Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission Embassy of Israel Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Duration	Agenda
4:00pm	Opening & Housekeeping by Singapore Water Association
4:05pm	Welcome Remarks by Mr Caden Tan, Israel Trade & Economic Department Singapore
4:10pm	The Singapore Water Story by Ms. Winnie Tan, PUB Senior Assistant Director Industry and Technology Collaboration
4:20pm 4:25pm	Israeli Speaker : Mr Ravid Levy, Director of WaterEdge IL Innovation Community Isreali Speaker : Mr Miki Zaide, Director of The Planning Divison at IWA Israeli Water Authority
4:30pm	Sharing by Biokube Asia Pte Ltd
4:40pm	Sharing by WFI Group
4:50pm	Sharing by SG Enviro Pte Ltd
5:00pm	Sharing by WaterGen
5:10pm	Q & A
5:25pm	SWA Closing Remarks

Israeli / Singapore Presenters:

BIOKUBE

WFI

SG ENVIRO

Watergen

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission Embassy of Israel Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Duration	Agenda
4:00pm	Opening & Housekeeping by Singapore Water Association
4:05pm	Welcome Remarks by Mr Caden Tan, Israel Trade & Economic Department Singapore
4:10pm	The Singapore Water Story by Ms. Winnie Tan, PUB Senior Assistant Director Industry and Technology Collaboration
4:20pm 4:25pm	Israeli Speaker : Mr Ravid Levy, Director of WaterEdge IL Innovation Community Isreali Speaker : Mr Miki Zaide, Director of The Planning Divison at IWA Israeli Water Authority
4:30pm	Sharing by Biokube Asia Pte Ltd
4:40pm	Sharing by WFI Group
4:50pm	Sharing by SG Enviro Pte Ltd
5:00pm	Sharing by WaterGen
5:10pm	Q & A
5:25pm	SWA Closing Remarks

Israeli / Singapore Presenters:

BIOKUBE

WFI

SG ENVIRO

Watergen

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission
Embassy of Israel
Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday, 4:00pm to 5:30pm SGT

HOUSEKEEPING

- ✓ To ensure better connectivity, please mute your microphone and turn off the camera. You may communicate with us after the event or during the Q & A.
- ✓ Please share your questions in Q & A icon (right bottom) where we will try to provide answers where possible. Do identify yourself so we can respond to any unanswered questions
- ✓ If you need real time speech-to-text translation, please select your preferred language in the bottom left CC icon
- ✓ Please complete a 1min poll survey at end of the session.

Israeli / Singapore Presenters:

BIOKUBE-R

WFI

SG ENVIRO

Watergen

Co-Organised by : Singapore Water Association; Economic & Trade Mission Embassy of Israel Singapore; Israel Export Institute

Supported by : PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday, 4:00pm to 5:30pm SGT

DISCLAIMER

- All information shared is for general information only and does not contain or convey any legal advice or administrative assistance.
- Information shared today is true and accurate as of publication date.
- The organiser and speakers reserve all rights in the provided materials
- This session will be recorded, shared and kept for as long as it serves a business purpose for the Association. By attending this event, you are giving your consent to this recording.

Israeli / Singapore Presenters: BIOKUBEN; WFI; SG ENVIRO; Watergen

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission
Embassy of Israel
Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Welcome Address

Mr Caden Tan
Israel Trade & Economic Department
Singapore

Israeli / Singapore Presenters:

BIOKUBEN

WFI

SG ENVIRO

Watergen

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission
Embassy of Israel
Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

The Singapore Water Story

Ms. Winnie Tan
PUB Senior Assistant Director
Industry and Technology Collaboration

Israeli / Singapore Presenters:

BIOKUBEN

WFI

SG ENVIRO

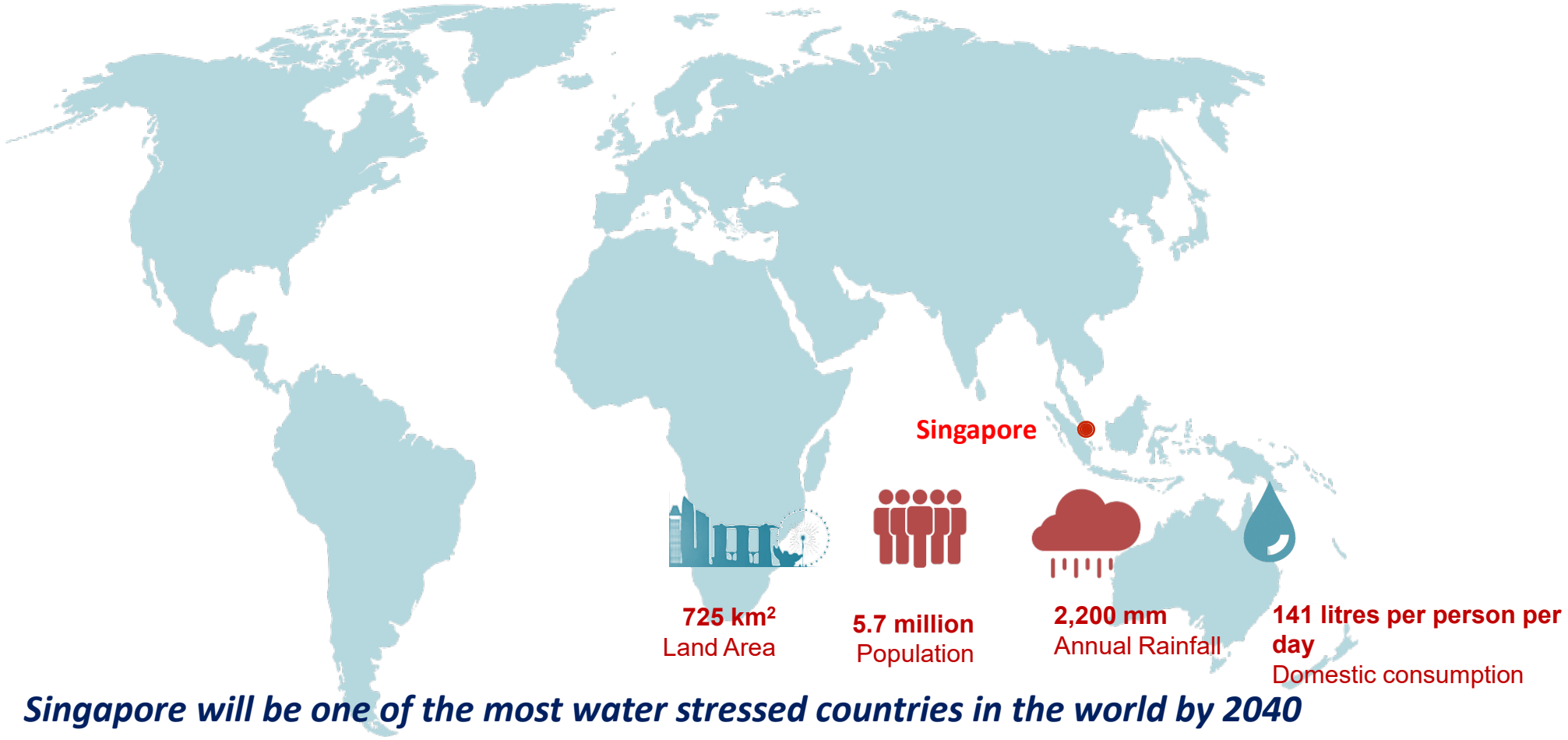
Watergen

PUB SINGAPORE'S NATIONAL WATER AGENCY

The Singapore Water Story

Presented by Winnie Tan (Ms)
Senior Assistant Director,
Industry & Technology Collaboration Department

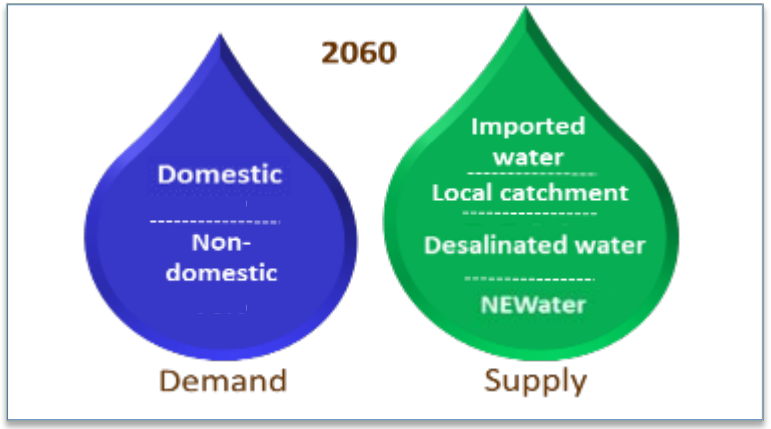
Singapore's Water Statistics



Singapore will be one of the most water stressed countries in the world by 2040 (source: World Resources Institute 2015 Report)

www.pub.gov.sg

Singapore's Water Challenges



Rising Water Demand

Climate Change & Rising Sea Level

Reduction in use of Energy and Carbon Emission

Reduction in Waste and Resource Recovery

PUB, Singapore's National Water Agency

Managing the entire water loop by a single agency in the Ministry of Sustainability and the Environment

Ministry of Sustainability and the Environment

Ministry of Sustainability and the Environment

National Environment Agency

To achieve a liveable and sustainable Singapore

•Clean Land •Clean Air •Public Health

PUB SINGAPORE'S NATIONAL WATER AGENCY

To ensure an efficient, adequate and sustainable supply of water

•Water Supply •Used Water •Drainage •Coastal Protection

Singapore Food Agency

To ensure and secure a supply of safe food

•Food Safety •Food Security

Delivering Our Mission

Supply Good Water

Diversified sources of water to ensure we never go thirsty

- Securing our Water Supply
- Upgrading our Water Plants
- Maintaining Network Reliability

Reclaim Used Water

Deep Tunnel Sewerage System; collects every drop of used water

- Phase 1: 42km, 20-55m deep
- Phase 2: 40km, 35-55m deep; scheduled to complete by 2025

