A 3-part series on Reimagining Reuse of Treated Wastewater in Agriculture in India: Technology, Finance and Governance Perspectives

Webinar 1

Reuse and Applications of Treated Wastewater in Agriculture:

Mapping the India Story and Insights from Israel

October 27th, 2020
4:00 – 6:00 pm

2030 Water Resources Group | HOSTED BY WORLD BANK GROUP Water | Government of Maharashtra

in collaboration with

wbcsd | Ministry of Economy and Industry Foreign Trade Administration | EUROPEAN UNION | german cooperation | Implemented by giz | INDIA-EU WATER PARTNERSHIP

Sl. No	Agenda item	Time slot	Speaker
1.	Welcome and Setting the Context	4:00 pm – 4:15 pm	- Kavita Sachwani, State Program Coordinator, 2030 WRG, Maharashtra - Sagi Itcher, Head of Economic and Trade Mission, Consulate General of Israel
2.	Insights from Israel: Innovations and partnerships for Wastewater Reuse in Agriculture	4:15 pm – 4:25 pm	- Oded Distel, Chief Executive Officer at Tal-Ya Agriculture Solutions, Israel
3.	WBCSD Perspectives on Wastewater and Resource Circularity	4:25 pm – 4:35 pm	- Tom Williams, Director-Water, World Business Council on Sustainable Development
4.	Insights into the Draft National Wastewater Reuse Policy	4:35 pm – 4:45 pm	- Jeremy Bird, Senior Water Policy Expert, India-EU Water Partnership / GIZ
5.	Panel Discussion 1: Reuse of Treated Wastewater in Agriculture – Current Status and Implementation challenges	4:45 pm – 5:15 pm	**Moderator:** Dr. Mahesh Patankar, Senior Advisor, 2030 WRG **Panelists:** - Shilp Verma, Researcher, International Water Management Institute - Vishwanath S, Director, Biome Environmental Solutions Ltd.
6.	Panel Discussion 2: Building Climate Resilience through Wastewater Reuse – Live case study from Marathwada	5:15 pm – 5:45 pm	**Facilitated by:** Dr. Anjali Parasnis, Technical Consultant, 2030 WRG and Kavita Sachwani, State Program Coordinator, 2030 WRG, Maharashtra **Panelists:** - Eknath Dawale, IAS, Secretary, Agriculture, Government of Maharashtra - Astik Pandey, IAS, Commissioner, Aurangabad Municipal Corporation, Government of Maharashtra - Anil Hadgaonkar, SDAO, Project on Climate Resilient Agriculture, Aurangabad - Farmer(s) / WUA of Zalta Gram Panchayat, Aurangabad
7.	Closing Remarks	5:45 pm – 6:00 pm	- K P Bakshi, IAS (Retd.), Former Chairman, MWRRA

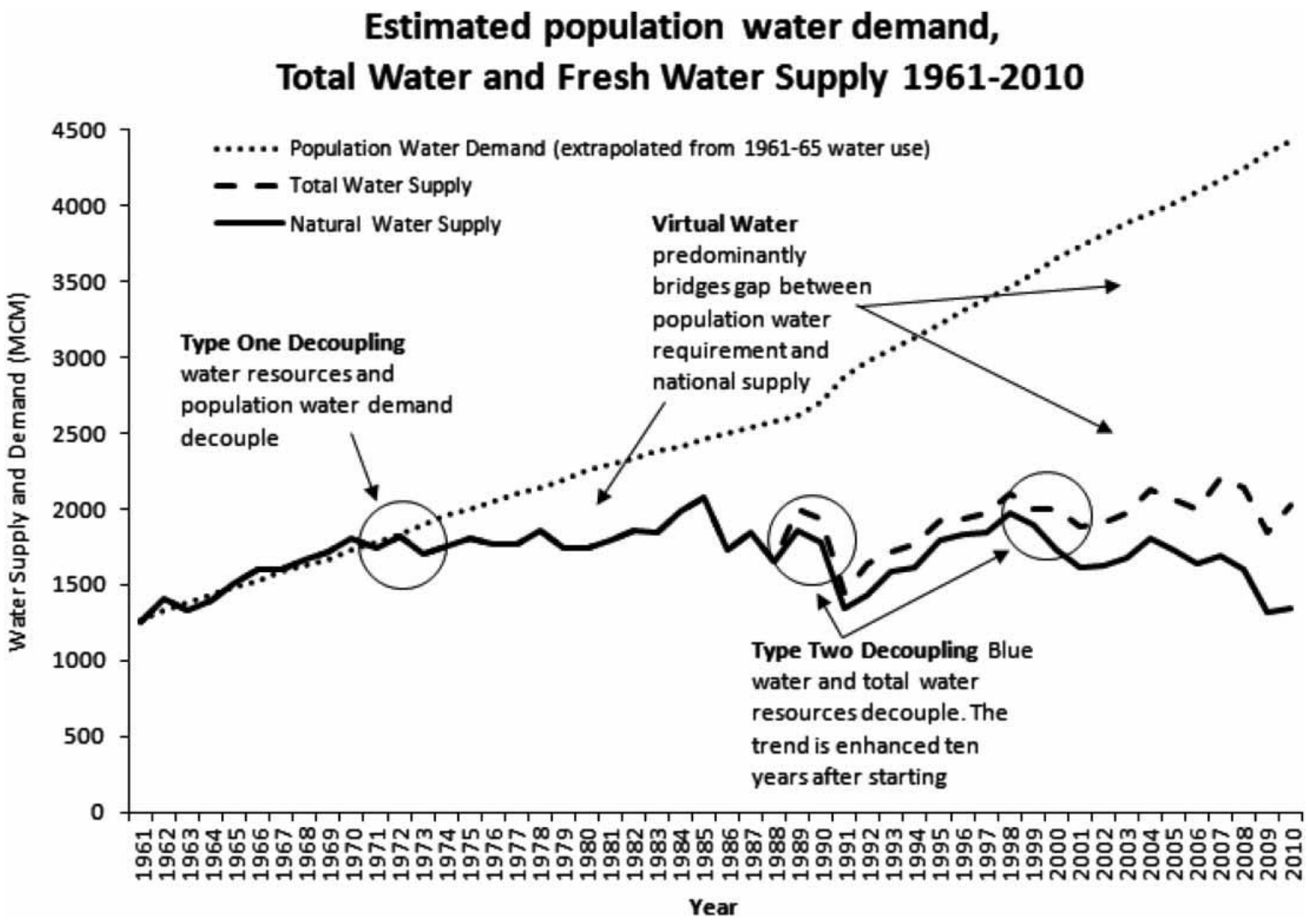
Insights from Israel: Innovations and partnerships for Wastewater Reuse in Agriculture

Oded Distel, Chief Executive Officer, Tal-Ya Agriculture Solutions, Israel

Necessity is the mother of Innovation

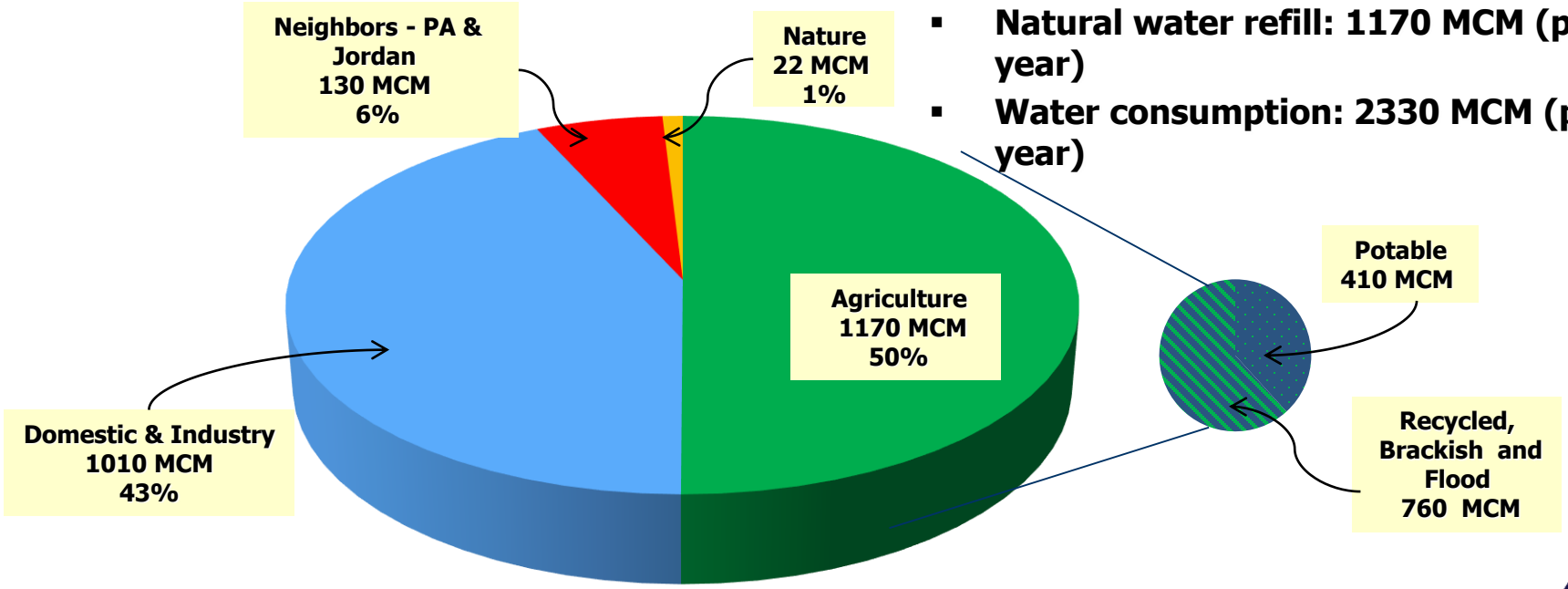
If it ain’t broken don’t fix it

WATER DECOUPLING



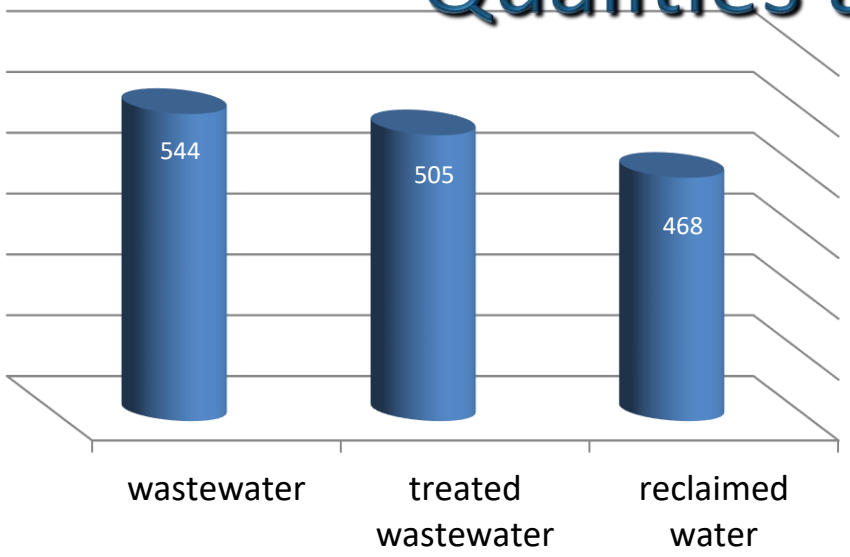
Source: Decoupling dependence on natural water, Glimont M., 2014

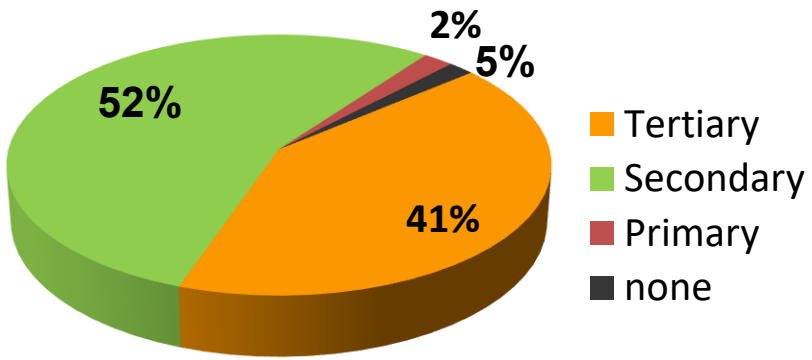
Water Supply in Israel
According to sectors - 2018



- **Natural water refill: 1170 MCM (per year)**
- **Water consumption: 2330 MCM (per year)**

