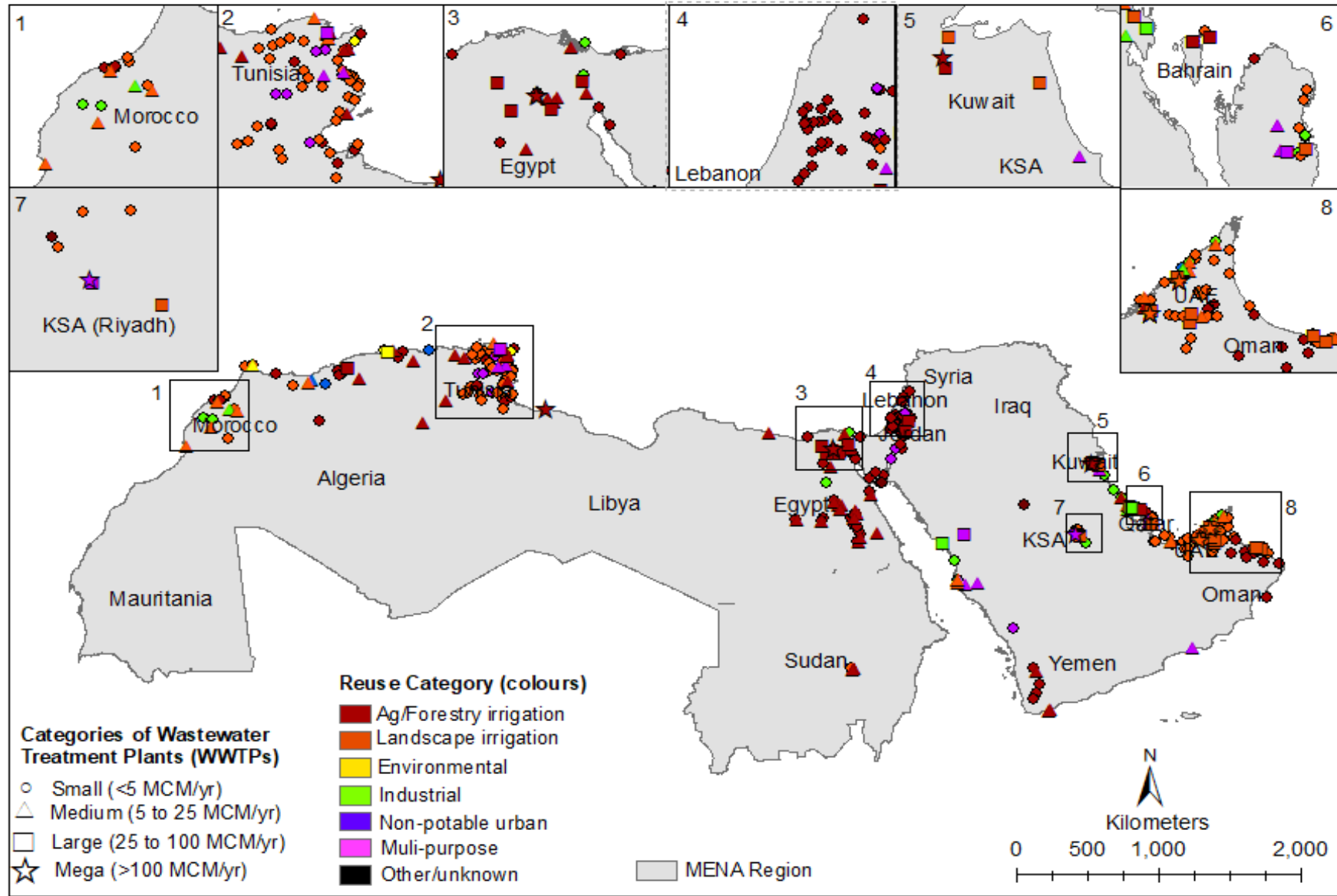
Surface irrigated with different types of reuse