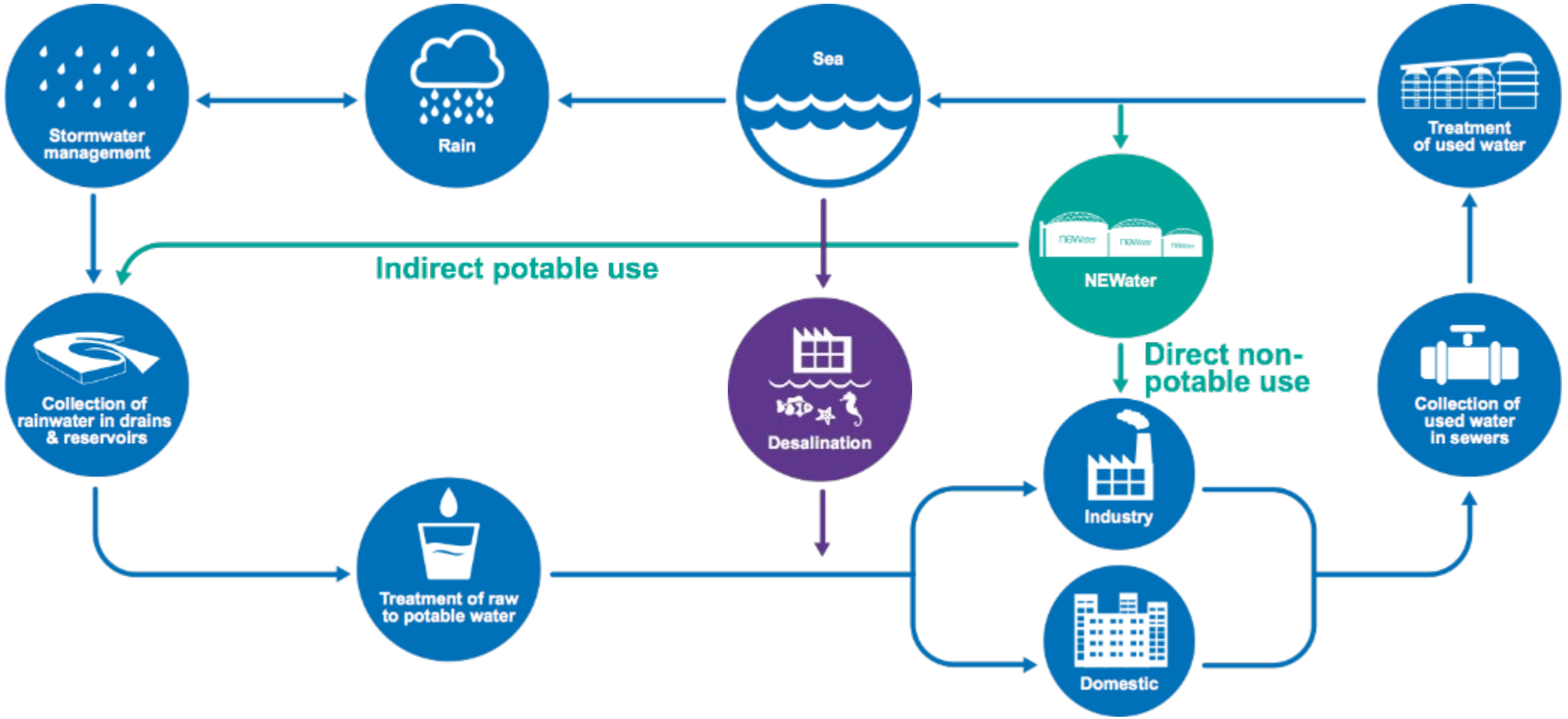
Tame Stormwater

- Increasing Drainage Capacity
- Responding to Flash Floods

Resist Rising Seas

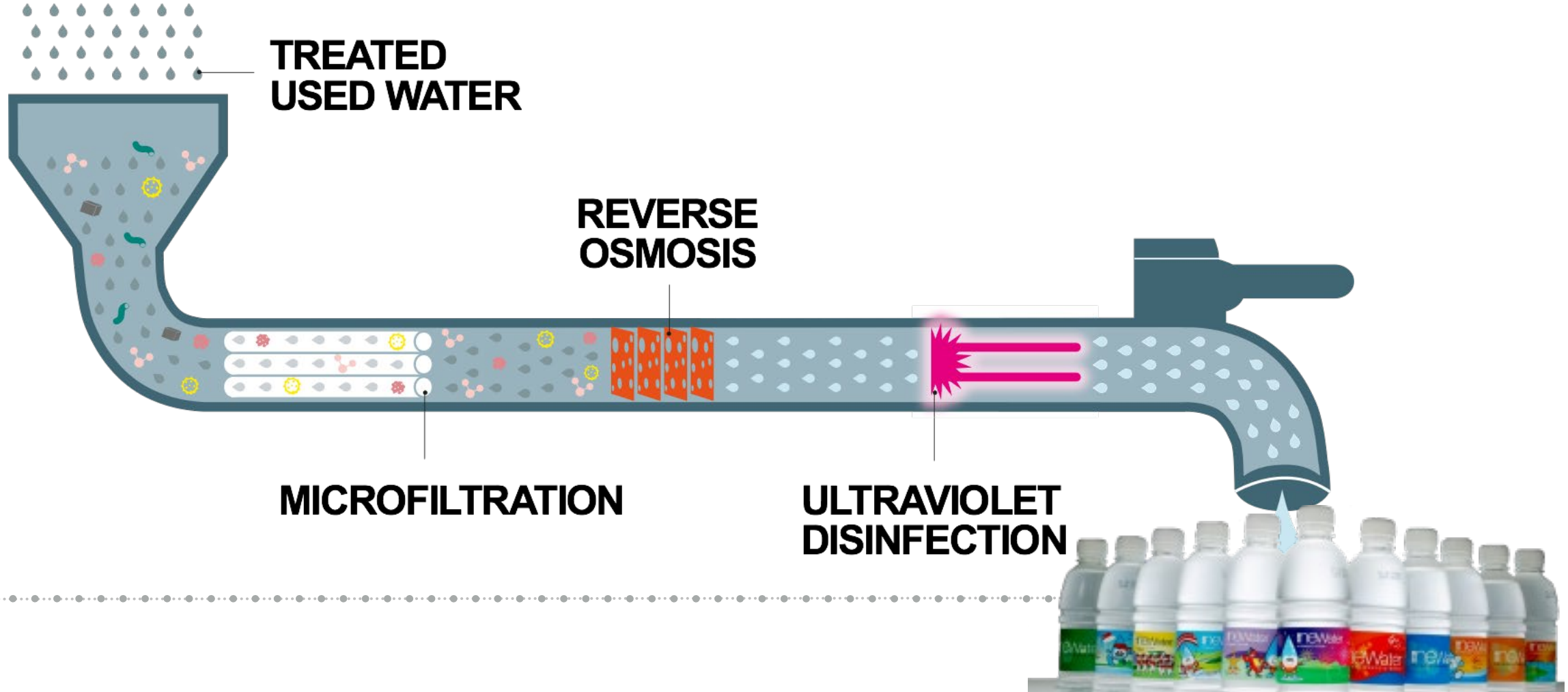
- Since April 2020, PUB has been designated as the lead agency to coordinate efforts and drive coastal protection initiatives.
  - Building Expertise in Coastal Engineering
  - Strengthening Coastal Defences
  - Coastal-Inland Flood Model
  - Site-specific Studies

PUB Manages the Complete Water Loop



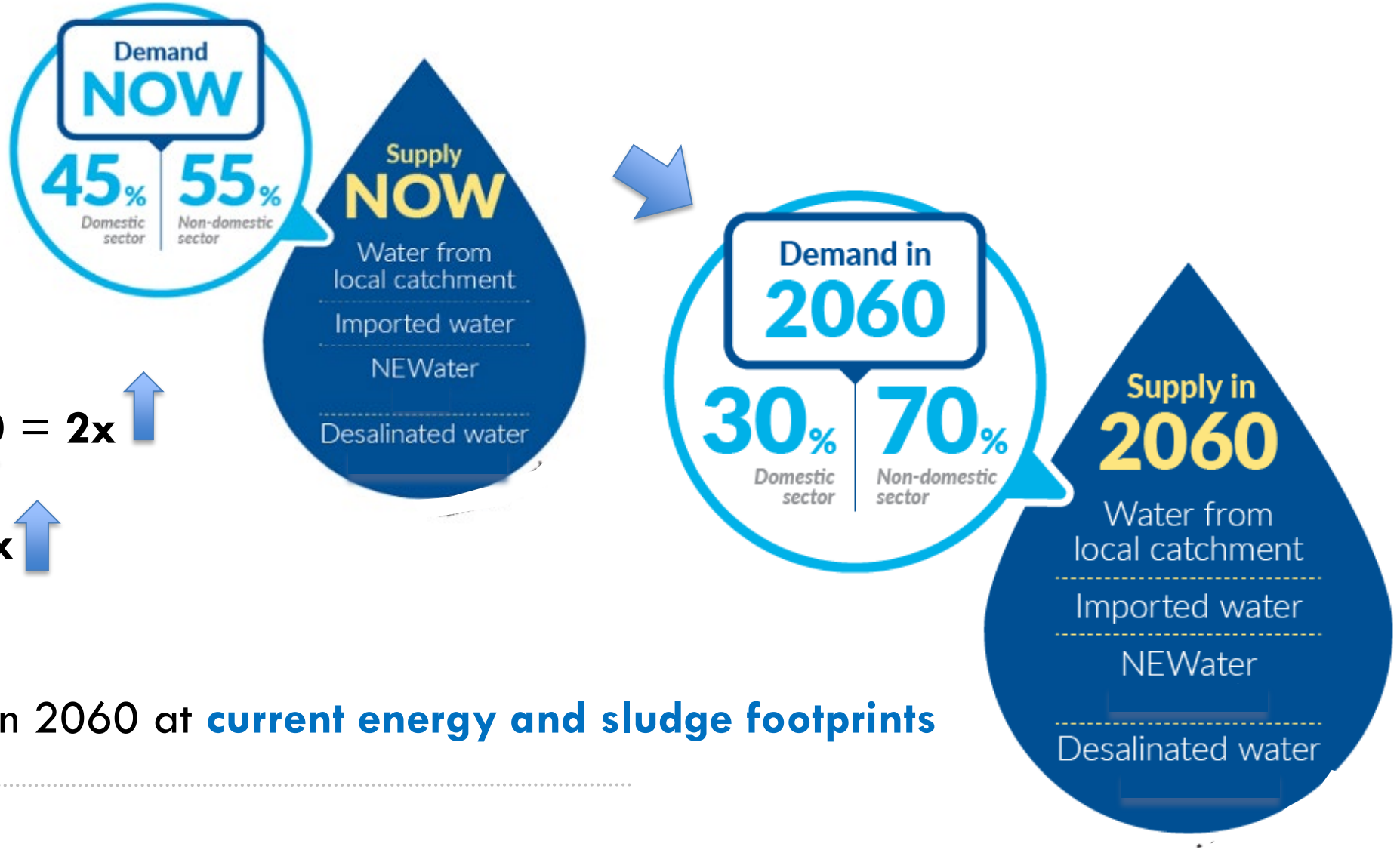
PUB leverages technological innovations to overcome water challenges and achieve long-term water sustainability.