Wastewater and Effluent Sector Qualities and Quantities





544 million m3 → 93% treated → 86% reused

Wastewater Treatment Plant (Shafdan) and the Pipeline to Negev

Sewage from the Greater Tel Aviv area – 125 MCM/Y

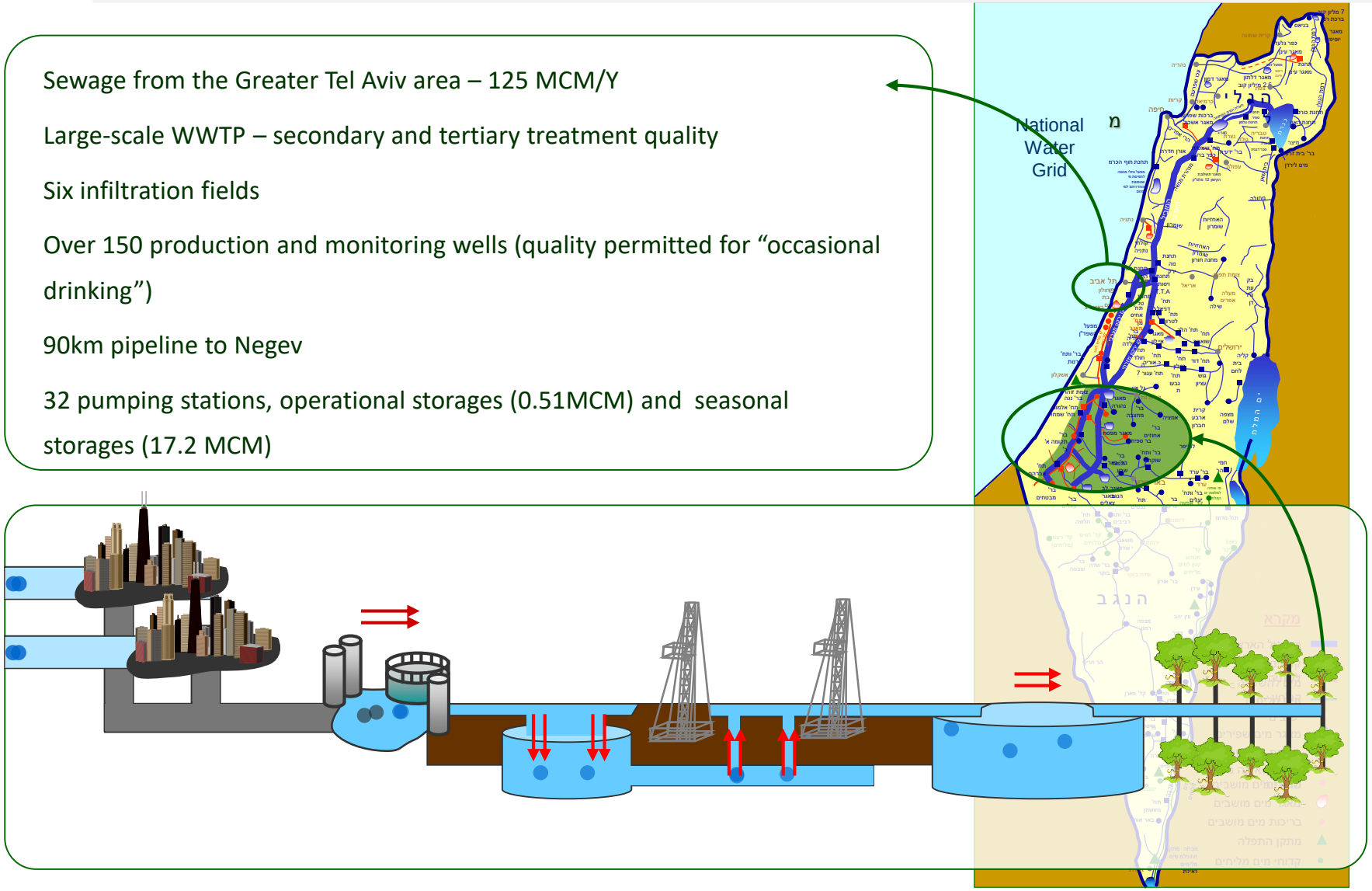
Large-scale WWTP – secondary and tertiary treatment quality

Six infiltration fields

Over 150 production and monitoring wells (quality permitted for “occasional drinking”)

90km pipeline to Negev

32 pumping stations, operational storages (0.51MCM) and seasonal storages (17.2 MCM)



Perspectives on Wastewater and Resource Circularity

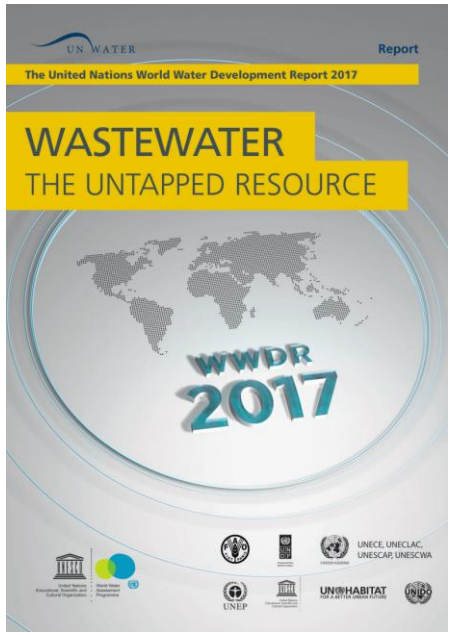
Tom Williams, Director – Water, World Business Council of Sustainable Development

Perspectives on Wastewater and Resource Circularity

Tom Williams
Director – Water
WBCSD

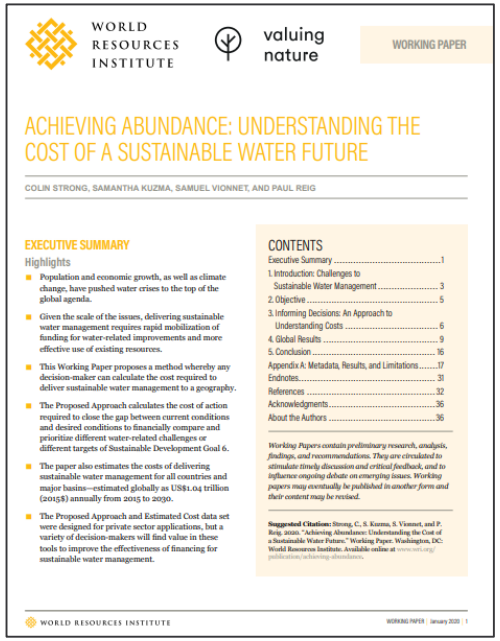
Major reports on **scale** and **urgency**

80% of wastewater is discharged into the environment untreated



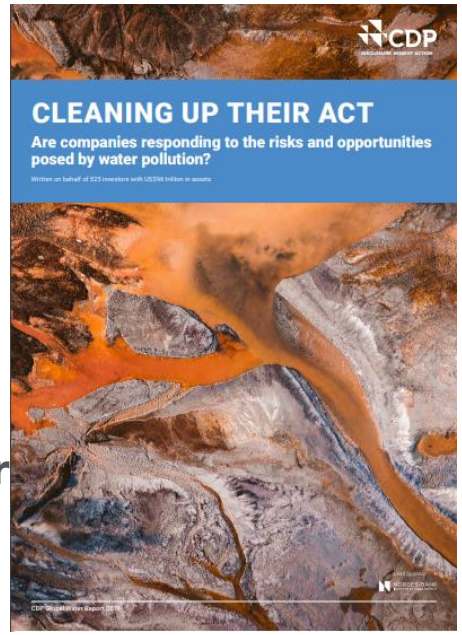
The world is not on track to meet the SDG6 Targets

In regions downstream of heavily polluted rivers, GDP growth is lowered by a third



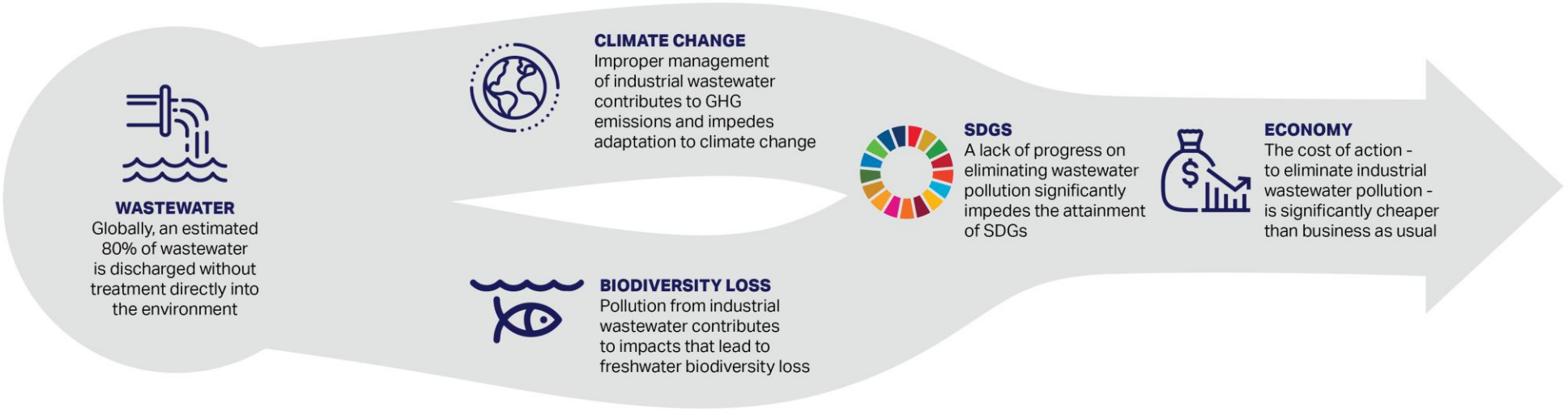
The estimated annual cost to eliminate industrial wastewater pollution is 87.4 Billion USD

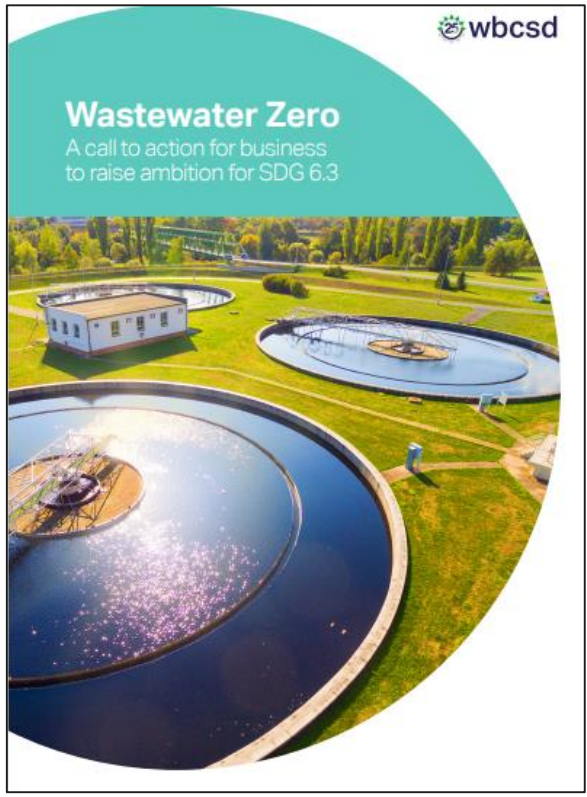
10% of companies reported risks linked to pollution



Wastewater Zero – Raising ambition towards SDG6.3

Wastewater pollution impacts climate and nature leading to negative social, environmental and economic outcomes





An **action framework** and **policy asks**

STANDARDS

Establish clear guidelines, based on the best available science, for effluent discharges and wastewater reuse

REGULATION

Establish the means to monitor and enforce regulations

VALUE

Support and require business to internalize externalities arising from water pollution