The number of reuse project has doubled every decade since 1990



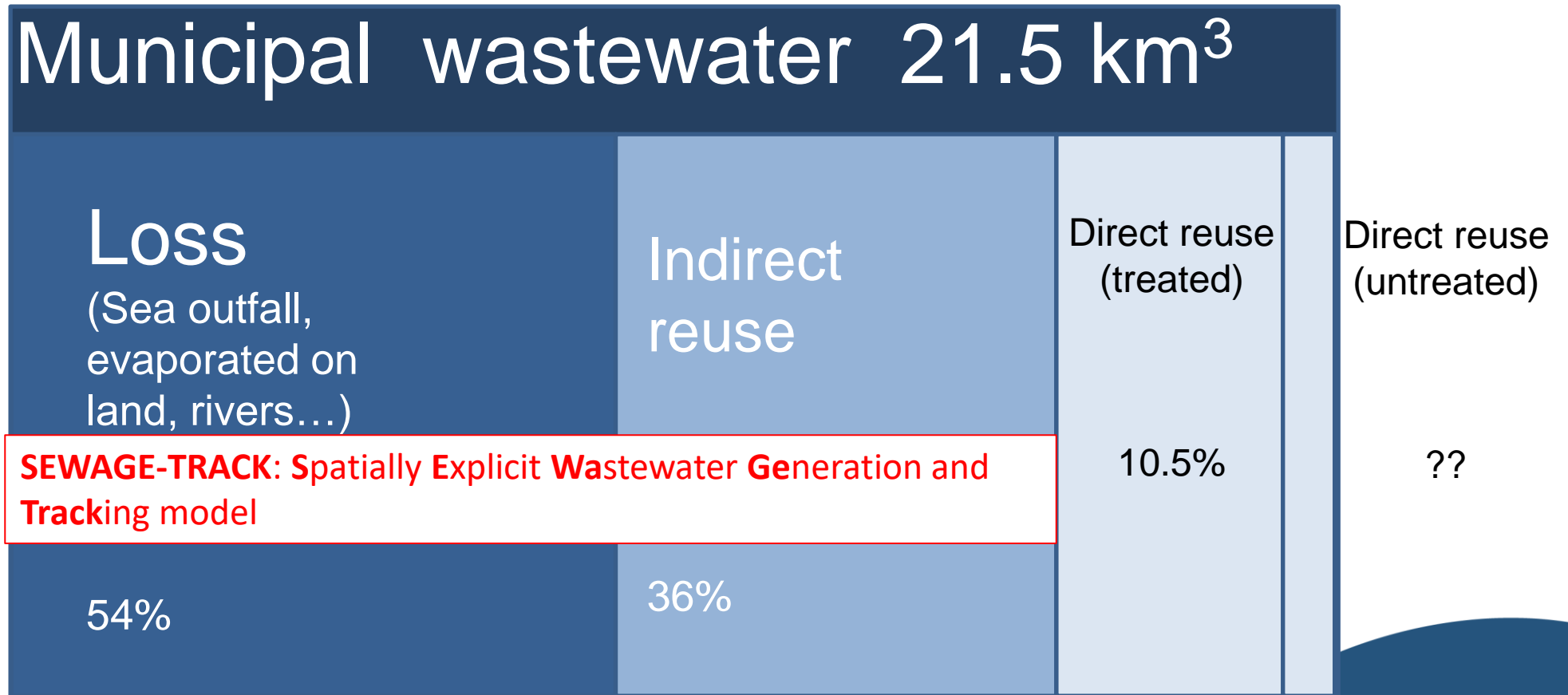
Water reuse projects in MENA as of 2020



Direct water reuse in 2020

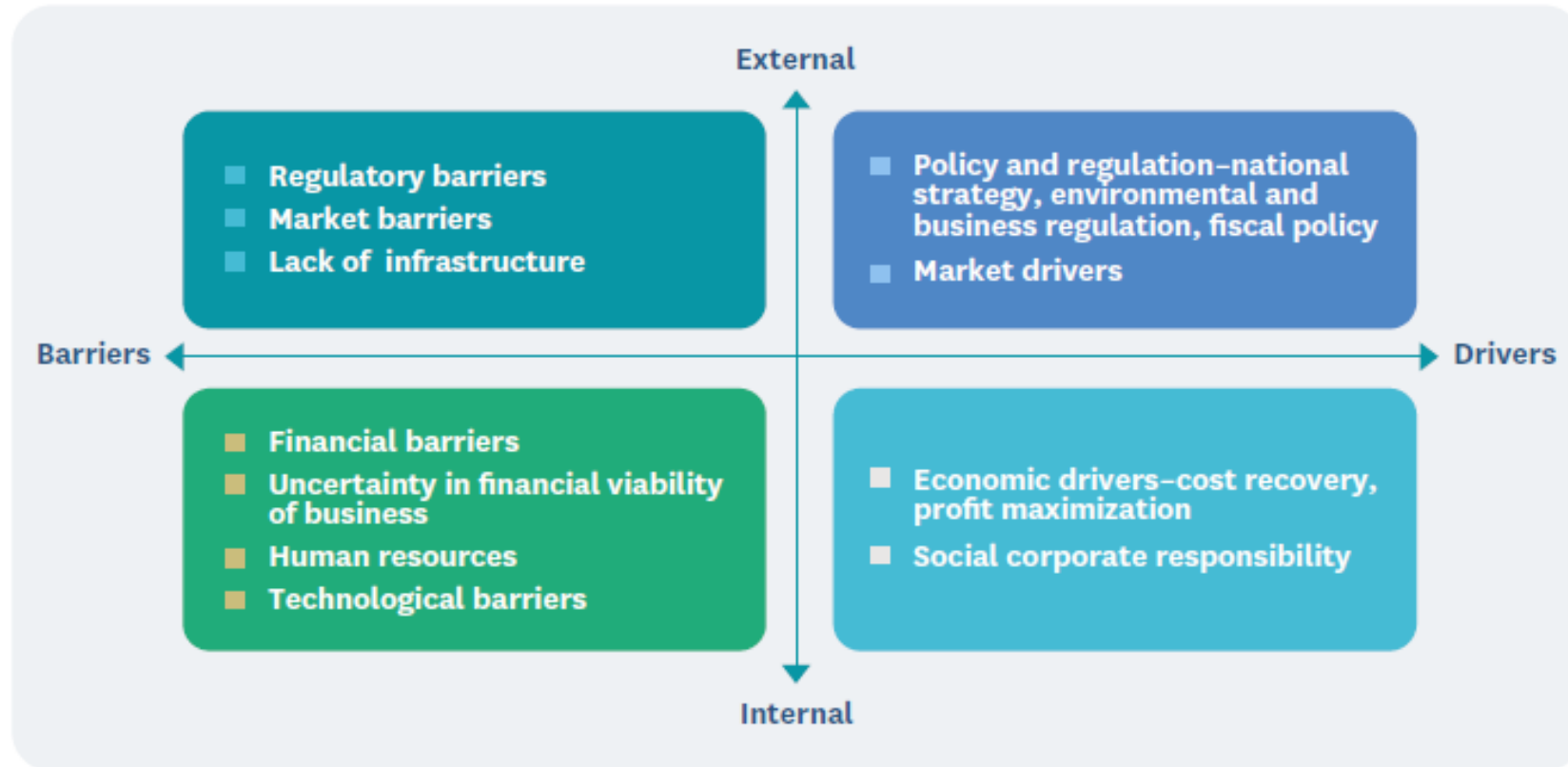
Country	Total municipal wastewater generated**	Municipal wastewater that is treated and directly reused	Directly reused from municipal wastewater	Number of projects where municipal wastewater is treated and directly reused
	(Mm3)	(Mm3)	(%)	(N)
Algeria	2,649	100	3.8	22
Bahrain	1,86	45	24	4
Egypt	7,196	341	4.7	77
Iraq	1,232	NA	NA	NA
Jordan	187	71	37.9	25
Kuwait	666	271	40.7	6
Lebanon	481	2	0.4	4
Libya	514	40	7.8	1
Mauritania	138	NA	NA	NA
Morocco	415	76	18.3	22
Oman	275	79	28.6	30
Palestine	180	7	3.7	24
Qatar	225	165	73.6	17
Saudi Arabia	3,144	431*	13.7	40
Sudan	1,533	29	1.9	3
Syria	1,147	NA	NA	NA
Tunisia	254	34	13.4	63
UAE	801	549	68.6	64
Yemen	326	36*	11.1	7
MENA	21,549	2,275	10.5	409