NEWater – High-grade reclaimed water that is well within WHO drinking water guidelines



NEWBrew – A collaboration between PUB and Brewerkz

The Road Ahead …



Water demand in 2060 = **2x**

Energy Needed = **4x**

Sludge Generated = **2x**

Long Term Goal:

Deliver water demand in 2060 at **current energy and sludge footprints**

Preparing PUB for the Future –Investing in R&D

Technically Feasible and Economically Viable Water Solutions

New Ideas and Innovations

Planning and Infrastructure Needs

Water Treatment, Desalination and Reuse
1. Ultra-permeable reverse osmosis membrane
2. Low energy, low chemical pre- and post-treatment, e.g. ceramic membranes
3. Process improvements, e.g. CCRO
4. Pressure retarded osmosis

Industrial Water Solutions
1. Increasing water recovery
2. Cooling tower make up and losses reduction
3. Novel less water-intensive processes/tools

Used Water Treatment
1. Anaerobic MBR and mainstream Anammox
2. Aerobic granular sludge MBR
3. Solids pre-conditioning and co-digestion
4. Membrane aerated biofilm reactor

Catchment Management
1. Reservoir Water Quality Management
2. Reservoir Water Quantity Management
3. Flood risk management
4. Integrated systems approach

Coastal Protection & Climate Change
1. Innovative coastal protection solutions
2. Study on Singapore coastal processes
3. CC impact to structural integrity of network
4. CC impact to treatment processes
5. CC impact to water quality (seawater, reservoir water and potable water network)
6. Removal of CO2 through technologies that could be integrated with PUB's Operations

Waste Reduction & Resource Recovery
1. Gasification of UW sludge
2. Pyrolysis of UW sludge
3. Adsorption membranes for Li recovery
4. Resource recovery from SWRO brine

Digitalisation
1. Internet-of-Things
2. Data analytics
3. Artificial intelligence
4. Digital twins
5. Autonomous system

Water Quality & Security
Field-based methods & technologies
1. In-situ sensors
2. Rapid sampling & collection

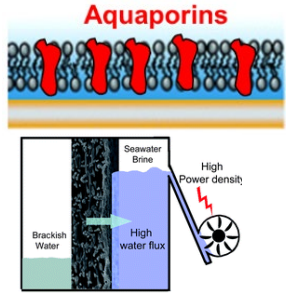
Lab based methods & technologies
3. Biomonitoring
4. Managing contaminants and pathogens of emerging concerns

Systemic Water Quality
5. Water science

Network Management (WSN)
1. Intelligent pipeline management
2. Real-time network anomaly monitoring
3. Intelligent command and control
4. Data driven customer engagement

Network Management (WRN)
1. Sewer planning analytics
2. Effluent discharge quality management
3. Smart network, tunnel, and equipment O&M
4. Smart construction and project management

R&D Focus Areas for 2021 - 2025



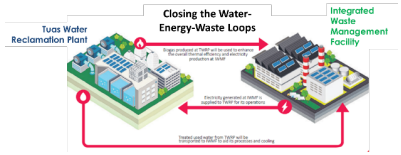
PRO

1 Desalination & Water Reuse

Reduce energy consumption

Current: 3.5 kWh/m^3 (Plant)
2025 target: 2 kWh/m^3 (R&D Demo)
Beyond 2030: <2.0kWh/m^3

Integrated Validation Plant



2 Used Water Treatment

Improve treatment energy self-sufficiency

Current: 25% (operation);
85% (R&D Demo)
2025 target: 95% (R&D demo)
By 2030: 100% (R&D demo)

** All % as energy self-sufficiency for treatment*

3 Industrial Water Solutions

Manage non-domestic water demand

Target: 3MGD reduction / year

4 Waste Reduction & Resource Recovery

Reduce amount of dewatered sludge sent to incineration

Current: 0.16 kg dry solids/m^3 used water
2025 target: 0.11 kg dry solids/m^3 used water

5 Coastal Protection

Increase coastline protection

2025 target: Completion of integrated coastal-inland drainage model and site-specific engineering studies

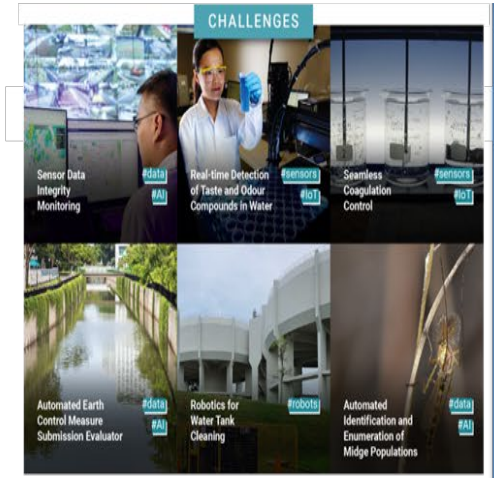
6 Climate Change Mitigation

Reduce greenhouse gas emissions

2025 target: Peak carbon emissions
By or around 2045: Achieve net zero emissions

PUB Global Innovation Challenge

Seeks to accelerate PUB's discovery and adoption of digital solutions and smart technologies to improve operational excellence and meet future water needs



GIC Cycle 1 (2020)

6 challenges, **104** solutions, **20** countries

9 Winners

Focus areas:

- Sensor & Monitoring Systems
- Automation & Robotics

GIC Cycle 2 (2021)

4 challenges, **57** solutions, **14** countries

4 Winners

Focus areas:

- Smart Conveyance Solutions
- Coastal Protection Measures

Carbon Zero Grand Challenge (2022)

1 challenge, **71** solutions, **21** countries

2 Winners

Focus area:

- Technologies to decarbonise PUB's Operations

>800k people reached

11 Challenges released

161 Proposals received

S$2M Funding awarded

8 Technologies deployed

https://pub.gov.sg/innovationchallenge

PUB works with the industry closely to prepare for today's and future challenges

Vibrant water industry in Singapore comprises more than 200 water companies and 25 research institutes

PUB

Marina East Desalination Plant

- Officially opened in Feb 2021
- Dual intake allows the plant to take source water from either the nearby Marina Reservoir or the sea, depending on weather.
- Conferred the Grand Innovation Award, at the International Water Association Project Innovation Award.

Floating Solar Farm @ Tengeh Reservoir

Reduce Emissions; Replace with Renewables; Remove Emissions

- **60 MWp** Floating Solar Farm - One of the world's largest inland floating solar farms

sembcorp

Offsets 7% of PUB's annual energy needs and reduces carbon footprint

Singapore will be one of the few in the world to achieve 100% green water treatment plants

Waste Reduction & Resource Recovery

Singapore Water Exchange (SgWX)

A Global Marketplace for Innovative Water Companies

Since 2018, SgWX has built an active, vibrant ecosystem

35

water-related companies, associations and incubators/ accelerators

~200

staff work from SgWX

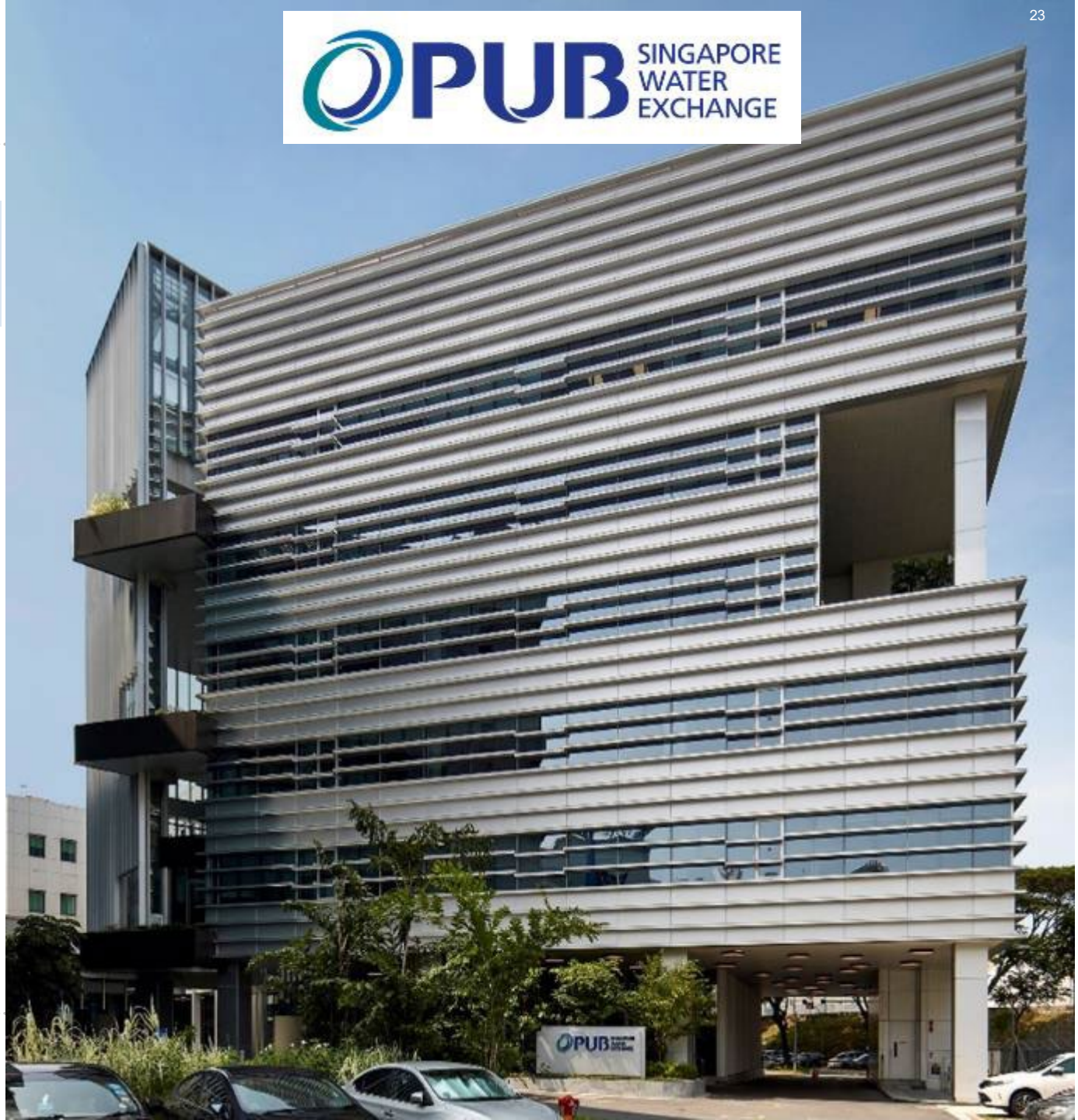
13

countries

Contact: pub_sgwx@pub.gov.sg

LinkedIn

www.pub.gov.sg



SIWW Spotlight 2023 and SIWW 2024

Singapore International Water Week Spotlight 2023

- **4-6 June 2023**
- ParkRoyal Collection Marina Bay, Singapore
- Theme: **Urgent Climate Action for a Sustainable Water Future**