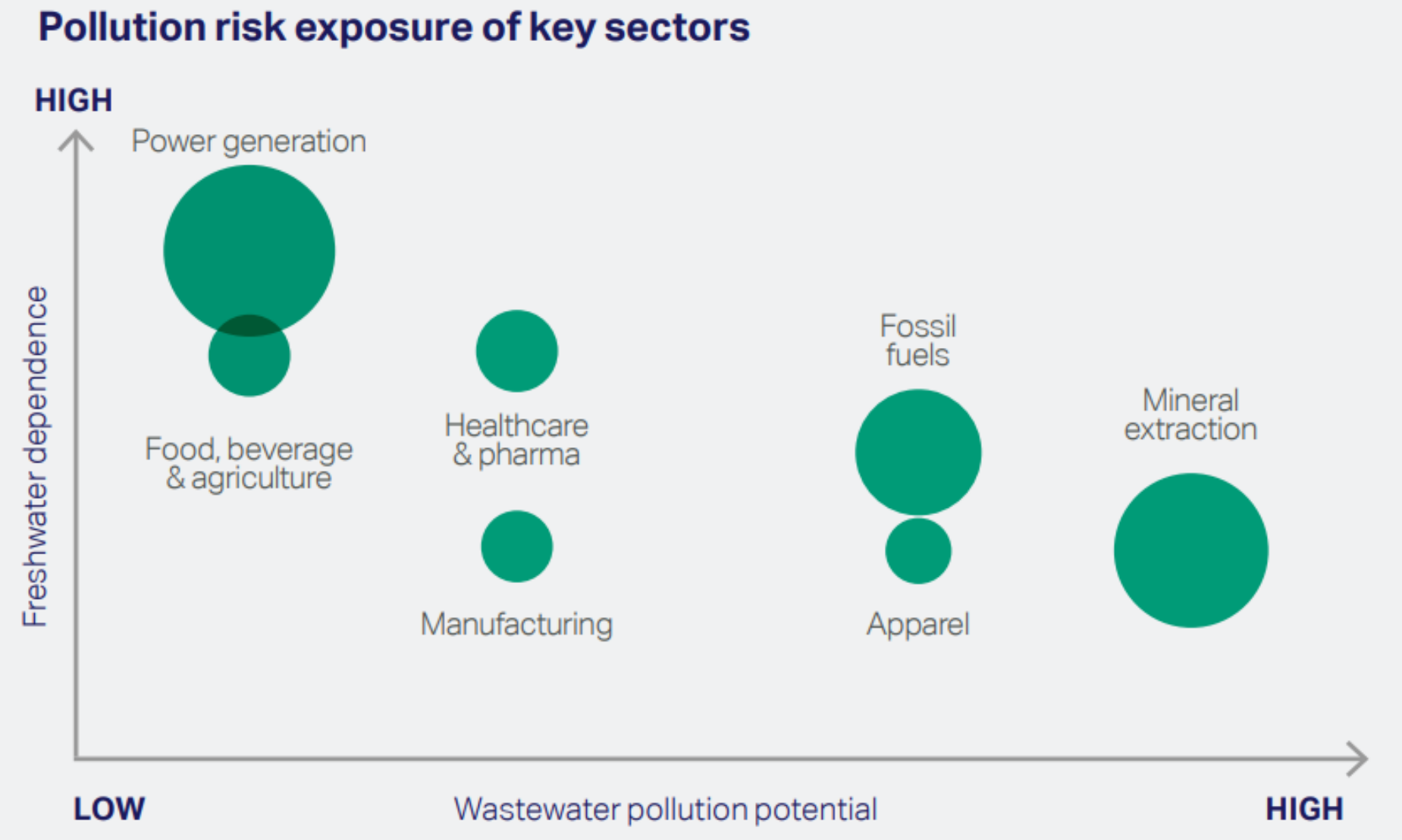
PARTNERSHIPS

Enable partnerships between public sector bodies and the private sector

INCENTIVIZE

Incentivize the recycling of water by industry and the trading of reused water

Agriculture and fashion are **priority sectors** for action



Wastewater reuse in agriculture – **scale** and **costs**

10% of the world's population relies on food grown with contaminated wastewater *(WHO / FAO)*

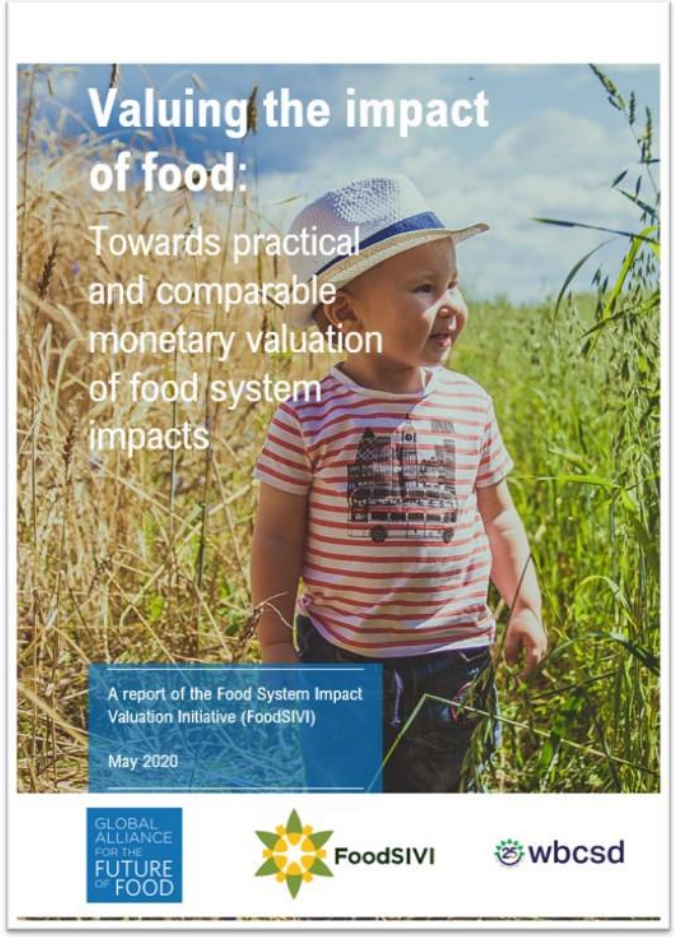
20 million hectares of crops worldwide (**7% of total cropland**) are irrigated with untreated or partially treated wastewater *(Jiménez, B. & Asano, T)*

Highly saline water negatively impacts crop yields globally by **11.0 to 13.5 %** *(World Bank)*

A 2013 study on the impact of industrial water pollution on rice production in Viet Nam estimated that water pollution caused a **yield reduction of 12%.**

A 2018 study by researchers at MIT looked at 63 industrial sites in India identified by the government as "severely polluting" and estimated the costs of their pollution for downstream agriculture. They found that on average, there was a **9% reduction in yield** compared with a corresponding district immediately upstream of the same site in the same year.

Impact of wastewater reuse in **food system**



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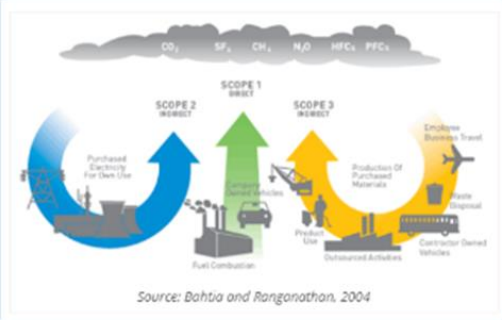
FS Impact Protocol: Water

What to measure, e.g. footprint

Why to measure, the FS problem and the Science Target

Why to measure, the opportunity/ incentives



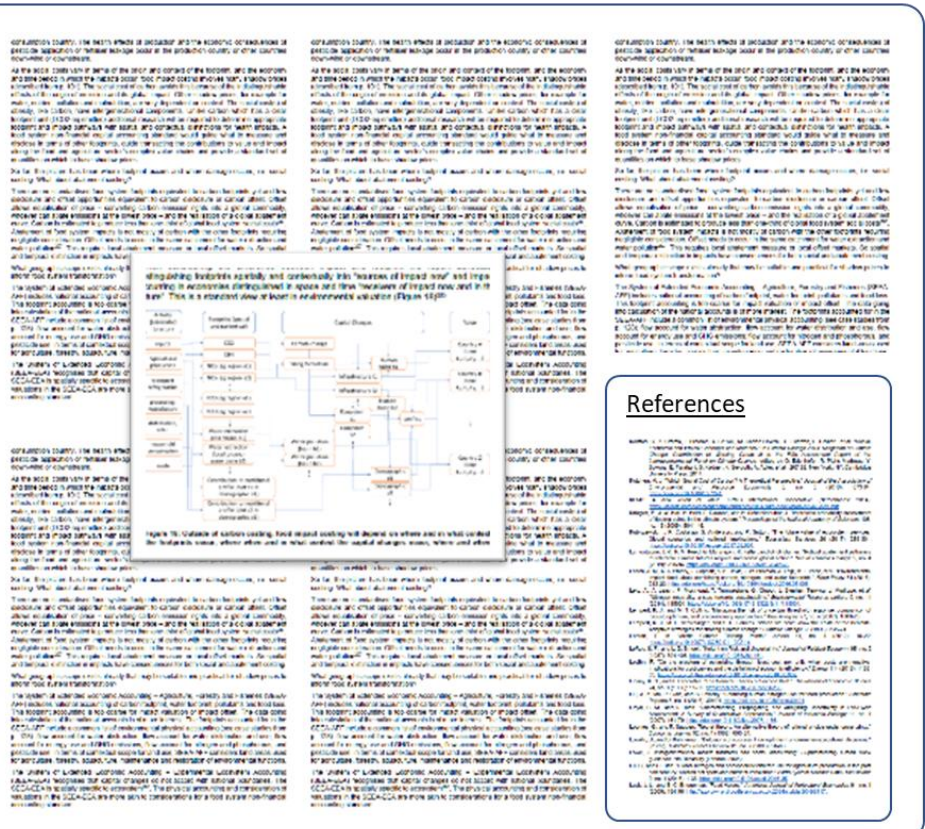
~10 pp

Target, e.g. Eat Lancet , FABLE

What to measure, e.g. footprint

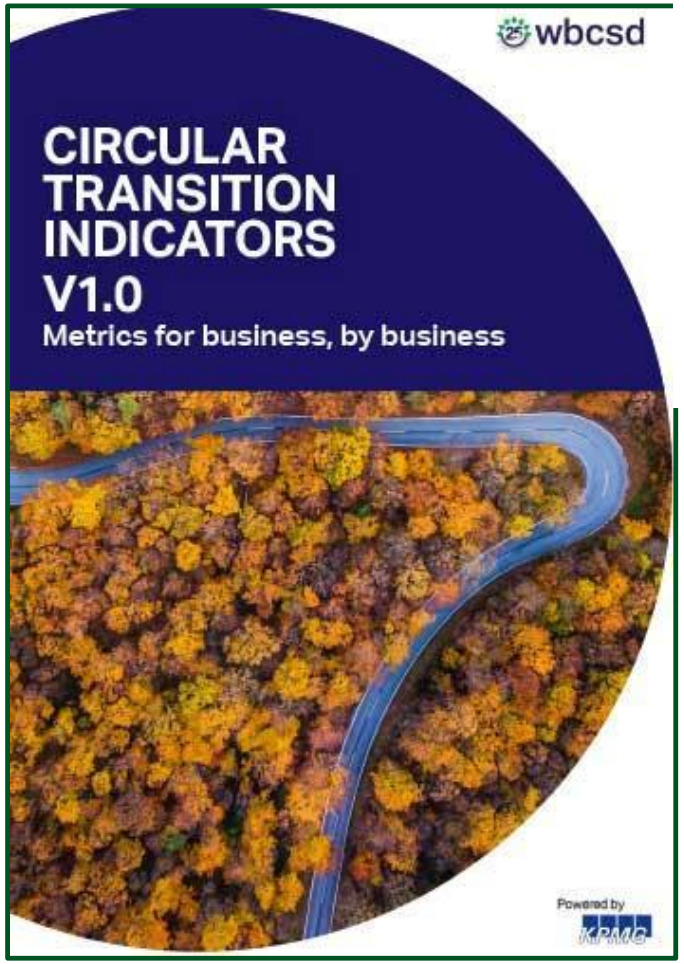
Calculation of Impact, e.g. pathway

Impact, measure of value of footprint reduction (SDG, abatement cost)



References

Water circularity **metrics** for **business**



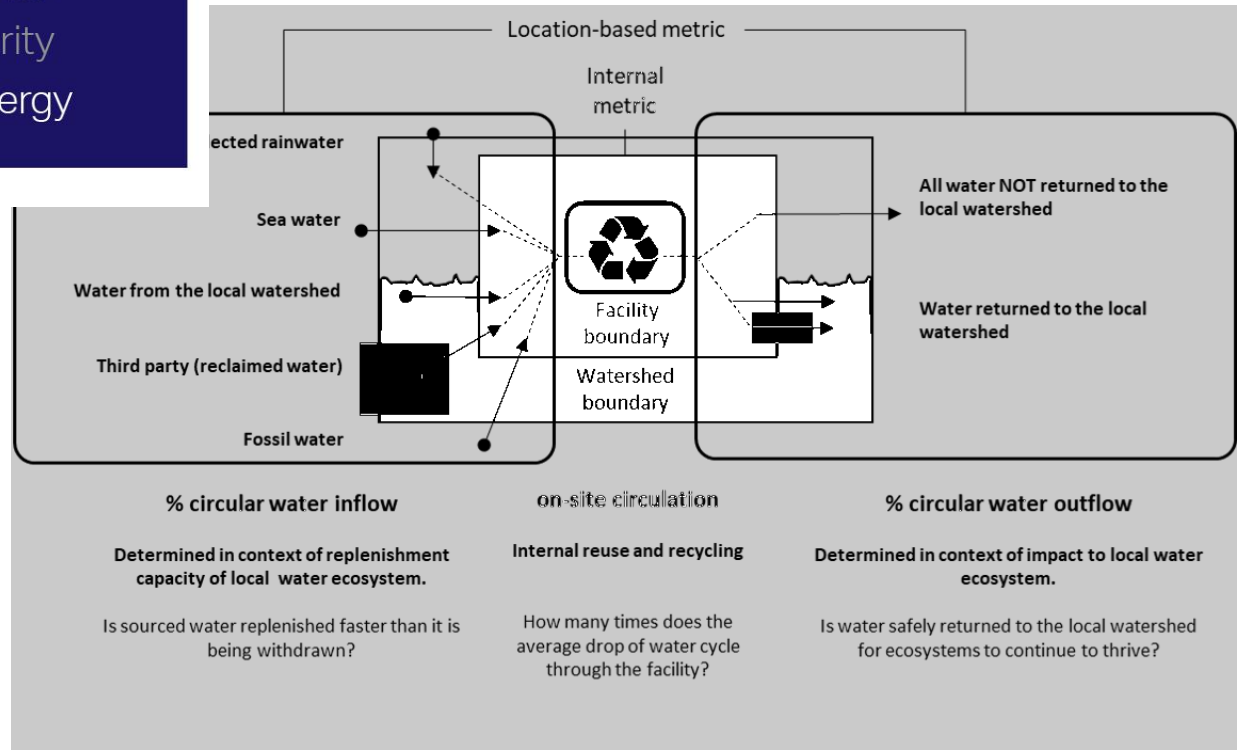
Close the loop

% circular inflow

% circular outflow

% water circularity

% renewable energy



Water circularity **metrics** for **business**

Main indicators

Context based indicators

Internal indicator

$$\text{WCM} = \%\ \textit{Water Circularity}$$

$$\frac{\%\ circular\ water\ inflow\ +\ \%\ circular\ water\ outflow}{2}$$

% Circular water inflow

$$= \frac{Q_{total\ circular\ water\ withdrawal}}{Q_{total\ water\ withdrawal}} * 100\%$$