Wastewater production and fate in MENA



Sources: IWMI 2022, Velpuri and Mateo-Sagasta 2022

Drivers and Barriers in MENA



Challenges in the face of WWT & Reuse expansion in MENA

low social acceptance

Incomplete economic analysis & limited financial sustainability

Unclear regulations and ineffective implementation

Fragmented and partial planning and governance

Unclear regulations and ineffective implementation

Over-stringent regulations

مشروع مواصفة لبنانية
NORME LIBANAISE
LEBANESE STANDARD

DNL
819-2019

First Edition
2024

مواصفة إعادة استخدام مياه الصرف الصحي المعالجة في الري

Standard for Water Reuse in Irrigation

Norme pour la Réutilisation des Eaux Usées Traitées en Irrigation



F2R-CWANA: From Fragility to Resilience in the Central and West Asia and North Africa



مؤسسة المقاييس والمواصفات اللبنانية
LIBNOR

Numéro de référence
Reference Number
NL 819 : 2024

ICS: 13.060.01, 13.060.30

At very final stage of approvals

Fragmented and partial planning and governance



The large array of stakeholders involved in the governance of agricultural water reuse systems.
Source: Nassif and Tawfik 2022

Fragmented and partial planning and governance

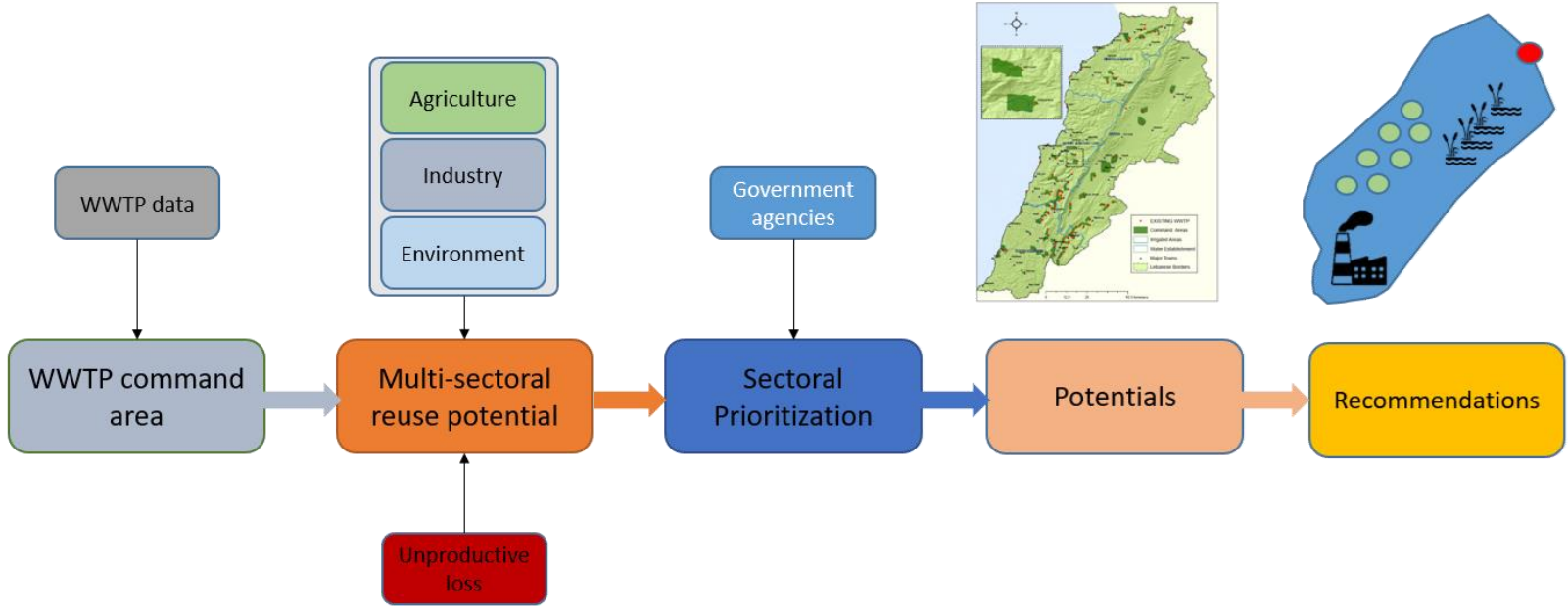
Recommendations

- Participatory stakeholder processes and effective communication
- Data-based and inclusive planning