Singapore International Water Week 2024

- **18-22 June 2024**
- Sands Expo & Convention Centre, Marina Bay Sands, Singapore
- **The Global Platform to Share and Co-Create Innovative Water Solutions**

Thank You

Contact: pub_sgwx@pub.gov.sg

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission Embassy of Israel Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Speakers

Mr Ravid Levy
Director of WaterEdge IL Innovation Community

Mr Miki Zaide
Director of The Planning Divison at IWA Israeli Water Authority

Israeli / Singapore Presenters:

BIOKUBEN

WFI

SG ENVIRO

Watergen

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission Embassy of Israel Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Speaker

Mr Ravid Levy
Director of WaterEdge IL Innovation Community

Israeli / Singapore Presenters:

BIOKUBEN

WFI

SG ENVIRO

Watergen

WaterEdge.IL

Israel Water Innovation Community

The Israeli Water Ecosystem - When need meets innovation

WaterEdge.IL

WaterEdge.IL Targets and Values

Enhancing	cooperation and knowledge sharing within the Israeli water ecosystem
Encouraging	water innovation, technology scale-up and adoption
Advancing	Israeli water industry's international activity and image
Promoting	human diversity and professionalism in the Israeli water sector
Connecting	the water ecosystem to Israel's climate objectives and UN SDG's

KINNERET
Kinneret Academic College

State of Israel
WATER AUTHORITY

Ministry of Economy

רשות החדשנות
Israel Innovation
Authority

WaterEdge.IL

Israel's water miracle…

WaterEdge.IL

…is no miracle at all…

The challenges:

- ❖ Semi-arid climate on the edge of the desert
- ❖ Isolated from neighboring countries
- ❖ Limited water sources (no rivers, one lake)
- ❖ Fast growing population and economy

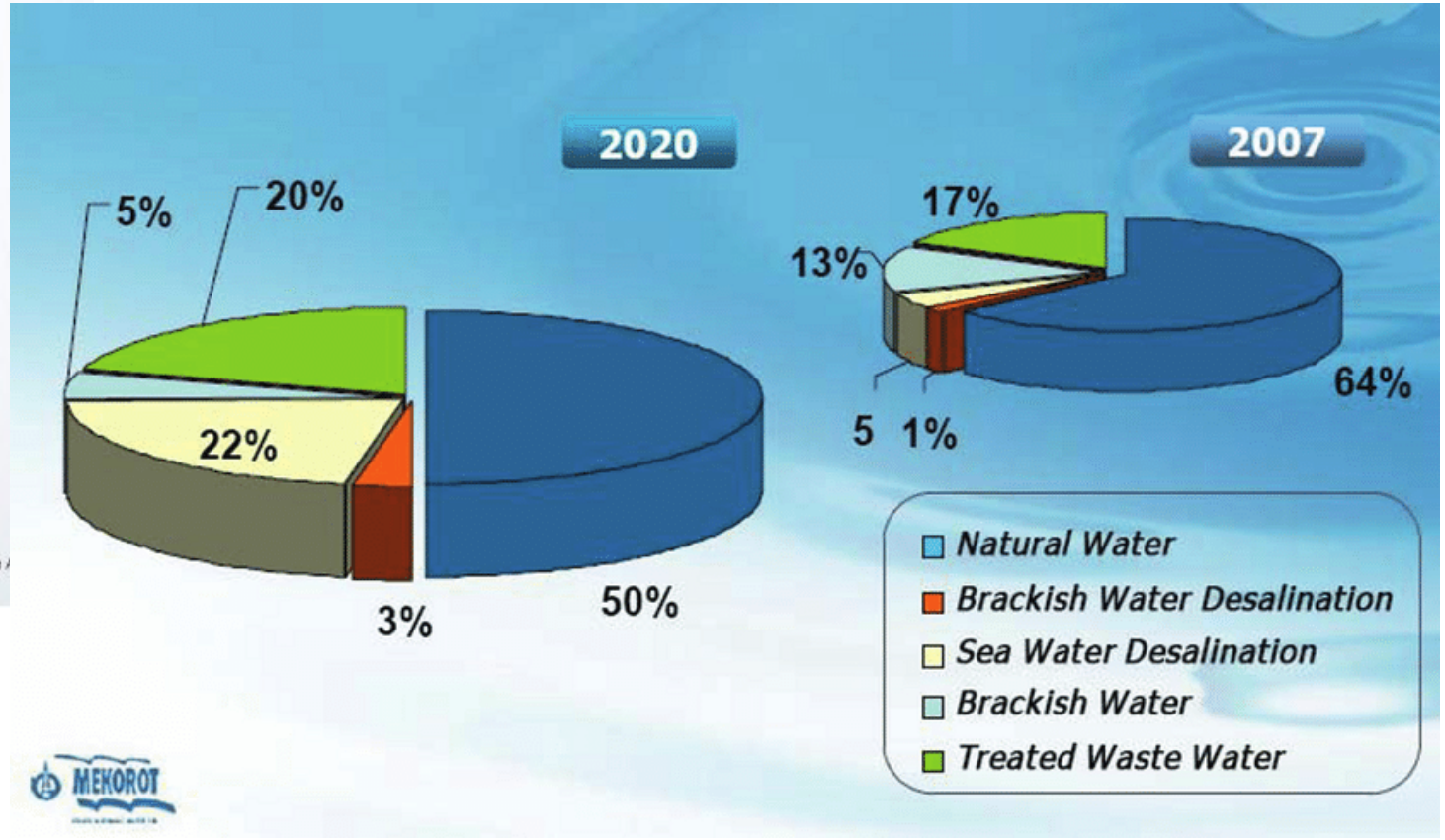
The solutions:

- ✓ Unique water law
- ✓ National water planning, pricing and allocation
- ✓ Education and public awareness
- ✓ Innovation and adoption of water technologies