On-site circulation (reuse & recycle)

$$= \frac{Q_{water\ use} - Q_{total\ water\ withdrawal}}{Q_{total\ water\ withdrawal}}$$

% Circular water outflow (discharge, restore)

$$= \frac{Q_{total\ circular\ discharge}}{Q_{total\ water\ withdrawal}} * 100\%$$

Supporting indicators

Nutrient recovery
absolute
(to be factored into CTI
% circular outflow)

Energy recovery
absolute
(to be factored into CTI
% renewable energy)

Insights into the Draft National Wastewater Reuse Policy

Jeremy Bird, Senior Water Policy Expert, India EU Water Partnership / GIZ

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INDIA-EU WATER PARTNERSHIP

Formulation of a National Policy on Safe Reuse of Treated Water (SRTW)

Meeting of the Water Resources Group, 27 October 2020

Jeremy Bird, Girija Bharat and Krishna Chaitanya Rao

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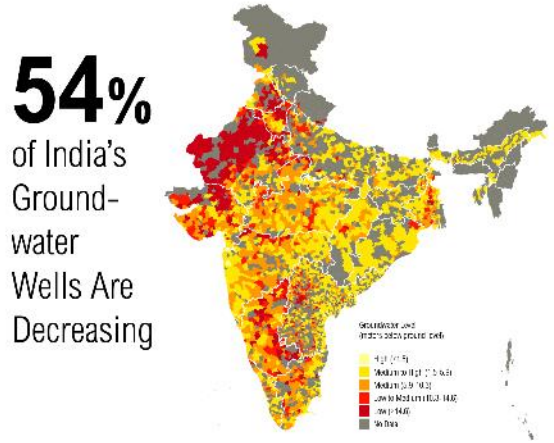
Drivers for SRTW

- Address water scarcity – augmenting freshwater
  - water resources are already very stressed
  - increasing irrigation, urban and industrial demand
  - price rises for bulk freshwater supply
- Improve environment and health
  - burden of disease from poor water services
  - high pollution load into water bodies: 38,000 MLD sewage is untreated (63%)
  - IUWM – scope to recharge lakes and wetlands
- Seize economic opportunity – <u>waste is a resource</u>
  - circular economy - reuse provides a revenue stream for WW treatment
  - complementary recovery of nutrients reduces import of fertilizer

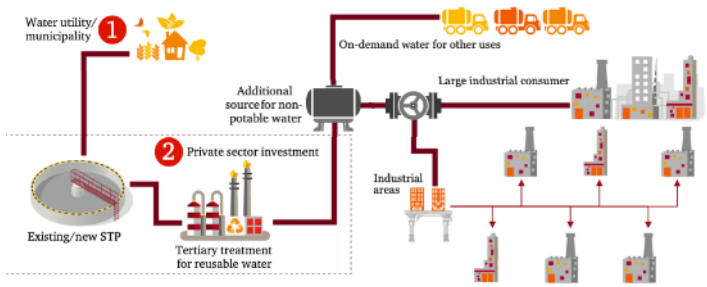


Perceptions are changing

States are adopting SRTW Policies:

- Chhattisgarh
- Gujarat (2018)
- Haryana (2019)
- Jammu & Kashmir (2017)
- Jharkand (2017)
- Karnataka (2017)
- Madhya Pradesh (2017)
- Maharashtra (2019 draft)
- Punjab (2019)
- Rajasthan (2016)
- Tamil Nadu (2019 draft)
- Uttar Pradesh (2018 draft)

New business models are being developed:



Complementary national processes

- National FSSM Policy
- New National Water Policy
- National Urban Sanitation Policy (being drafted)
- Industry – Zero Liquid Discharge
- AMRUT
- Swachh Bharat Mission
- Jal Jeevan Mission
- …

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High level support

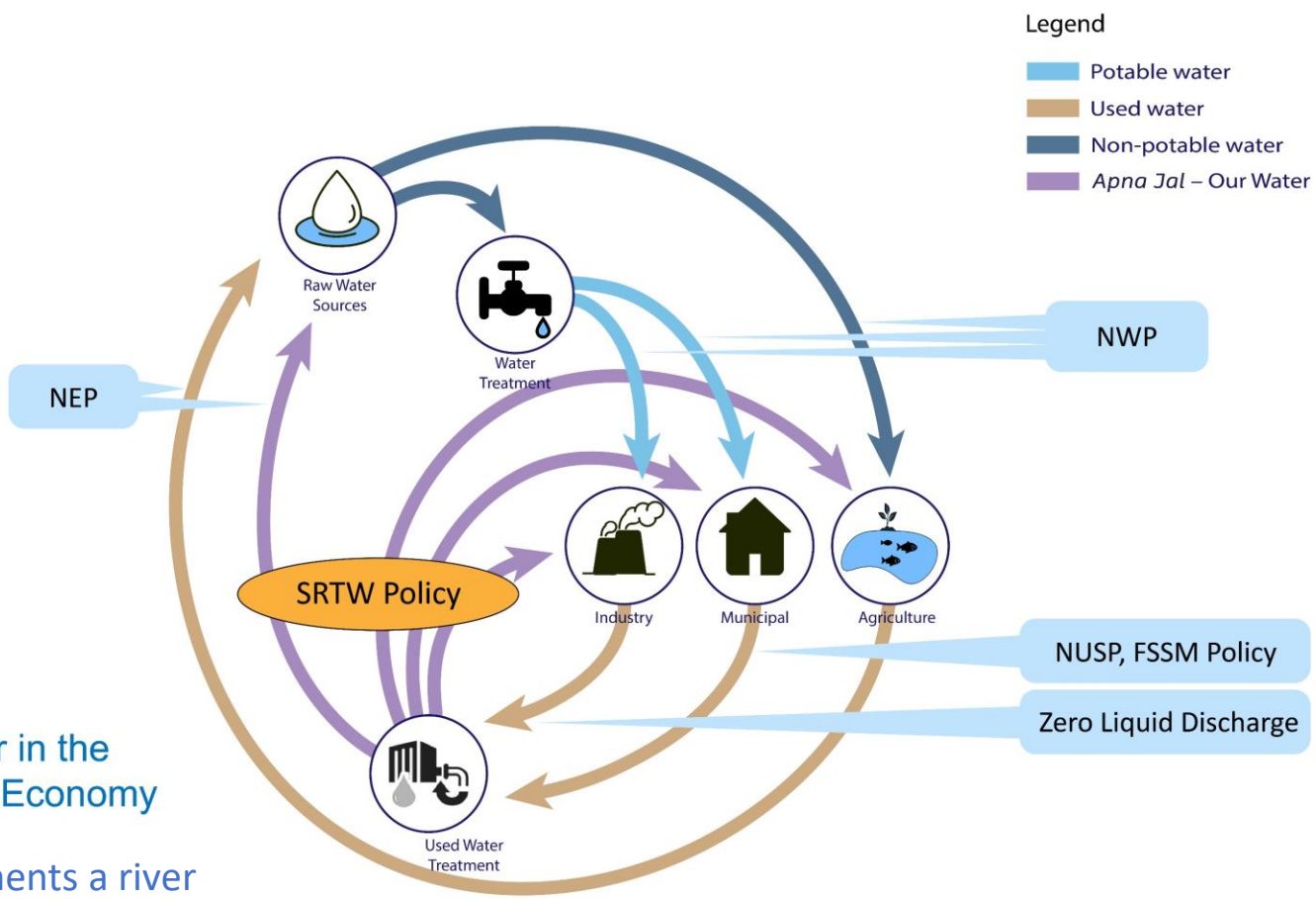
14 December 2019: At a meeting of the National Ganga Council, the Prime Minister of India highlighted the need to:

> *'reuse and recycle solid and liquid waste and develop suitable revenue models and State policies thereby promoting long term sustainability'*.

The Ministry of Jal Shakti (MoJS) requested the National Mission for Clean Ganga (NMCG) to coordinate the process.

Support provided by the India-EU Water Partnership (IEWP) and the GIZ Support to Ganga Rejuvenation Project.

SRTW within a wider policy environment



Water in the Circular Economy

- complements a river basin approach

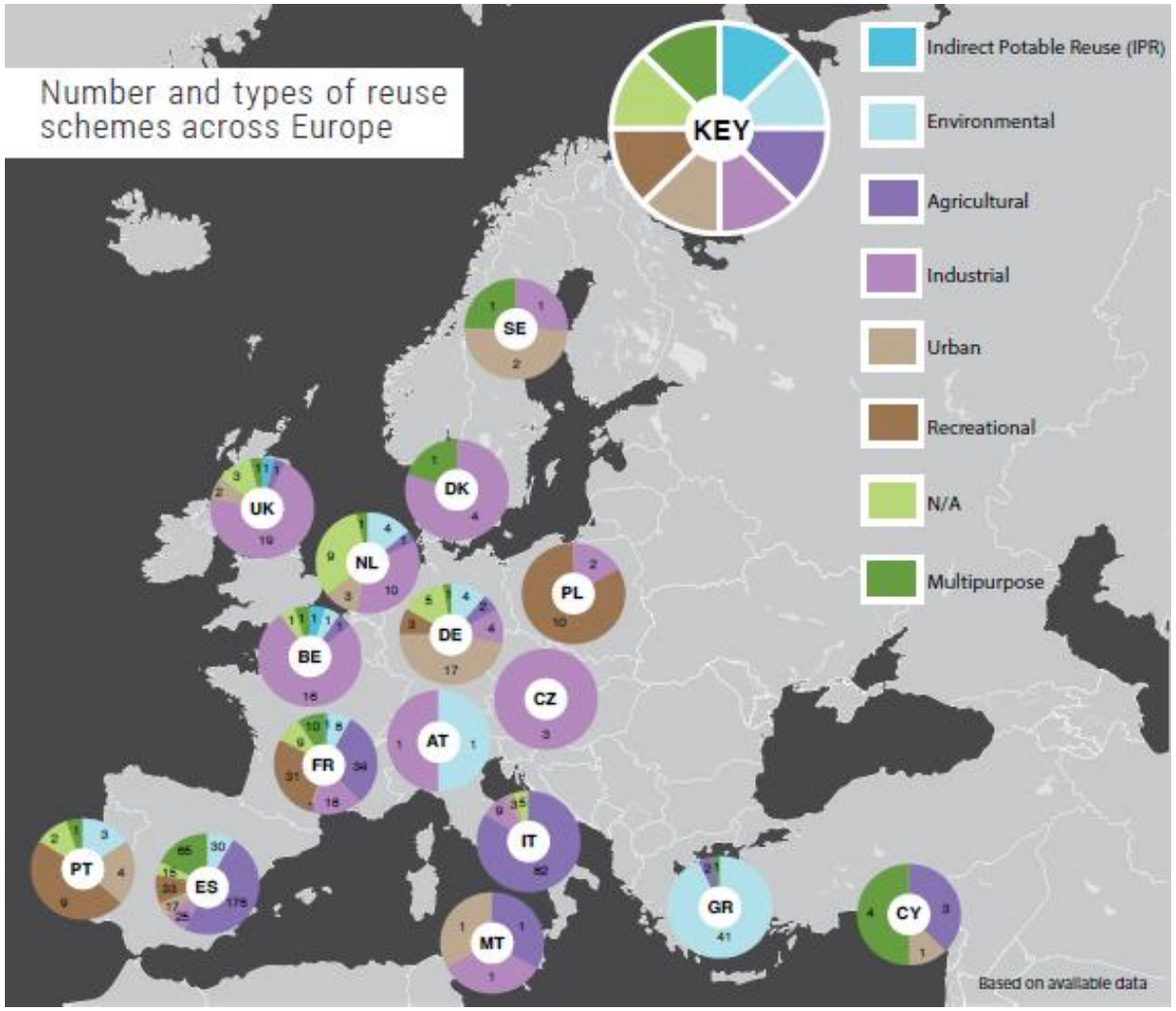
Adapted from Water Reuse Europe Review, 2018