Data-based Wastewater reuse planning



e-ReWater Project



Data-based Wastewater reuse planning

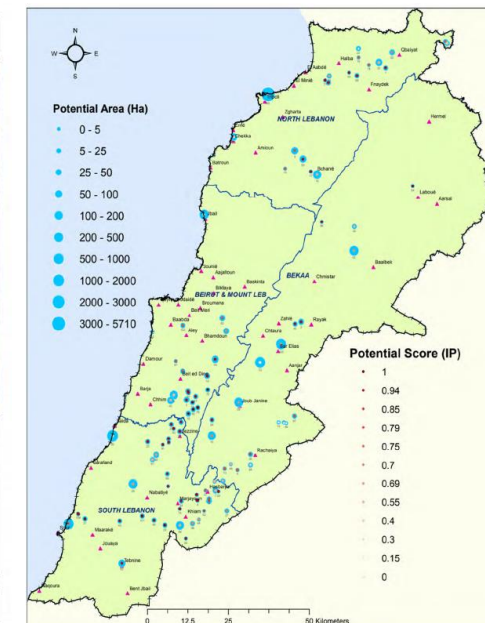


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Research Report

Analysis of Water Reuse Potential for Irrigation in Lebanon

Karim Eid-Sabbagh, Salim Roukoz, Marie-Hélène Nassif, Naga Velpuri and Javier Mateo-Sagasta

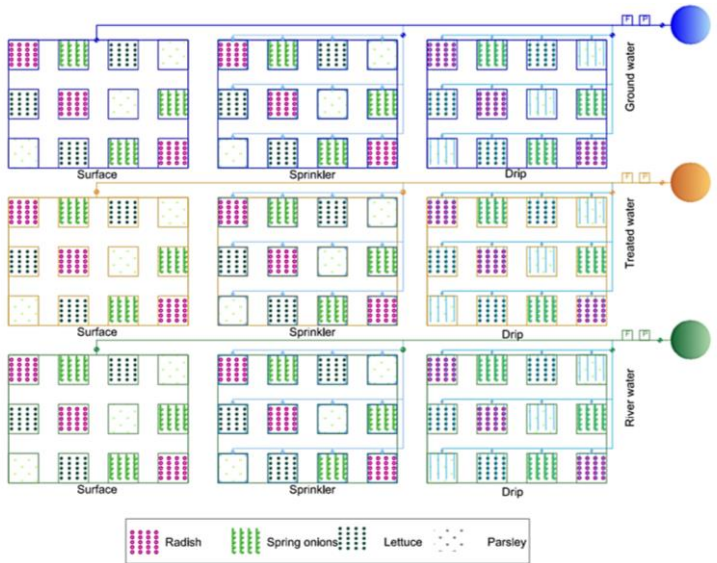


Low social acceptance

Recommendations

- Understanding the cultural/religious barriers and distrust
- Science-Policy-Society Dialogue