National water planning & management

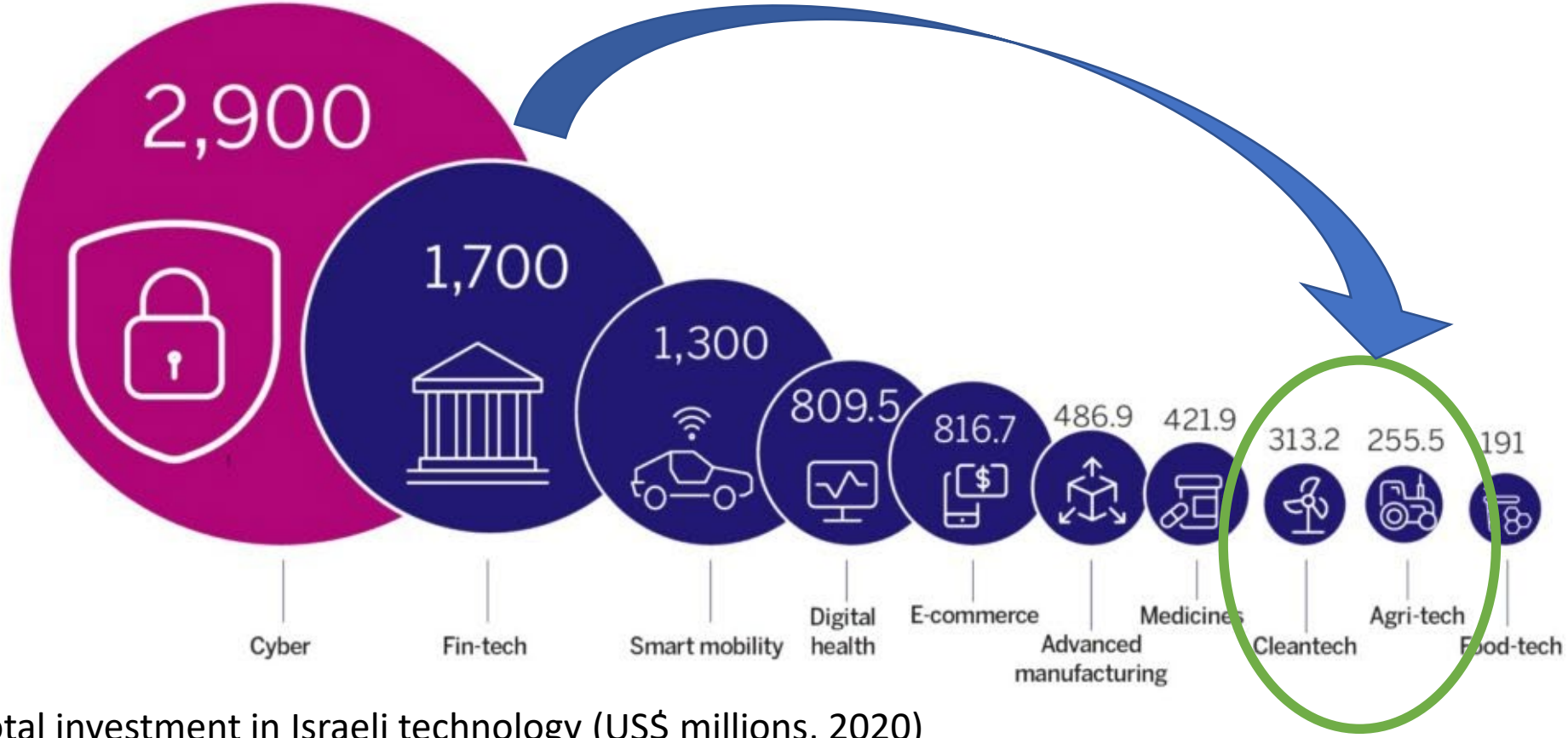
WaterEdge.IL

Diversified Water Sources



WaterEdge.IL

Fostering Innovation

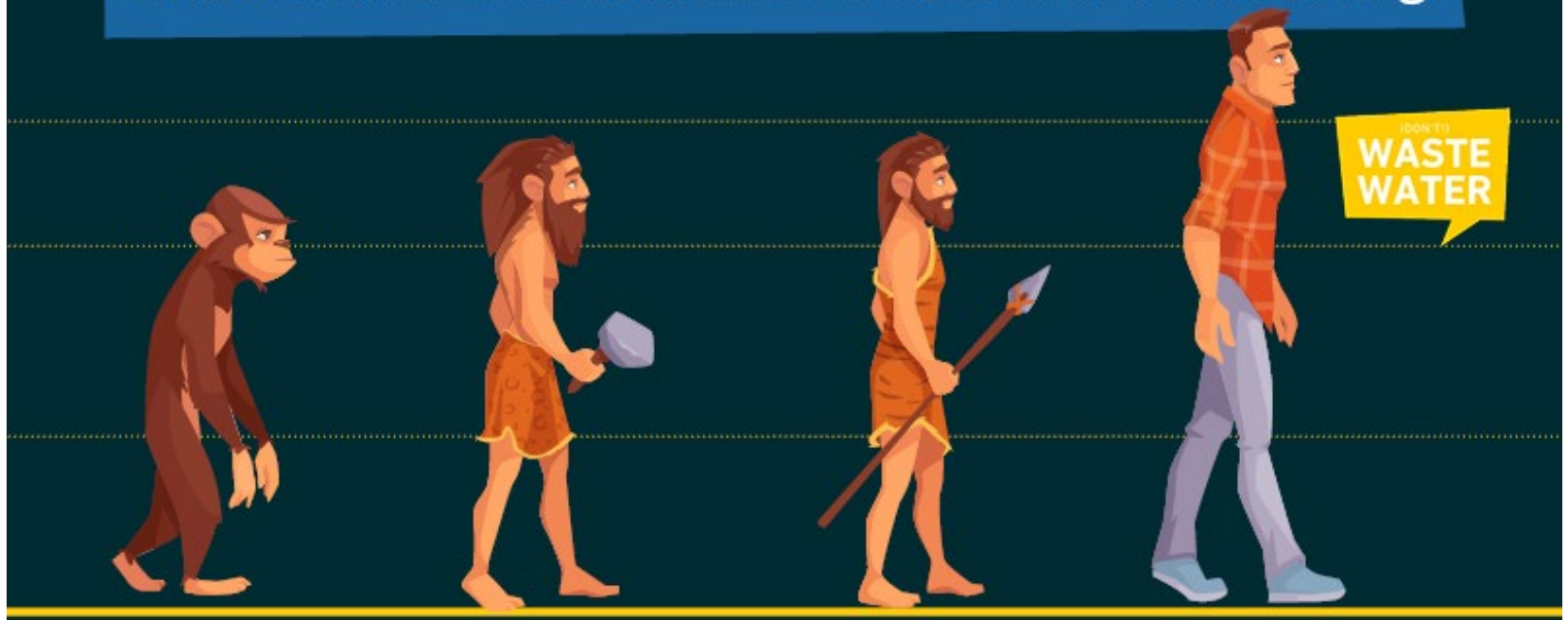


Total investment in Israeli technology (US$ millions, 2020)

Source: Innovation Authority adaptation of SNC data

WaterEdge.IL

The human evolution of wastewater handling



Homo pollutius

Dispose 100%, treat and recycle nothing.

Homo ecologicus

Treat 100%, recycle nothing.

Homo reuseis

Treat 100%, recycle 80-90% as water, reuse some energy as biogas, safely dispose or decompose the rest.

Homo circularis (aka Sapiens)

Reduce at source, treat 100%, recycle everything as water, energy, biosolids & nutrients. Dispose nothing

Join the evolution:

dww.show

Concept: Ravid Levy

Welcome to the way we see the Israeli water world

WaterEdge.IL

Israel Water Innovation Community

Thank you

Toda Raba

KINNERET

Kinneret Academic College

State of Israel

WATER AUTHORITY

Ministry of Economy

Soulful Economy

רשות החדשנות

Israel Innovation Authority

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission Embassy of Israel Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Speaker

Mr Miki Zaide
Director of The Planning Divison at IWA Israeli Water Authority

Israeli / Singapore Presenters:

BIOKUBEN

WFI

SG ENVIRO

Watergen

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission Embassy of Israel Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Speaker

Mr Christian Vinson / Mr Sebastian Giebel
Director of Biokude Aisa Pacific Pte Ltd

Israeli / Singapore Presenters:

BIOKUBE

WFI

SG ENVIRO

Watergen

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission Embassy of Israel Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Speaker

Mr Chen Ofer
Sales Director of WFI Group

Israeli / Singapore Presenters:

BIOKUBEN

WFI

SG ENVIRO

Watergen

Water From Innovation

CLEAR WATER VALUE

2022 PRESENTATION

Technology Awards & Recognition

TAYA technology awarded for innovative sustainable & cost-efficient manure processing

2019, Belgium

With TAYA technology the energy & cost were reduced by 70%

Italy

“TAYA technology recognized as an excellent alternative for minimal impact and reduced OPEX”

2018, Italy

Acceptance of the TAYA Technology as an Alternative Technology for Use in Domestic Wastewater Treatment Works in Colorado

OUR NUMBERS

3000M³/HR
INSTALLED CAPACITY

90-98%
RECOVERY RATE

15-80%
ENERGY SAVINGS

25-40%
CAPEX SAVINGS

50-80%
OPEX SAVINGS

4 Business Units, One Vision

TOXSORB

RENEW WATER VALUE

Converting polluted water into valuable assets, delivering high-quality water for drinking & industrial purposes

TRIPLET

SIMPLIFY WATER REUSE

Making biological wastewater treatment simple and valuable for municipal & agricultural use, enabling affordable clean water

ROTEC

CHALLENGE THE FLOW

Delivering high recovery retrofit & turnkey optimized RO desalination plants – robust, cost-effective & risk-free

AST

OUTPERFORM WATER

Holistic engineering, tech integration & project mgmt. services, delivering clear water value

TRIPLET
by WFI Group

SIMPLIFY WASTEWATER REUSE

TRIPLET
by WFI Group

TAYA ECO

A fit and forget solution for municipal wastewater or effluent polish upgrade that reduces key parameters by 90%, generating high-quality effluent, with the lowest operational costs and near-zero sludge. Gravel Cleaning is needed only once in 8-10 years!

TAYA ECO GO

A unique, prefabricated wastewater treatment solution based on TAYA ECO that takes just 2 weeks to set up. It reduces eco-footprint and delivers huge savings for small and decentralized communities.

TAYA GROW

A breakthrough solution that treats nitrogen and ammonia in manure, reducing the required footprint for manure spreading. Thus, farmers are able to save time, hassle and costs.

MBR 3T

The containerized MBR 3T All-in-One biological wastewater treatment system is tailored to task, producing exactly the right effluent capacity for every application with superior quality.

60-80%
OPEX
SAVINGS

CAPEX
SAVINGS

80%
ENERGY
SAVINGS

TRIPLET
by WFI Group

TAYA TECHNOLOGY

TRIPLET
by WFI Group

TAYA ECO

FOR MUNICIPAL WASTEWATER

TAYA ECO IN NUMBERS

TRIPLET by WFI Group

TAYA vs. MBR Operational Expenses (OPEX)

Daily Flow (m^3/day)	TAYA Cost ($/$m^3$)	MBR Cost ($/$m^3$)
1,000	0.03	0.21

TAYA vs. Activated Sludge Operational Expenses (OPEX)