Policy	
NEP, 2006	National Environment Policy
NWP, 2012	National Water Policy (under revision)
NUSP, 2008	National Urban Sanitation Policy (under revision)
FSSM, 2017	National Policy on Faecal Sludge and Septage Management
SRTW (draft)	**National Policy on Safe Reuse of Treated Water**

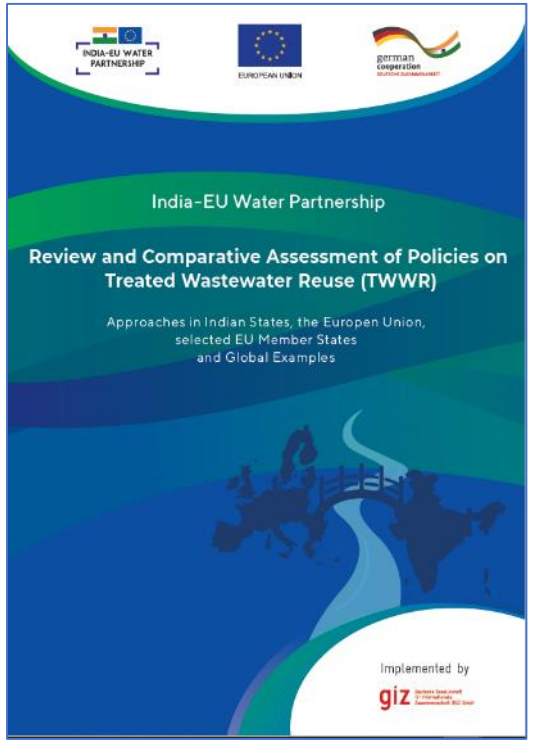
Programmes	
AMRUT	Atal Mission for Rejuvenation of Urban Transformation
SBM	Swachh Bharat Mission
JJM	Jal Jeevan Mission
NMCG	National Mission for Clean Ganga
NRDWP	National Rural Drinking Water Programme

Standards and Compliance	
CPCB, SPCB	Central / State Pollution Control Board(s)
CPHEEO Manual	Central Public Health Environmental Engineering Organization
NGT	National Green Tribunal (oversight)

Diversity of wastewater reuse



Like in EU, the SRTW Policy will need to accommodate diversity across States in India



Source: IEWP (India-EU Water Partnership). 2019. Final draft Review and Comparative Assessment of Policies on Treated Wastewater Reuse.

Implemented by giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Sources and Uses

Sources of used water for reuse covered by the SRTW Policy

- Wastewater generated by households and commercial enterprises in both urban and rural settings
- Not industrial wastewater – covered under a separate initiative on Zero Liquid Discharge
- Special consideration needed where industrial wastewater is mixed with municipal wastewater

Potential areas of Reuse

Priorities to be defined by States depending on prevailing demand and viability

- industry (including industrial estates, power generation and railways)
- agriculture (including forestry and horticulture) and aquaculture
- municipal uses (e.g. landscaping, parks, toilet flushing, construction, fire fighting, …)
- environment, including discharge into surface water bodies and maintenance of wetlands and environmental flows
- aquifer recharge (subject to stringent controls and discussion with CGWB)
- construction
- on-site use within STPs, including desludging
- others?

Vision

'Apna Jal' (Our water)

The Vision of the Policy is for widespread and safe reuse of treated wastewater in India that reduces the pressure on scare freshwater resources, reduces pollution of the environment and risks to public health, and achieves economic benefits by adopting a sustainable circular economy approach.

Scope of the Policy

The SRTW Policy aims to:

- set out **principles and guidance** to incorporate in the planning of SRTW projects – both urban and rural;
- identify the **commitments and actions** at central level to underpin, support and facilitate implementation of SRTW across the country; and
- provide a **model framework** for States to consider in the development and enhancement of their own policy, regulatory and implementation frameworks, allowing flexibility to adapt them to their own contexts and priorities.

Objectives

The Policy will:

- Move India on a **pathway of mainstreaming SRTW** by 2022 by encouraging States to adopt the necessary enabling environment and actively promoting its implementation.
- View SRTW as part of the **water cycle** encouraging multiple cycles of use-reuse
- Contribute to the Government's **commitment to sustainability** including achievement of SDG 6.3 on improving water quality through increased recycling and safe reuse.
- Define the **roles and responsibilities** of various government entities and agencies and of other key stakeholders such as industry and other parts of the private sector, local government, civil society organisations and citizens.
- Establish new **funding mechanisms** and support synergies among relevant Central Government programs such as SBM, AMRUT, Jal Jeewan Mission, National Water Mission Goal 3, Service Level Benchmarks, etc.
- Adopt a **precautionary approach** while progressively adopting improved water quality standards, and the need for an incremental approach based on available resources and time to build necessary infrastructure, institutional and human resource capacity.

Outline for the SRTW Policy

Message/Foreword/Preface

1. Terminology
2. Introduction (Existing situation, Need for the Policy, Challenges, International experience, Guiding principles)
3. Objectives and scope (Vision, objectives, scope, milestones)
4. Expected outcomes
5. Legislative and regulatory context (related laws and policies, State policies and regulations)
6. Roles and responsibilities
7. Water quality standards and environmental considerations (standards for defined groups of users, groundwater recharge, surface water bodies, lakes/wetlands)
8. Implementation approach (National level, State, ULB, Rural, Basin)
9. Business models (pricing, guidance on model selection and private sector engagement, managing risks)
10. Financing (national programs, State programs, incentives)
11. Monitoring, Evaluation, Surveillance and Review (principles and responsibilities, information systems, periodic review)
12. Capacity Building and Awareness Generation

Annexes

State SRTW Policy Framework; business models; technology options;

eligibility for funding; no-freshwater zones

Reuse in Agriculture

- Priority sectors for reuse to be determined by each State
- Pricing regime to consider ability to pay and alternative sources of water
- SRTW projects to:
  - address prior use of untreated wastewater in agriculture, e.g. in peri-urban agriculture
  - explore mutually beneficial outcomes for prior/ customary users
- Food safety standards – importance for both domestic and export market

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Roles and Responsibilities

National:

- Ministry of Jal Shakti - the responsible agency for facilitating and coordinating the Policy, including financial support to States, public awareness campaign and monitoring implementation
- Ministry of Housing and Urban Affairs - coordinating implementation in States and providing technical support
- Proposal to establish a National Council and State Councils on SRTW for inter-agency coordination
- CPCB / CPEEHO roles to establish end-use water quality standards for different uses

State:

- State responsibility to formulate and implement State Policy on SRTW - develop Strategy and Action Plan, including mandatory usage targets, no-freshwater zones, changes to existing regulatory frameworks
- ULB and *Panchayati Raj Institutions* responsible for on the ground implementation
- SPCBs regulatory role in monitoring and compliance of water quality standards
- Industries – proactive engagement on planning SRTW projects

Water Quality

Main points:

- Standards to be 'fit for purpose' based on the different types of reuse – need to agree on the process and timeframe for new standards
- Need to follow a risk-based approach - take into consideration nature of contaminants, including 'emerging contaminants', depending on the intended purpose of reuse
- Requires greater compliance with discharge parameters from existing STPs
- Reuse in agriculture/aquaculture should meet standards for specific crops/aquatic species and consider food safety standard requirements for public health and trade
- Quality for reuse in industry is very site specific – financial responsibility for treatment above discharge norms (i.e. secondary treatment) rests with the industry
- Precautionary approach for discharge into aquifers – emphasis on ensuring compliance
- Consider consequences of pandemics and risk with pathogens

Target setting

Proposed policy provisions

- All States adopt a State SRTW Policy by end 2022
- States with existing policies review them by end 2022 to ensure eligibility for national funding support
- Targets for treating and safely reusing wastewater:
  - (i) where collection and treatment capacity already exists – 100% reuse by 2025
  - (ii) where collection and treatment capacity does not yet exist

    50% reuse by 2030

    100% reuse by 2045

Establishing a new Fund

Proposed policy provision

- Establish a National Fund for incentivizing uptake of Safe Reuse of Treated Water
- Financial allocations from existing programs
- Criteria for the Fund include:
  - Adoption of SRTW Policy by the State
  - State has defined clearly roles and responsibilities for regulation, implementation, monitoring and compliance
  - In AMRUT towns/cities, funds will be applied only for tertiary treatment and distribution networks
  - In towns/cities outside AMRUT, funds may also be used to establish STPs
  - Funds are available to cities that meet specified service level benchmarks on sanitation defined by MoHUA
  - Minimum cost recovery principles are attainable
  - Project will not be eligible if other GOI funding program is already approved for the reuse components
  - States need to typically demonstrate 50% funding from own sources or private sector with lower contributions from those that are eligible for additional subsidy (e.g. NE States, Hill States etc.)
  - There will be a maximum total amount that any one State can utilize from the Fund to ensure the Fund's effectiveness to incentivize SRTW across the country.

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Panel Discussion 1:
Reuse of Treated Wastewater in Agriculture – Current Status and Implementation Challenges

Moderator: Dr. Mahesh Patankar, Senior Advisor, 2030 WRG
Shilp Verma, Researcher, International Water Management Institute
Vishwanath S, Director, Biome Environmental Solutions Ltd

International Water Management Institute

CGIAR RESEARCH PROGRAM ON Water, Land and Ecosystems

IWMI-TATA Water Policy Program

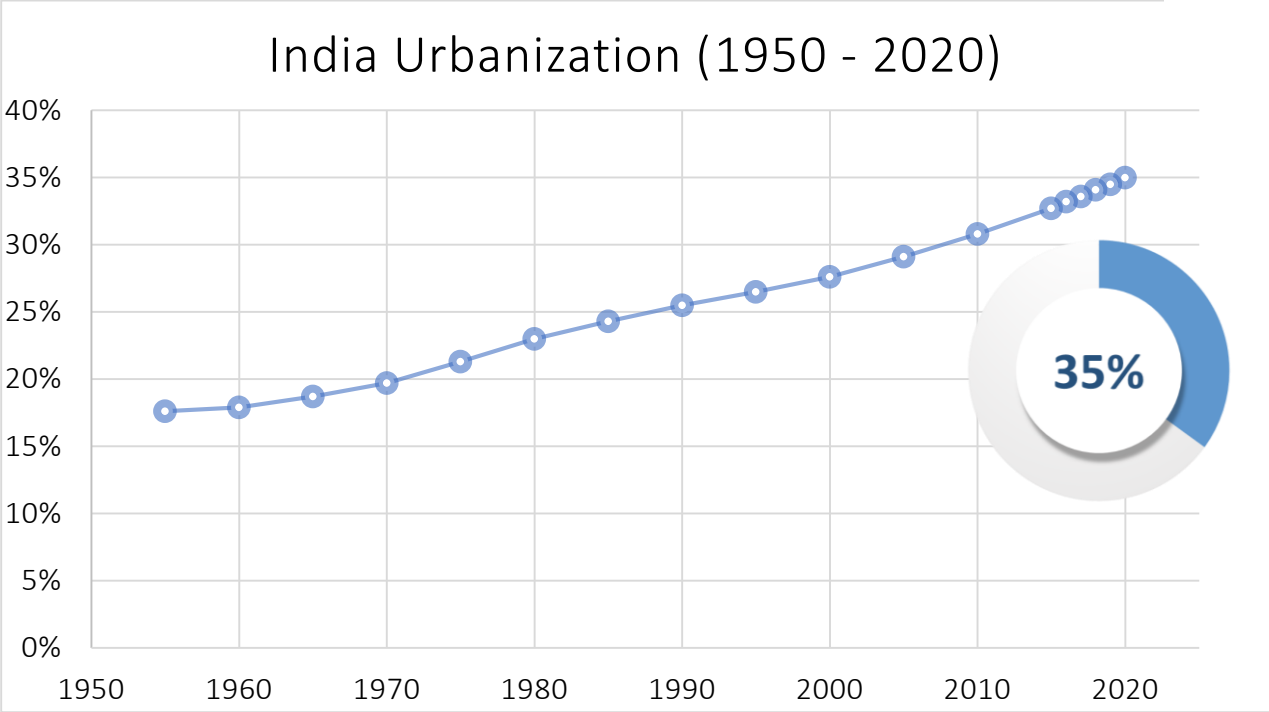
Wastewater Reuse for Irrigation in India