Experiments to develop on-farm practices to mitigate reuse risks



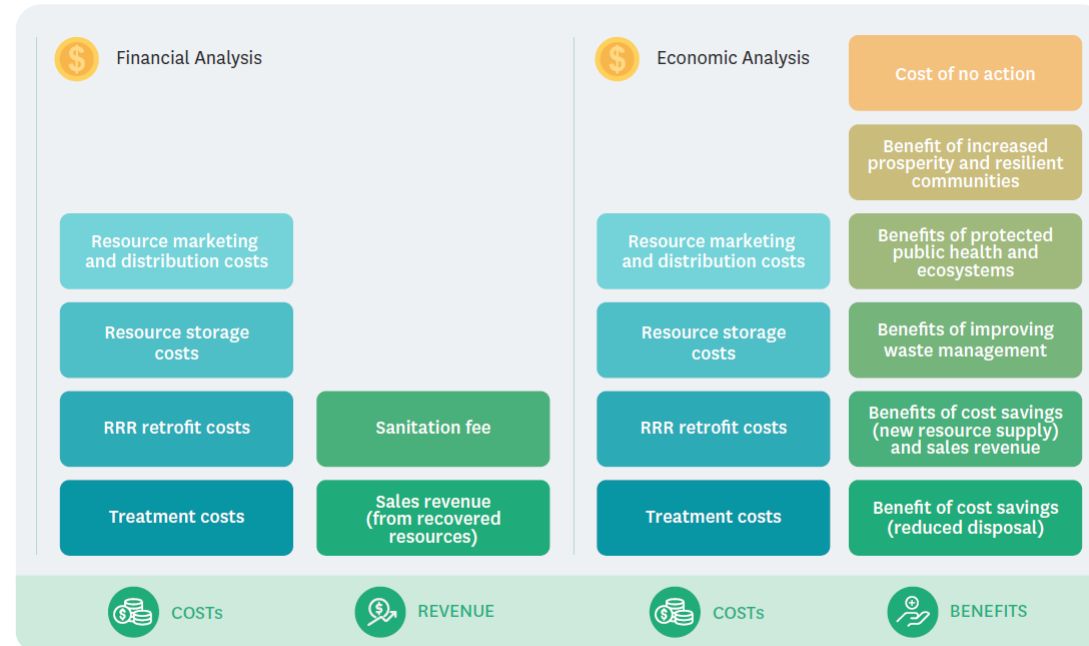
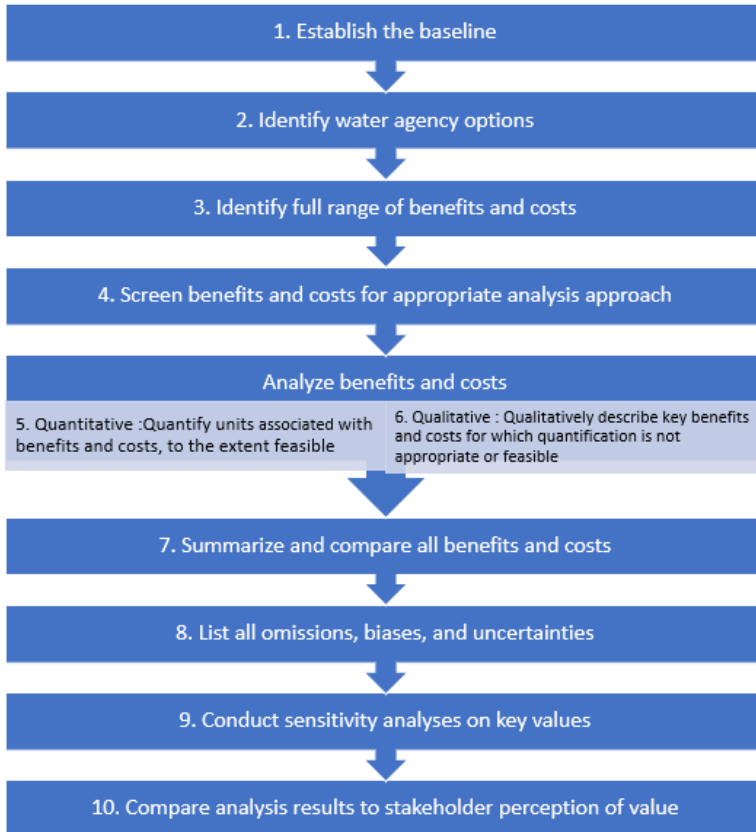
Incomplete economic analysis & limited financial sustainability

High costs and lack of cost recovery mechanisms !
Who will pay for the costs of a reuse project?