Daily Flow (m^3/day)	TAYA ($/$m^3$)	Activated Sludge ($/m3)
1,300	0.04	0.15

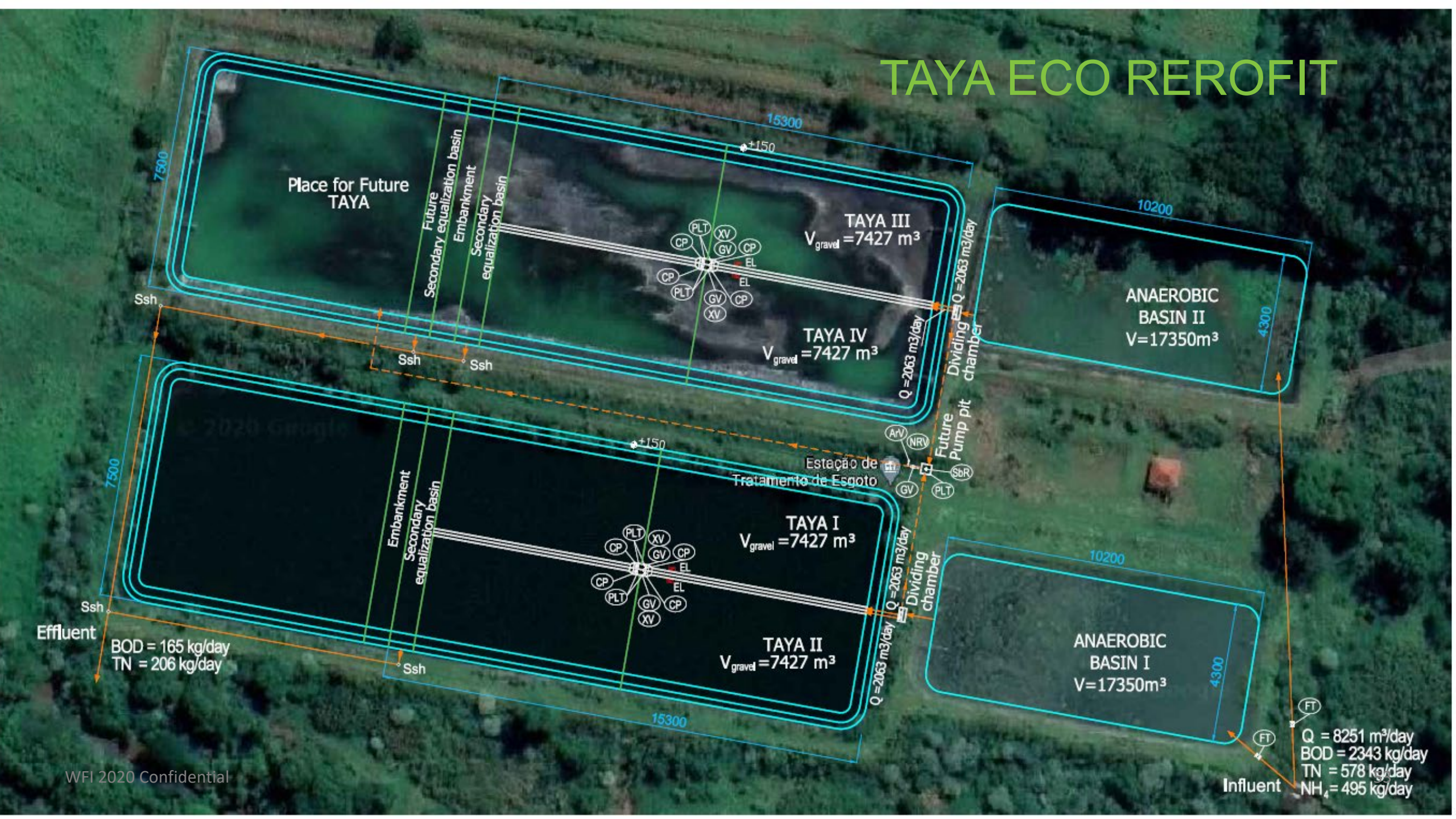
TAYA ECO SOLUTION

KEY FEATURES

- Full TAYA system design
- Plug & Play “Brain in a Box”
- Hydraulic canal

POSITIVE ENERGY CONSUMPTION CONCEPT WITH SOLAR PANELS

TRIPLET by WFI Group


TAYA ECO REROFIT
Place for Future TAYA
Future Secondary equalization basin
Embankment
Secondary equalization basin
15300
+150
7500
TAYA III
V_{gravel} =7427 m³
TAYA IV
V_{gravel} =7427 m³
TAYA I
V_{gravel} =7427 m³
TAYA II
V_{gravel} =7427 m³
PLT
XV
GV
CP
EL
Ssh
Q =2063 m3/day
Dividing chamber
10200
ANAEROBIC BASIN II
V=17350m³
ANAEROBIC BASIN I
V=17350m³
4300
ArV
NRV
SbR
Future Pump pit
Estação de Tratamento de Esgoto
Effluent
BOD = 165 kg/day
TN = 206 kg/day
Influent
FT
Q = 8251 m³/day
BOD = 2343 kg/day
TN = 578 kg/day
NH_4 = 495 kg/day
WFI 2020 Confidential

SECURE THE FUTURE OF SMALL COMMUNITIES VIA SMART WATER REUSE

TRIPLET by WFI Group

Municipal WWT

Bennett, Colorado, USA

Commissioned 2019

30 m^3/day / 7,200 gpd

WATER REUSE AUTONOMY – MAXIMUM SAVINGS, MINIMUM RESOURCES

TRIPLET by WFI Group

Municipal & Industrial WWT

Menashe, Israel

Commissioned 2013, 2020

3,500 m^3/day / 640 gpm

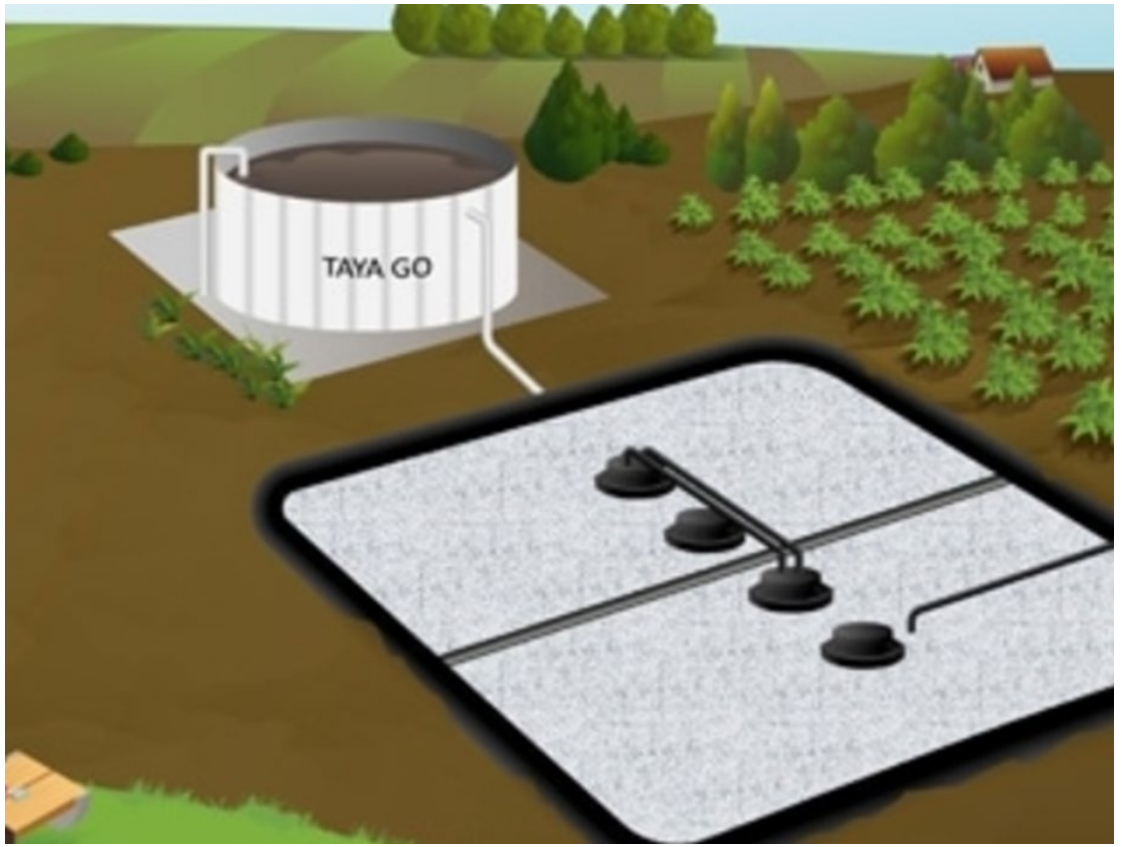
TRIPLET
by WFI Group

TAYA ECO GO

FOR MUNICIPAL WASTEWATER

TAYA ECO GO SOLUTION

- 50 m^3/day & 100 m^3/day configurations
- Prefabricated package – Minimal work on site
- Fast installation – up to 2 weeks



TAYA ECO GO SOLUTION

- Simplifying operation
- Near Zero Sludge - gravel cleaning once in 10 years
- Minimal labor – just a few hours a week

TRIPLET
by WFI Group

MBR 3T

MBR 3T SOLUTION

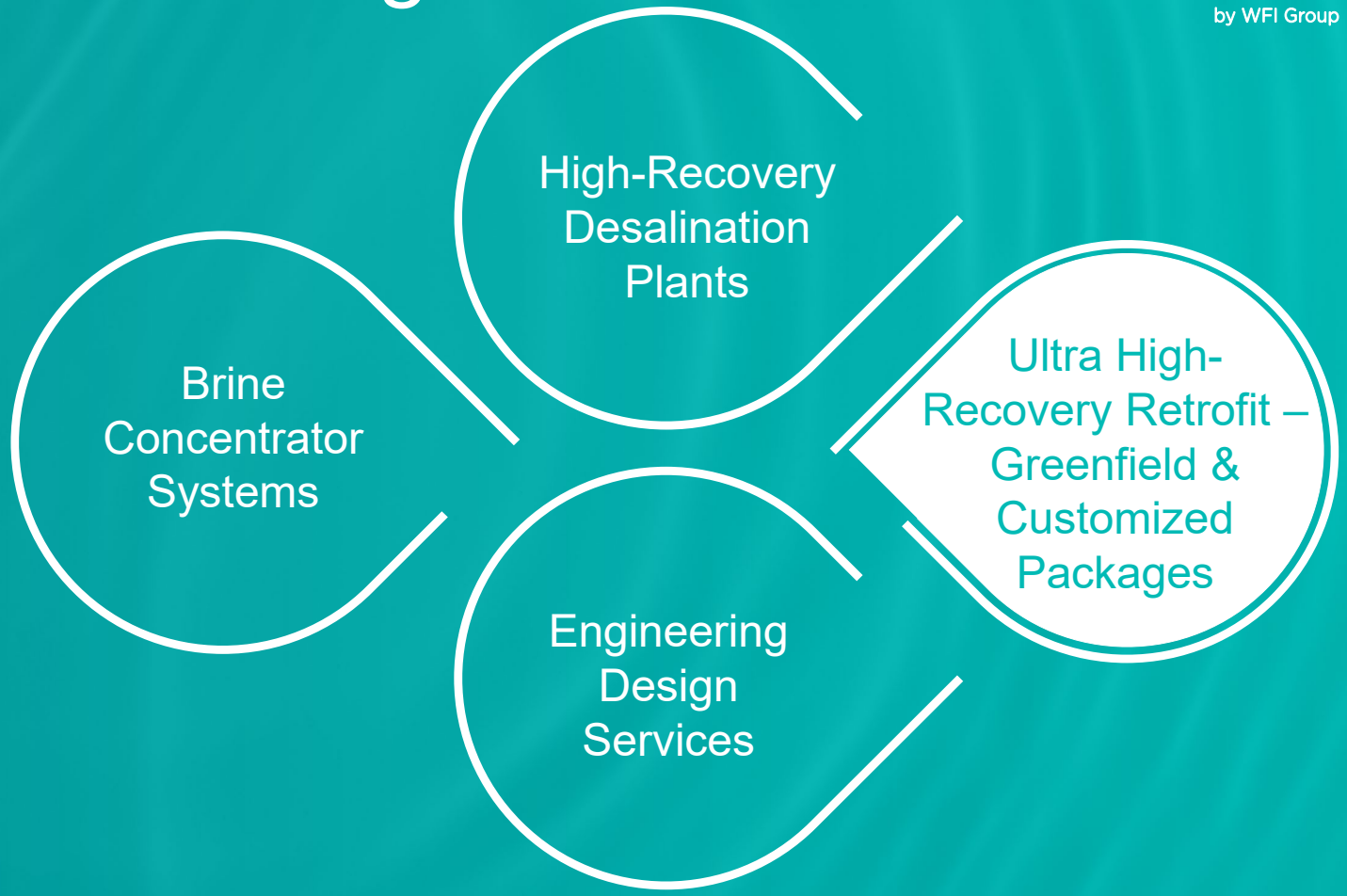
- Containerized 40” Tailored-to-Task - 200 m^3/day
- Compact design
- Modularity and versatility
- Superior effluent quality
- Ease of operation and maintenance