Towards a 'Smart Design'

Innovative water solutions for sustainable development

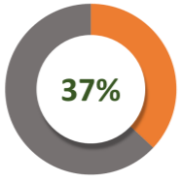
Food · Climate · Growth

India's Urbanization Challenge…

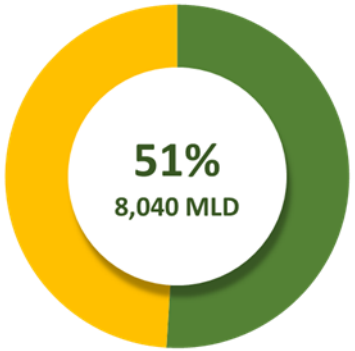


Wastewater Generation: 61,754 MLD

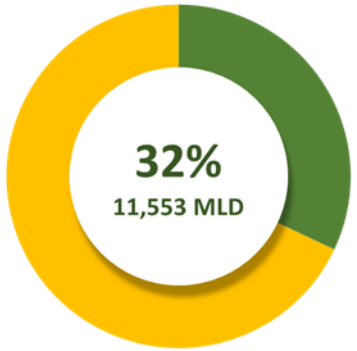
WW Treatment Capacity: 23,270 MLD



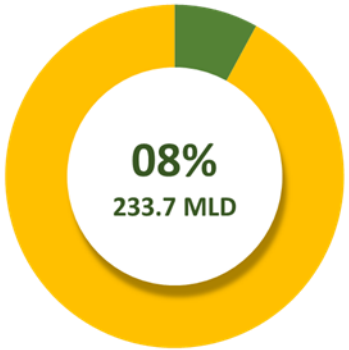
Wastewater Actually Treated: ?? MLD



Million+ Cities
15,644 MLD



Class I Cities
35,558 MLD



Class II Cities
2,696.7 MLD

Wastewater Irrigation is not new…

Paris Sewage Farm

Ann Arbor Argus-Democrat, January 13, 1899

Old News: Old News, Ann Arbor Argus-Democrat

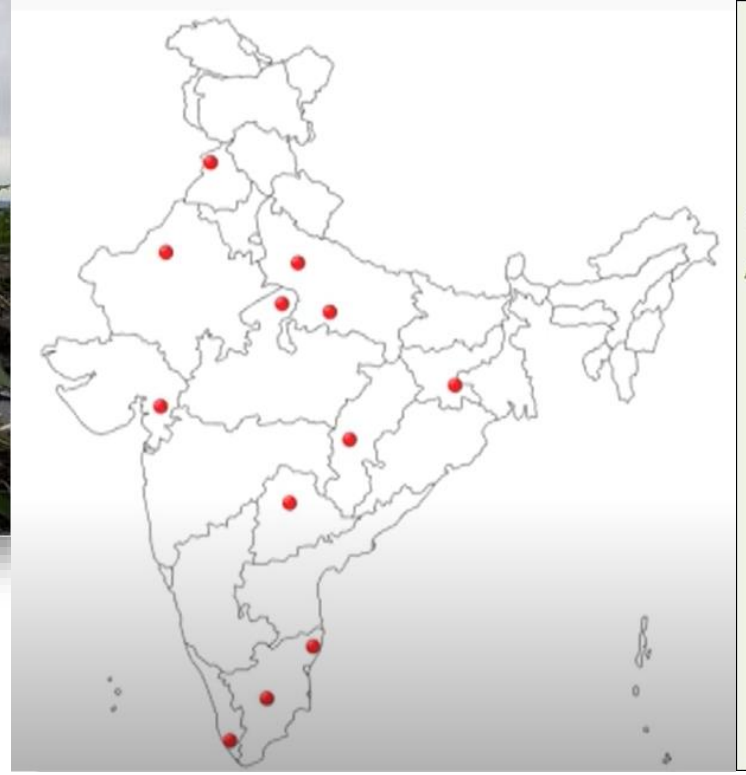
Cropped Images:

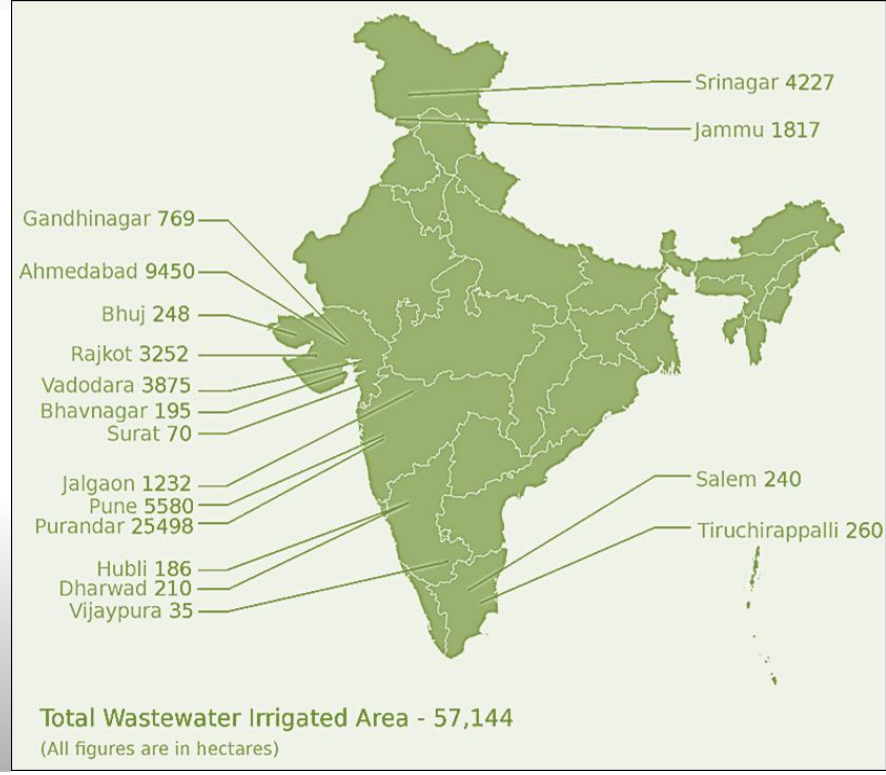
Paris Sewage Farm.

The sewage of the city of Paris is now being used to irrigate an immense farm of nearly four square miles' area. It has proved such a benefit to the land that farmers in the vicinity, who opposed it, are now anxious to arrange to receive sewage on their own farms.

Day: 13
Month: January
Year: 1899
Copyright: Public Domain

US and UK were leaders in making sewage farms, Paris known to supply vegetables and fruits to London





ITP field studies:

Shah *et al*. 2016

- 57,000+ Ha irrigated in 17 locations
- Favourable Econ; cost as a driver
- Better yield, improved produce quality
- Some awareness on (direct) health impacts;
- Preference for municipal WW, not industrial
- **Varied institutions and business models**
- **No coherent policy**

Wastewater irrigation can convert ‘waste into resource’ and ‘farmlands into wetlands’

Gujarat’s ‘Wastewater Institutions’ Heritage

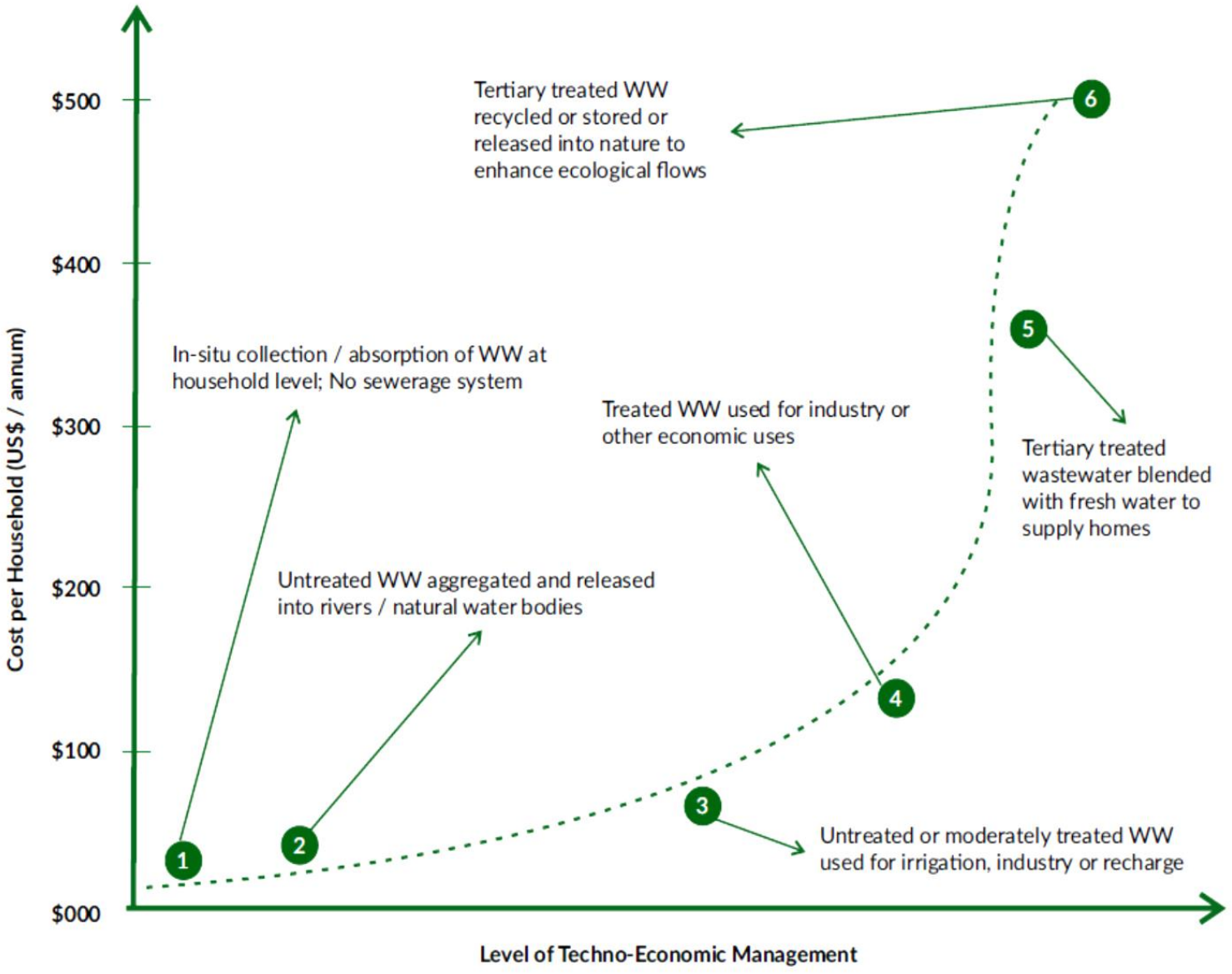
https://www.youtube.com/watch?v=qZUxptX1018

- How we 'treat' wastewater is a function of how much households / government is able and/or willing to pay for it

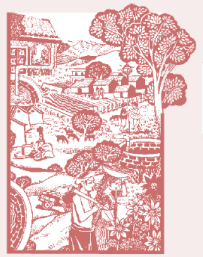
- Treating municipal wastewater to tertiary level, robbing it of its nutrients, and then re-using it doesn't make any sense

- Rather than 'by default' wastewater irrigation, if this is done 'by design', municipal wastewater can become a efficient and super reliable 'surface irrigation system'

  - Avoid mixing industrial wastewater
  - Simple precautions for (direct) impacts
  - Simple local treatment practices
  - Intelligently select crops for use
  - Promote institutional innovations
  - Invest in research on (indirect) impacts



Shah *et al*. 2016



53
2012
Revised version

IWMI-TATA
Water Policy Program

Water Policy Research
HIGHLIGHT

Cities as Sources of Irrigation Water:

An Indian Scenario

Growing Indian cities have the potential to support their peri-urban futures by providing irrigation water for food production. Over 1.1 million ha of land could be irrigated if the city waters are rendered safe for use. While the practice of periurban agriculture using city water is not a new phenomenon in India, its full potential has not been fully explored, due to poor/marginal quality and lack of adequate institutional arrangements and dialogue for its effective use. It is timely that inter-sectoral dialogue is focussed towards developing a well-integrated water development plan for cities, which includes irrigation water as well.

Priyanie Amerasinghe, Mahesh Jampani and Pay Drechsel

2012

Download this highlight from
www.iwmi.org/iwmi-tata/apm2012

04
2016

IWMI-TATA
Water Policy Program

Water Policy Research
HIGHLIGHT

Wastewater Irrigation in Karnataka

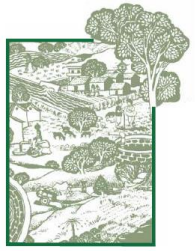
An exploration

The availability of reliable and permanent supply of wastewater from urban areas like Hubli–Dharwad and Vijayapura in Karnataka has enabled peri-urban farmers to sustain their farming livelihoods. Proximity to cities has helped farmers adopt year-round, intensive vegetable cultivation. Apart from the increase in crop yield due to high nutrients available in the wastewater, it also makes cultivation a profitable venture during the summer season. However, there are adverse health impacts of irrigating with untreated wastewater and intensive application of pesticides to fight the pests that infest these crops. Through a case study approach, this highlight attempts to analyze the current status of wastewater generation, its uses and benefits along with farmers' perceptions about its negative health impacts.