Recommendation

- Economic and finance models that improve cost recovery and sustainability

Development of Cos-benefit Analysis frameworks

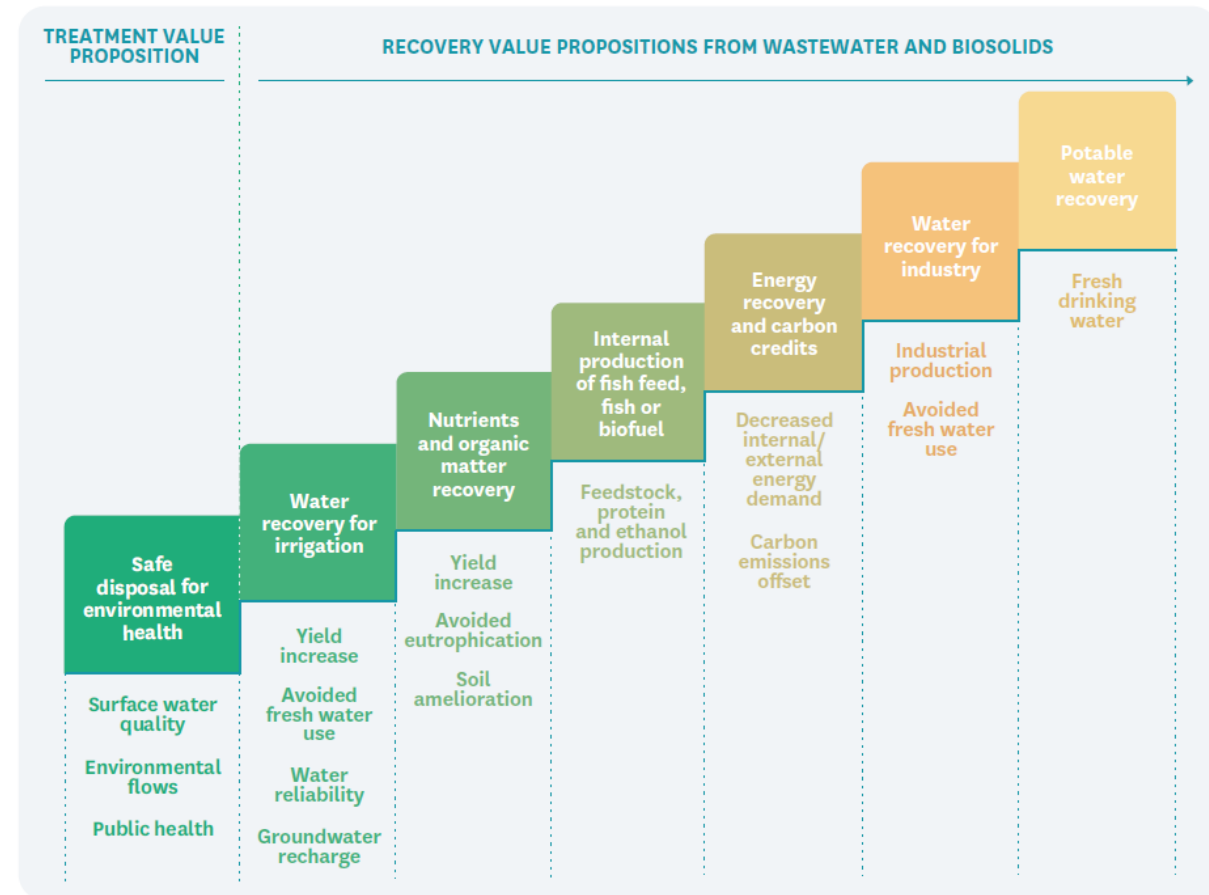


Financial versus economic analysis of water reuse solutions (adapted from Otoo et al. 2016).



Takeaway Messages

- Gain wider social acceptance & Incorporate gender transformative approaches
- Develop bankable water reuse models
- Accelerate wastewater treatment to cope with wastewater production growth
- Assess health risks in informal and indirect water reuse
- Incentivize the adoption of on-farm practices for safe water reuse
- Improve planning and governance
- Expand implementation of water quality standards
- Create an enabling environment to encourage private sector involvement

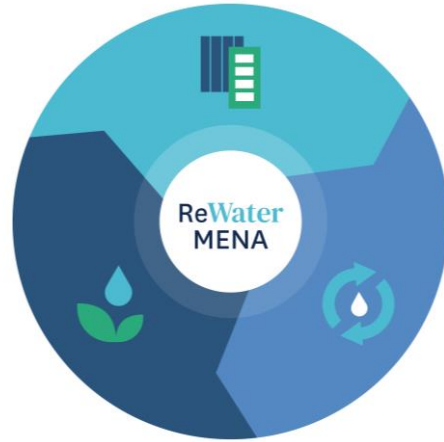


Ladder of increasing value propositions related to water reuse based on increasing investments in water quality and/or the value chain. Source: Drechsel et al. 2015

Water reuse in the Middle East and North Africa

A sourcebook

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Thanks

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