Mahima Gupta
Vandana Ravindra
Alka Palrecha

2016

Download this highlight from http://iwmi-tata.blogspot.in



09
2016

IWMI-TATA
Water Policy Program

Water Policy Research
HIGHLIGHT

Wastewater Irrigation in Maharashtra

An exploration

Wastewater irrigation is not new in Maharashtra and the Government of Maharashtra as well as farmers are beginning to recognize its value as a drought response. This Highlight presents a synthesis of field explorations in 11 locations in Maharashtra which cover the extent of wastewater irrigation; economics of wastewater and freshwater use; farmers' preferences and perceptions about wastewater; and how they are adapting to its use in agriculture.

Alka Palrecha, Nihal Sakhare, Shraddha Patkar, Shraddha Sule, Sancy Sebastian and Mukta Ramola

2016

Download this highlight from http://iwmi-tata.blogspot.in

06
2017

IWMI-TATA
Water Policy Program

Water Policy Research
HIGHLIGHT

Wastewater Irrigation in Jammu and Kashmir

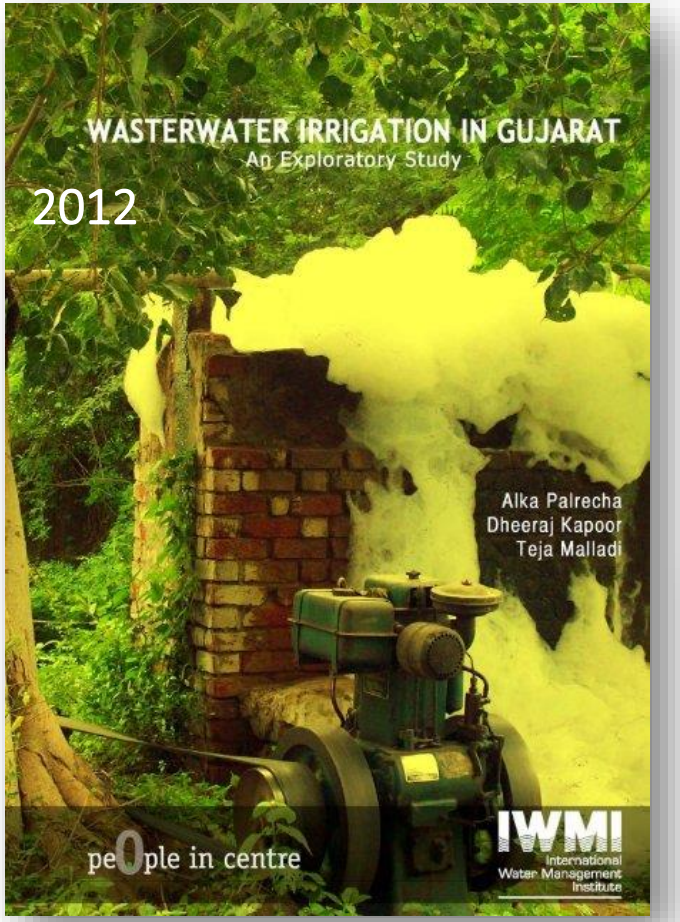
An exploration

More than 25-30 per cent of the water in the canals and field channels across Jammu and Srinagar is wastewater from urban areas. Interestingly, while wastewater irrigation has resulted in increased crop yields owing to high nutrient content in Maharashtra and Karnataka, research in J&K found no perceptible difference in crop yields. Could this be due to the degree of mixed wastewater in the canals and field channels? Based on field research in and around Srinagar and Jammu, this Highlight tracks the current status of wastewater generation; extent of its use by downstream farmers; and the perceived health risks associated with wastewater use in agriculture.

Farhet A. Shaheen

2017

Download this highlight from http://iwmi-tata.blogspot.in



IWMI
International Water Management Institute

IWMI-TATA
Water Policy Program

IWMI-TATA
POLICY PAPER
JUNE 2016

HAR KHET KO PANI
(Water to Every Farm)
Rethinking Pradhan Mantri Krishi Sinchai Yojana (PMKSY)

Tushaar Shah
Shilp Verma
Neha Durga
Abhishek Rajan
Alankrita Goswami
Alka Palrecha

2016

International Water Management Institute

Thank You…

Shilp Verma [shilp.verma@cgiar.org]

Anushri Tiwari [a.tiwari@cgiar.org]

Innovative water solutions for sustainable development

Food · Climate · Growth

Formalizing the informal

Transition of wastewater reuse in agriculture

S.Vishwanath
Biome Environmental Trust
zenrainman@gmail.com

biome
Environmental

Key points

- In many inland cities , there is already an embedded agricultural reuse of wastewater , with large investments made by farmers
- Wastewater policies will need to take into account this pre-use before diverting to other uses
- A prioritization of wastewater reuse , on the lines similar to water rights, domestic, agricultural, ecological ,industrial/urban is called for.

biome Environmental

Tumkur : Population 300,000

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- A 25 million litres per day aeration pond
- Treated and untreated wastewater fill three lakes
- Flourishing agriculture with these waters of a wetland medicinal crop called Baje . Annual turnover Rs 40 million . 200 farmers. 5000 farm workers.
- Farmers allowed STP with a promise to make available treated wastewater
- Farmers need – crop choice , best cultivation practice, drip irrigation systems and an assurance on availability of treated wastewater

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Vijayapura : Population 40,000

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Value addition

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What farmers want

- Assured wastewater
- Better drip irrigation systems
- Assistance with the right crop choice

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Environmental

Bengaluru : Population 13 million (Informal)

What farmers want

- No industrial effluent in wastewater
- Assured flows
- Crop choice with market
- Advice on irrigation practice
- On farm improvement of wastewater quality

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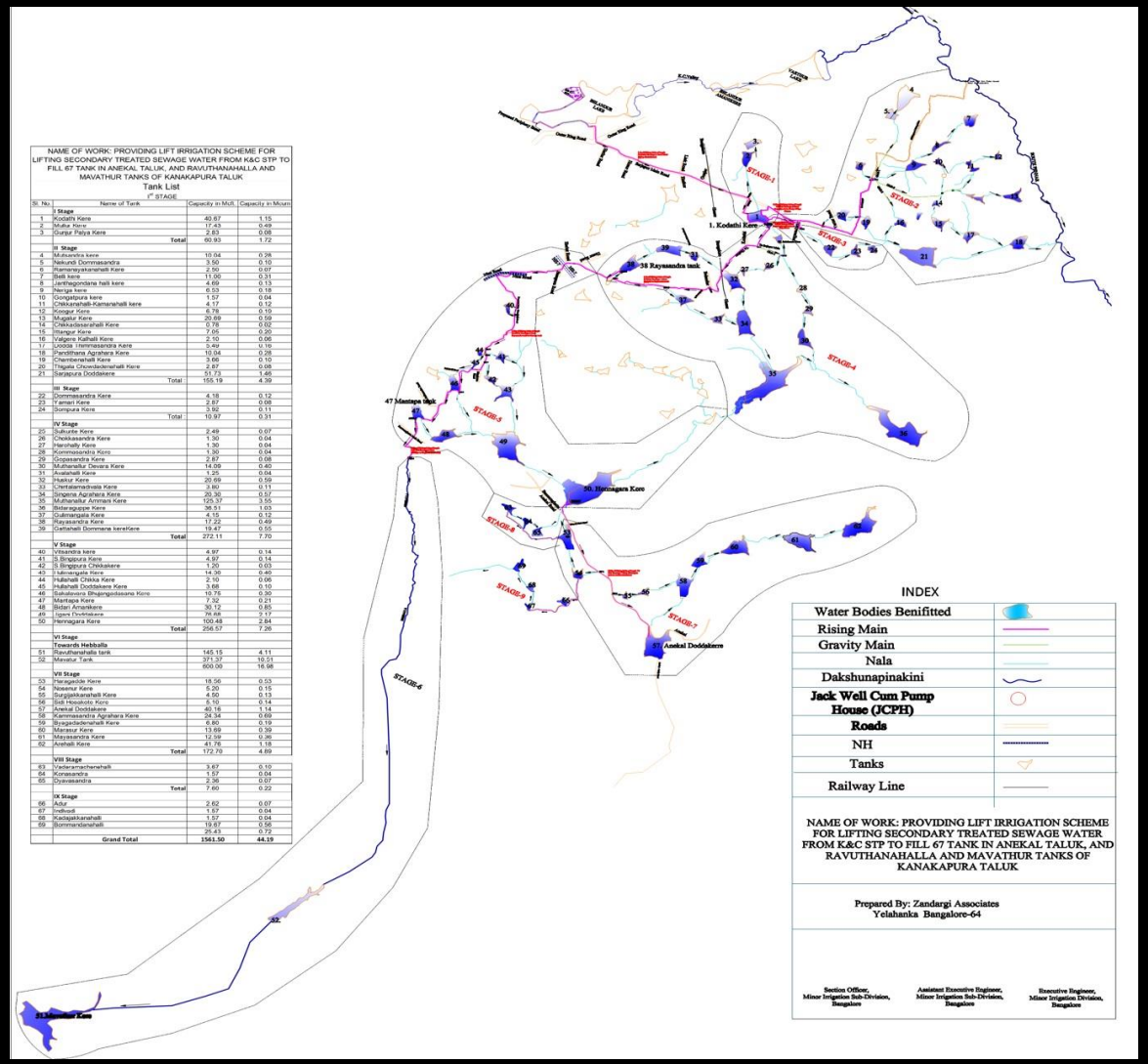
Formal transfer of 1100 mld of treated wastewater ongoing to drought prone districts to fill lakes



NAME OF WORK: PROVIDING LIFT IRRIGATION SCHEME FOR LIFTING SECONDARY TREATED SEWAGE WATER FROM K&C STP TO FILL 67 TANK IN ANEKAL TALUK, AND RAVUTHANAHALLA AND MAVATHUR TANKS OF KANAKAPURA TALUK

Tank List

1st STAGE

Sl. No.	Name of Tank	Capacity in Mcft.	Capacity in Mcum
	I Stage		
1	Kodathi Kere	40.87	1.15
2	Muka Kere	17.43	0.49
3	Gurpur Palya Kere	2.83	0.08
	Total	60.93	1.72
	II Stage		
4	Mutsandra kere	10.04	0.28
5	Nekundi Dommasandra	3.50	0.10
6	Ramanayakanahalli Kere	2.50	0.07
7	Belli kere	11.06	0.31
8	Janthagondana halli kere	4.69	0.13
9	Nerga kere	6.53	0.18
10	Gongatpura kere	1.57	0.04
11	Chikkanahalli-Kamanahalli kere	4.17	0.12
12	Koogur Kere	6.78	0.19
13	Mugalur Kere	20.69	0.59
14	Chikkadasarahalli Kere	0.78	0.02
15	Illangur Kere	7.05	0.20
16	Valgere Kalihalli Kere	2.10	0.06
17	Loosa Ishmasandra Kere	3.49	0.10
18	Pandithana Agrahara Kere	10.04	0.28
19	Chembenahalli Kere	3.66	0.10
20	Thigala Chowdenahalli Kere	2.87	0.08
21	Sarapura Doddakere	51.73	1.46
	Total	155.19	4.39
	III Stage		
22	Dommasandra Kere	4.18	0.12
23	Temani Kere	2.87	0.08
24	Bompura Kere	3.82	0.11
	Total	10.97	0.31
	IV Stage		
25	Sulkunte Kere	2.49	0.07
26	Chikkasandra Kere	1.30	0.04
27	Harohally Kere	1.30	0.04
28	Kommasandra Kere	1.30	0.04
29	Gopasandra Kere	2.87	0.08
30	Muthanallur Devara Kere	14.09	0.40
31	Avalahalli Kere	1.25	0.04
32	Huskur Kere	20.69	0.59
33	Chettalamadivala Kere	3.90	0.11
34	Singena Agrahara Kere	20.36	0.57
35	Muthanallur Ammas Kere	125.37	3.55
36	Bidarguppe Kere	36.51	1.03
37	Gulmangala Kere	4.15	0.12
38	Rayasandra Kere	17.22	0.49
39	Gattahalli Dommana kereKere	19.47	0.55
	Total	272.11	7.70
	V Stage		
40	Vittandra kere	4.97	0.14
41	S.Singapura Kere	4.97	0.14
42	S.Singapura Chikkakere	1.20	0.03
43	I Mirangala Kere	14.36	0.40
44	Hullahalli Chikka Kere	2.10	0.06
45	Hullahalli Doddakere Kere	3.68	0.10
46	Sahalavara Bhagondasana Kere	10.76	0.30
47	Mantapa Kere	7.32	0.21
48	Bidari Amankere	30.12	0.85
49	Igoni Doddakere	76.68	2.17
50	Hennagara Kere	100.48	2.84
	Total	256.57	7.26
	VI Stage		
	Towards Hebballa		
51	Ravuthanahalla tank	145.15	4.11
52	Mavatur Tank	371.37	10.51
		600.00	16.98
	VII Stage		
53	Harogeside Kere	18.56	0.53
54	Neemur Kere	5.20	0.15
55	Surgalakanahalli Kere	4.50	0.13
56	Sidi Hosakote Kere	5.10	0.14
57	Anekal Doddakere	40.16	1.14
58	Kammasandra Agrahara Kere	24.34	0.69
59	Byagadadenahalli Kere	6.80	0.19
60	Marasur Kere	13.69	0.39
61	Mayasandra Kere	12.98	0.36
62	Arehalli Kere	41.76	1.18
	Total	172.79	4.89
	VIII Stage		
63	Vaderamacherehalli	3.67	0.10
64	Konasandra	1.57	0.04
65	Dyavasandra	2.36	0.07
	Total	7.60	0.22
	IX Stage		
66	Adur	2.62	0.07
67	Indhodi	1.57	0.04
68	Kadajakanahalli	1.57	0.04
69	Bommandanahalli	19.87	0.56
		25.43	0.72
	Grand Total	**1561.50**	**44.19**

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Aquifer recharge and irrigation

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Key Observations

- A vast hinterland of wastewater agriculture provides livelihoods and employment in the city
- No formal institutional mechanism exists to monitor and manage this
- Farmers have made huge investments in pumping the wastewater into their fields
- Fit for purpose treated wastewater to be made available
- Farmers need technical assistance to manage soil and crops better
- A risk management approach using the Sanitation Safety Plan developed by WHO can be adopted .

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Panel Discussion 2:
Building Climate Resilience through Wastewater Reuse – Live case study from Marathwada

Facilitated by: Dr. Anjali Parasnis, Technical Consultant and Kavita Sachwani, State Program Coordinator, 2030 WRG, Maharashtra

- Eknath Dawale, IAS, Secretary, Agriculture, Government of Maharashtra
- Astik Pandey, IAS, Commissioner, Aurangabad Municipal Corporation, Government of Maharashtra
- Anil Hadgaonkar, SDAO, Project on Climate Resilient Agriculture, Aurangabad
- Farmer(s) / WUA of Zalta Gram Panchayat, Aurangabad

Building Climate Resilience and Circular Economy through Treated Wastewater Reuse

2030 Water Resources Group

WORLD BANK GROUP
Water

Live Case Study from Marathwada
Zalta, Aurangabad

Context and Problem Statement

Farmers of Zalta Village pump untreated water directly from river

Farmers source raw sewage from nearby sources

Ground Zero Aurangabad

Drought prone district in Marathwada region

Key Facts	
Location	Zalta, Aurangabad District, Maharashtra
Distance from nearest town	12 Km to Aurangabad
Total Geographical Area	537 Hectares
Population	2,304
Primary Source of Livelihood	Agriculture
Capacity of STP	35 MLD

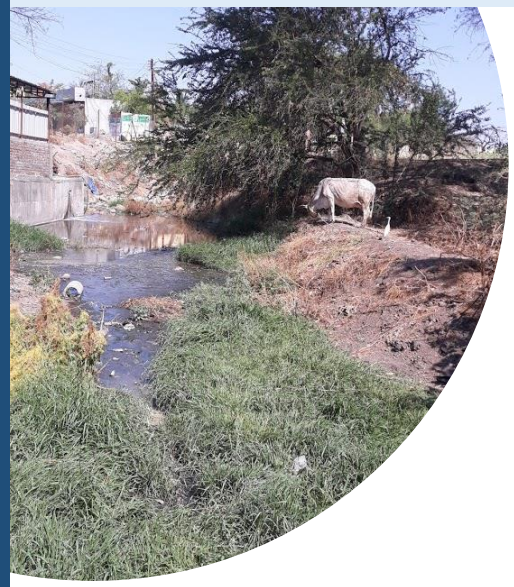
Farmers need alternative source of perennial safe water for irrigation

Zalta STP has capacity to treat 25 MLD water –upto secondary level. Only 6-9 MLD gets treated and released into Sukhna river

Aerial View of the STP Plant at Zalta

Treated wastewater released in the Nallah

Collection / Testing of Samples



Tested Samples of Untreated Water Found Unfit for Irrigation

Collection/Testing of Soil, Water, Foodgrain, Milk samples :
Kumbhephal, Aurangabad

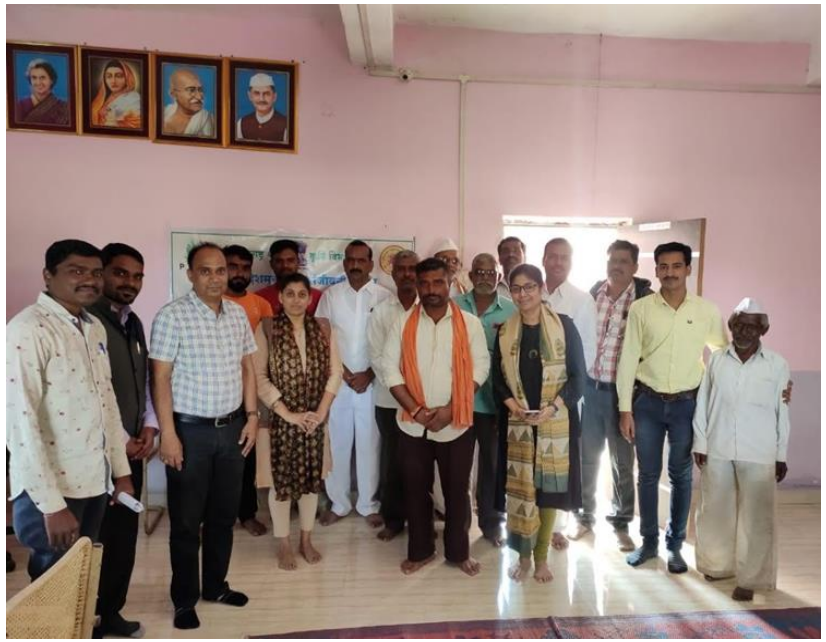
Presence of Heavy metals like Cadmium, Mercury and Lead detected in samples tested by IIT-B. Bioaccumulation of pollutants in food chain. Use of sensors developed by IIT-B would be useful.

Collection /Testing of Soil, Water samples :
Zalta farms and open source stream, Aurangabad

High salinity, electric conductivity observed. Open source water is found to be unfit for irrigation

Innovative Solutions Using Multi-stakeholder Approach

Formation of Wastewater Reuse Association Zalta



Multi-stakeholder Approach

- Aurangabad Municipal Corporation
- PoCRA – PMU Mumbai, Aurangabad
- MWRRA
- Zalta Gram Panchayat and Farmers
- Zalta STP
- 2030 WRG

Agreement by Farmers to pay for water, electricity for pumping water

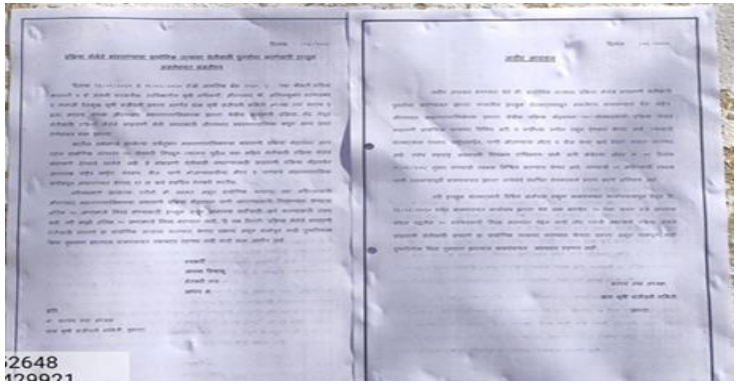
Bulk Water Tariff Order	Rates in Paise/ cu.m (MWRRA)	
Season	Rate for Rgtd Users	Individual Benes
Kharif	3.38	4.50
Rabi	6.75	9.00
Hot Weather	10.13	13.50

Approval given by Aurangabad Municipal Corporation to lift 2 MLD of Water for Farmers

Contracts between farmers and Zalta Gram Panchayat and AMC under progress

Meeting of Farmers convened in October 2020

Display of EoI by Zalta GP



Key Milestones and Way Forward

Pre- Pilot
(Nov 2018- December 2019)

1. Stakeholder Mapping
2. Filed visits to Aurangabad and Interaction with Farmers.
3. Defining Problem statement, base line and indicators
4. Dialogue with Partners
5. Qualitative testing of water, soil, crop, food and fodder samples in collaboration with IIT-B
6. Qualitative analysis of stream water and soil-in collaboration with PoCRA

Pilot Scale Project
(January 2020- December 2020)

1. MSP meetings at Zalta Gram Panchayat (ZGP)
2. Formation of the 1st Wastewater Reuse Association
3. Agreement between ZGP and beneficiary groups to pay for water and pumping set up
4. Request Letter submitted to Aurangabad Municipal Corporation (AMC)
5. Request For Expression of Interest (EOI) displayed on the Notice Board.
6. A formal permission to lift 2 MLD water issued by AMC. Farmers accept ToR of AMC.
7. The first group of farmers would be reusing treated wastewater at ZGP by December 2020.

Scale Up- Long term
(January 2021- December 2021)

1. Scaling up of operations.
2. Formation and registration of multiple Wastewater Reuse Associations at Zalta
3. Developing Detailed Project Report in consultation with AMC and PoCRA
4. Developing appropriate conveyance infrastructure
5. Carrying out Impact assessment- Socio Economic, Environmental, Qualitative and Quantitative parameters.

Towards Building Climate Resilience and Resource Circularity

1. **Water and Wastewater Management**
   - Potential to bridge the gap of 100 MLD between water demand and supply through water reuse and recycle.
   - Scope for reuse of at least 100 MLD treated wastewater for Industries, Urban areas and Agriculture.
   - Potential sludge generation- 1,572,354 Kg and Biogas production potential- 774,082 m^3 (to leverage Calorific, Nutritive and Commercial value of Sludge).
2. **Energy Generation and Saving**
   - At STPs-Biogas Production potential is high.
   - Integration of Solar Energy for sustainability and energy conservation.
3. **Comparison with National and Global Benchmarks and GHG Mitigation Targets.**

Dimensions of Circular Economy Using Treated Wastewater

Wastewater Reuse for Agriculture

Wastewater Reuse for Afforestation

Sludge Management- Source of Plant Nutrient and Energy

Carbon emission Reduction- Energy and Water use efficiency

Opportunities of Revenue Generation

Climate Resilience Carbon neutral Water Utilities

Transcripts from the Discussion with farmers of Zalta Village, Aurangabad during the webinar

Ms. Rima Sonavane and Mr. Gajanan Surashe

- The villagers do not have an option but to use the polluted water from nearby streams and rivers. The farmers have noted degradation of the soil over the years due to the use of contaminated water.

- There are impacts of polluted water consumption on health of the people as well as on livestock. Especially in village Zalta, the increasing percentage of cancer patients is a serious concern. Similarly, there are more incidences of skin infections and vector borne diseases such as malaria.

- If the villagers and farmers could get access to treated wastewater for farming and pure potable water for households, it will positively impact the health and socioeconomic status of the villagers. The farmers would take long term crops, plant more fruit trees and cultivate fodder on large scale.


Thank you

Tag these social media handles and hashtags

Social Media Handles

@2030WRG

@wbcsd

Indian Euro Water Partnership

Israel Economic and Trade Mission

Government of Maharashtra

Hashtags

#CircularEconomy

#TreatedWastewater

#MultiStakeholderPlatform

#WaterSecurity

#ResiliencePlanning

Please join us for the upcoming sessions of our

3-part Webinar series on Reimagining Reuse of Treated Wastewater in Agriculture in India:

Technology, Finance and Governance Perspectives

Webinar 2: Wastewater Treatment Systems and Technologies : Fit for purpose – Fit for India, **26th Nov 2020**
Webinar 3: Financing and Governance to Mainstream Reuse of Treated Wastewater, **17th Dec 2020**

Detailed agenda to follow soon

2030 Water Resources Group | HOSTED BY WORLD BANK GROUP Water | Government of Maharashtra

in collaboration with

wbcsd | Ministry of Economy and Industry Foreign Trade Administration | EUROPEAN UNION | german cooperation | Implemented by giz | INDIA-EU WATER PARTNERSHIP

Thank you!

Please write to us at 2030wrg_mh@worldbank.org to know more about the Webinar Series