ROTEC
by WFI Group

CHALLENGE THE FLOW

Unmatched Sustainable Offering

- Modular & turnkey solutions
- Retrofit & new desalination plants

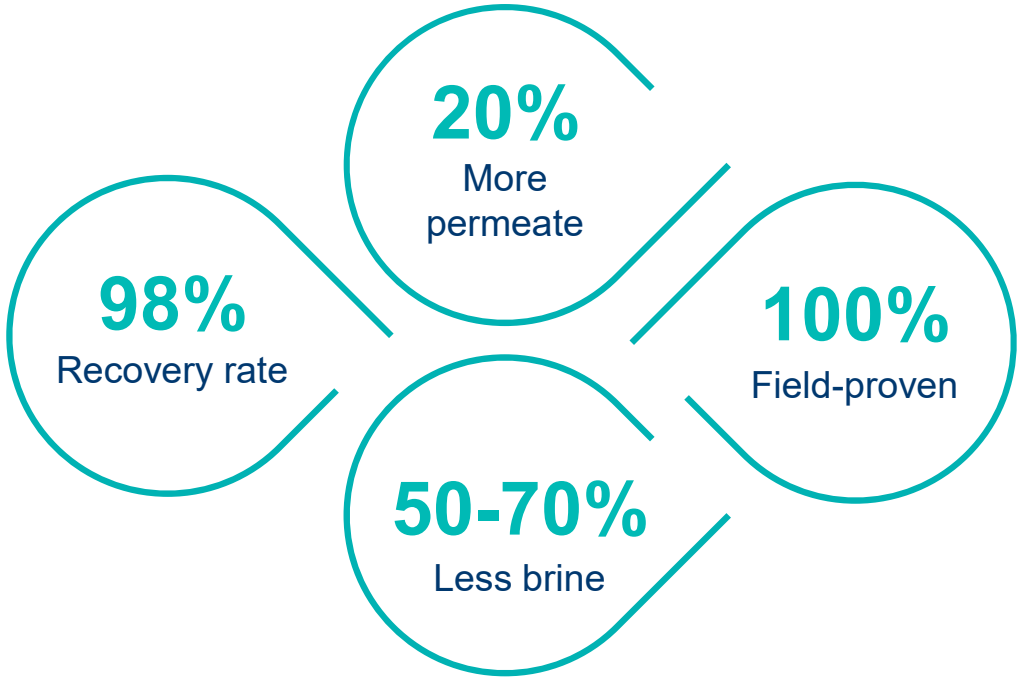


SELECTED CUSTOMERS

ROTEC by WFI Group

AdEdge water technologies
Vitens
Seventh Framework Programme
InNOW Technology for A Better World
JACOBS
tialoc
ch2m.
PRODALYSA LTDA.
Sinopec
ATLANTIC COPPER
Henkel
PUB SINGAPORE'S NATIONAL WATER AGENCY
Coca-Cola
KURITA
VITAL S.A.
燕京啤酒 YANJING BEER
MEKOROT ISRAEL NATIONAL WATER CO.
AK-CHIN INDIAN COMMUNITY ARIZONA
PEPSICO
AQUAVANT TECNOLOGIAS AVANZADAS
金马能源 JINMA ENERGY
SUEZ
GALENE
Strauss
ADS ADVANTAGEOUS SYSTEMS
Century Water Systems & Technologies Pte Ltd

Flow Reversal (FR) Technology



- Outperforms conventional RO
- Minimizes scaling & biofouling in situ
- Delivers more high quality permeate
- Produces less waste
- Achieves any recovery target
- Retrofit & new desalination plants

How Does FR-RO Work?

1

Reversing the flow in the PV

2

Block rotation

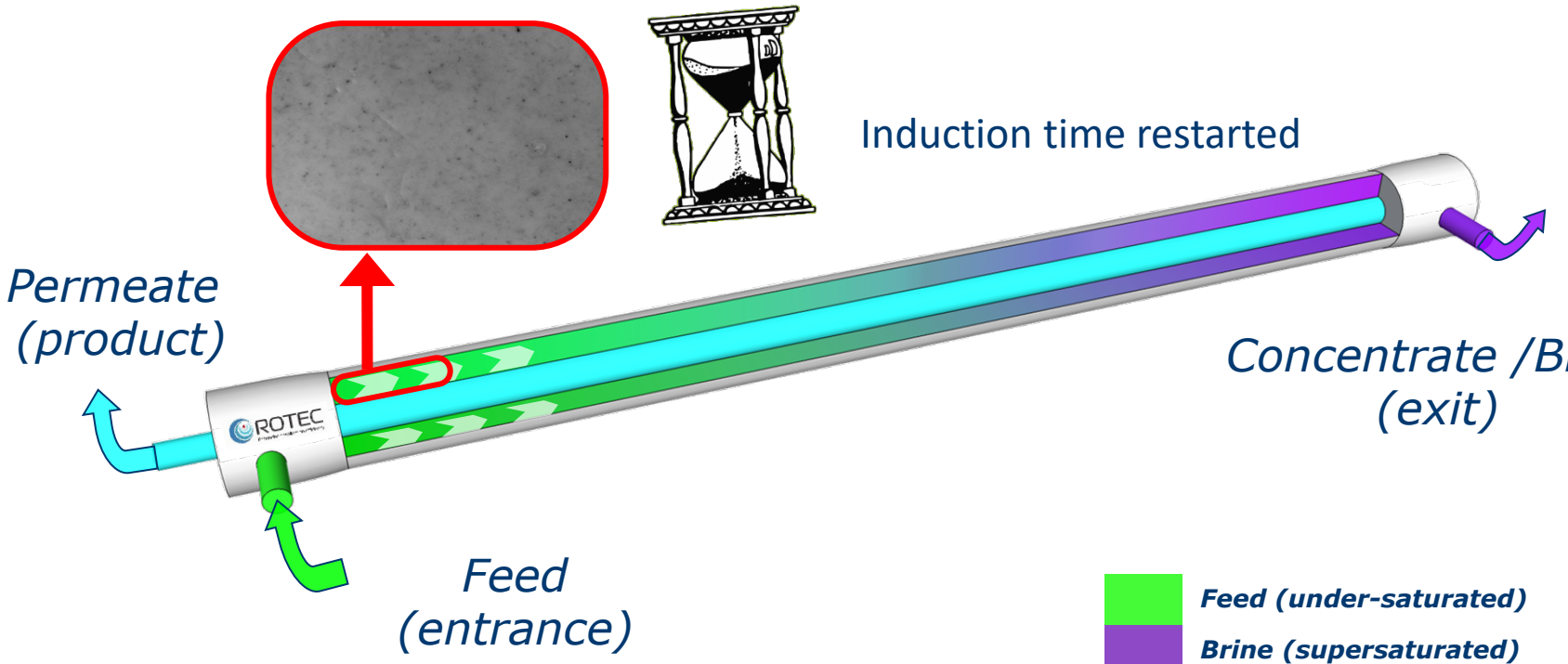
3

Continuous process

ROTEC Technology - Flow Reversal

ROTEC Flow Reversal RO– operation above permitted recovery rate

Membrane status: ***Clean***



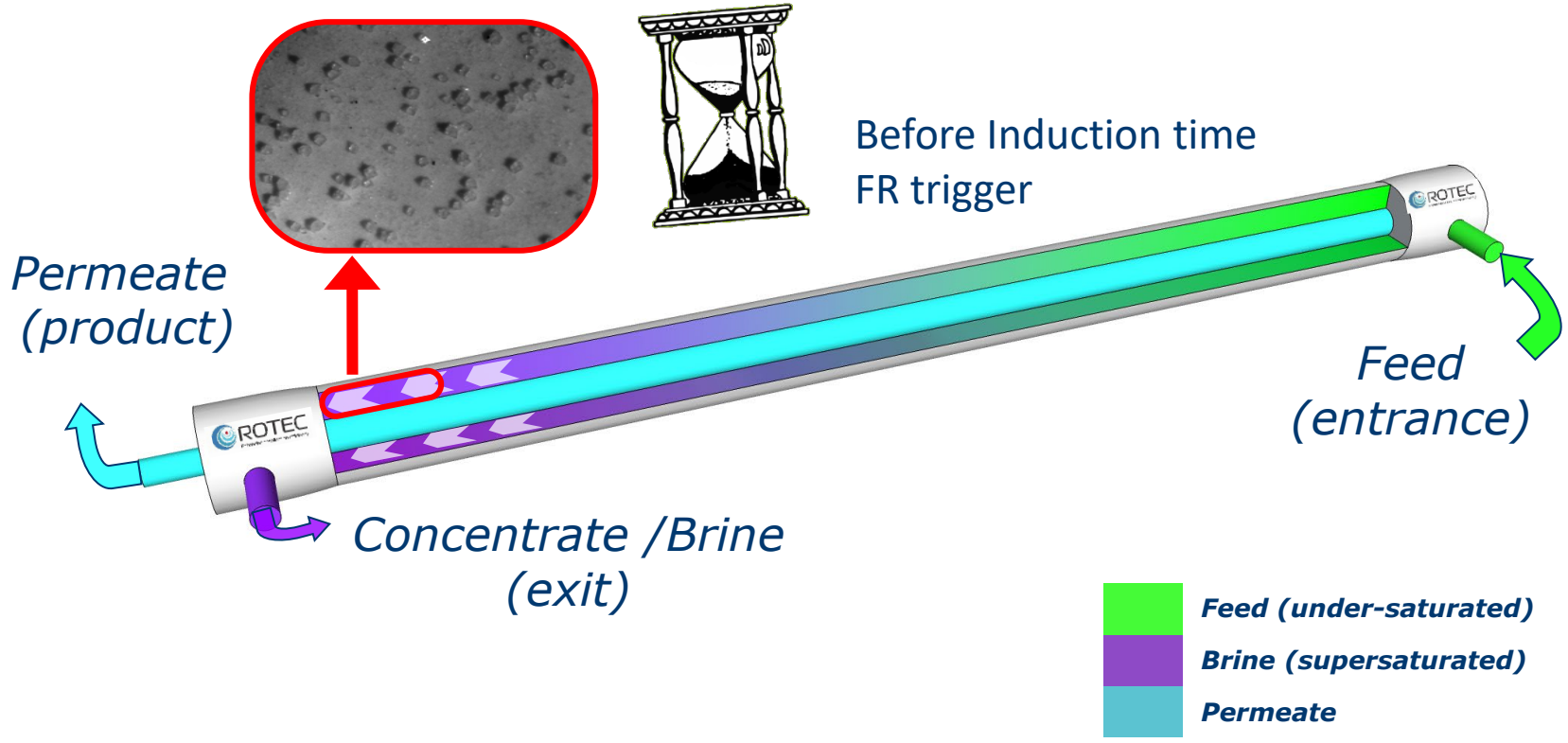
After Flow Reversal:

- Salts “load” is shifting
- Different water chemistry and hydraulics conditions

ROTEC Technology - Flow Reversal

ROTEC Flow Reversal RO– operation above permitted recovery rate

*Membrane status: Last membrane **slightly clogged***



KNF Retrofit

Before (75% RR) Original design

After (90% RR) Retrofitted unit

KNF Retrofit Project

- **Location:** Singapore, Kranji NEWater facility
- **Client:** Public Utilities Board (**PUB)**
- **Water source and quality:** Tertiary effluent, quality TDS 200-400 (high Ca and PO_4 content)
- **Plant total feed capacity :** ~110,000 m^3/day (~10,920 m^3/hr),
- **FR-RO Technology:** retrofit of existing RO unit
- **Retrofitted RO unit feed capacity:** ~10,920 m^3/day, (445 m^3/hr)

Goals:

Increasing existing plant RR from current **75%** to 85%-**90%**

Maintaining the similar CIP frequency

GO AGAINST THE FLOW
20% INCREASE IN WATER RECOVERY

Turnkey high-recovery BWRO desalination

Huiquan, Fujian, Chin

Commissioned – 2016

1,600 m^3/day

ULTRA HIGH RECOVERY FOR SAVINGS & GROWTH

Turnkey high-recovery BWRO desalination

Suez Water (for Copper Manufacturer), Spain

Commissioned – 2018

170 m^3/day

85% HIGH RECOVERY FOR ENHANCED PERFORMANCE & WATER SAVINGS

ROTEC by WFI Group

Wastewater RO desalination
Vital Jugos, Coca Cola, Chile

Commissioned – 2015
2160 m^3/day

LET’S CREATE MORE

VALUABLE WATER!

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission
Embassy of Israel
Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Speaker

Dr Wendy Tu
Senior Process & BD Manger of
SG Enviro Pte Ltd

Israeli / Singapore Presenters:

BIOKUBEN

WFI

SG ENVIRO

Watergen

Non-thermal Plasma: a promising green technology for environmental remediation

By: Dr. Wendy Tu

Date: 09/11/22

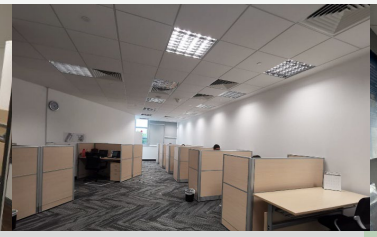
SG Enviro Pte Ltd
(CO REG NO: 201831895H)
84 Toh Guan Road East #04-06/07
Singapore 608501
TEL: +65 6908 6783 FAX: + 65 6368 0948
www.sg-enviro.com

Content

About Us

- Incorporate in Oct 2018
- Proprietary Non-Thermal Plasma & Nano-bubble technology
- Focused on Industrial Wastewater & Sustainable Environment Business
- ISO 9001 certified, Bizsafe Level 3, BCA-CW02
- Comprehensive team including advanced laboratory, design & build, fabrication, operation and maintenance.

Engineering Office & Laboratory at SgWX



Workshop & Fabrication Yard at Kranji

Our Capabilities

1. Solving difficult to treat water problems

- In-house NTP & NB technology
- In-house advanced laboratory
- Partnership with innovation technology providers, research centres and design institutes.

2. Design and Build

- Experienced engineering design team
- Full-functional project management team
- Comprehensive site management team.

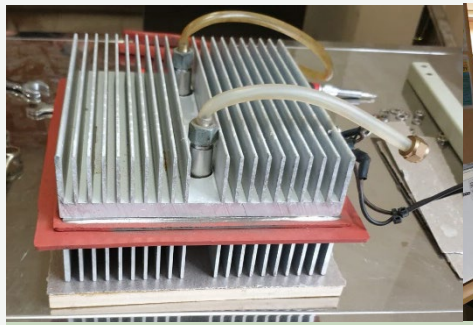
3. Operation and maintenance

- Full-fleet O&M team to take care the plant from preventive maintenance to day-to-day operation.

4. Chemical and material supply

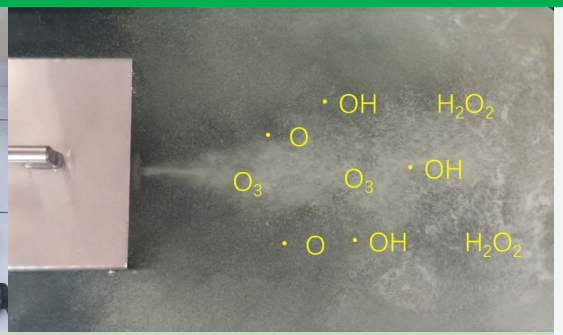
- Chemicals
- Consumables
- Spare parts
- One-stop solution.

Non-Thermal Plasma and Nano-Bubble Nozzles

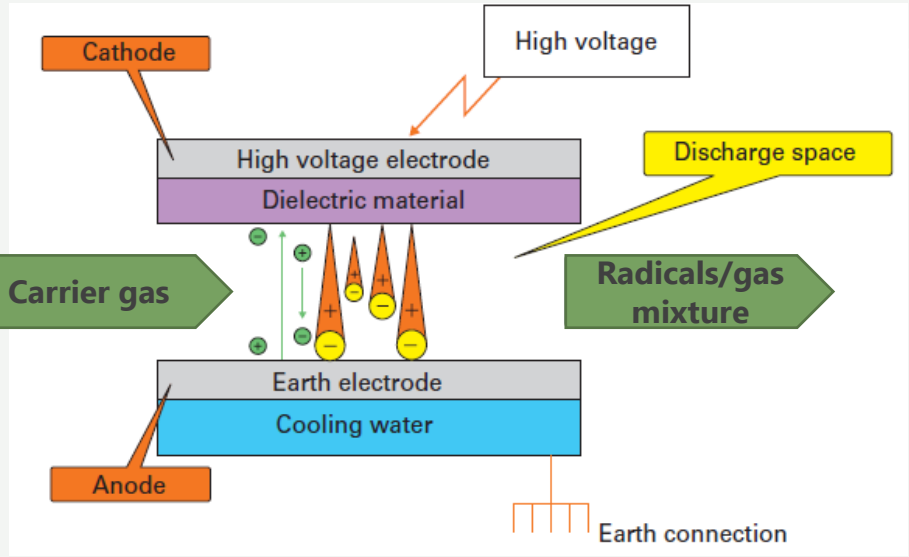


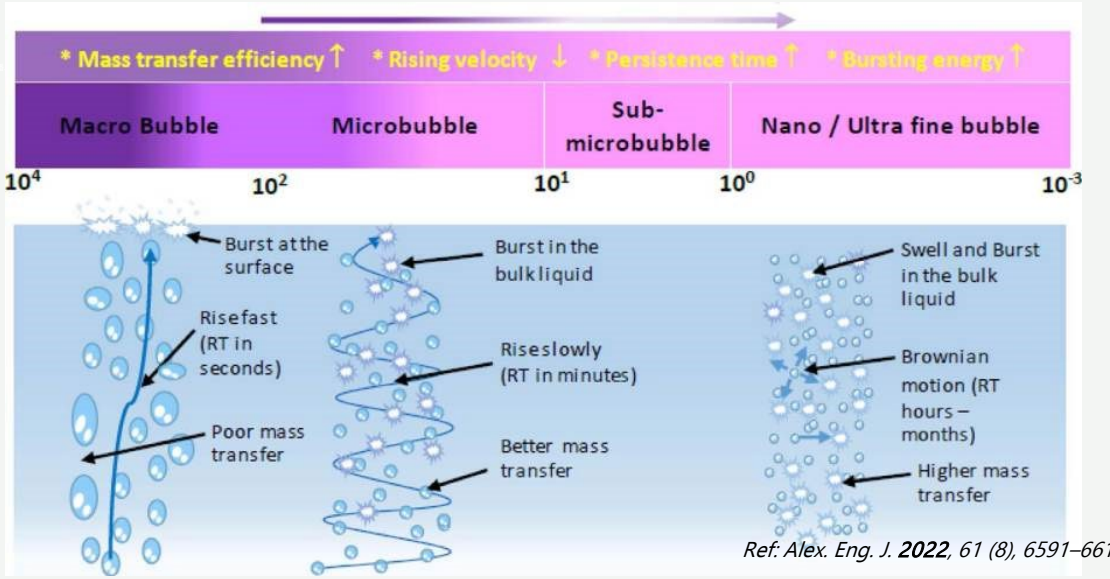
Plasma Chamber

Modular Plasma Generator



Nano Bubble Nozzles





*Ref: Alex. Eng. J. **2022**, 61 (8), 6591–6612*

Effective generation of highly reactive species in gas ✚ High gas dissolution in nano-size bubble

〓 highly effective advanced oxidation process

Advantages of NTP water treatment

	Conventional WWTP		Non-Thermal Plasma
	Biological	Chemical	
Foot Print (area)	Big	Big	30% smaller than conventional
Treatment time	Long	Moderate	Continuous treatment could be up to 50% faster than conventional
Residual sludge	A lot	A lot	Conventional can generate up to 30-50% sludge, while NTP generate 0-5% sludge
Cost of Operation	Moderate	High	30-50% cheaper than conventional, more if there is sludge to be incinerated
Recycling of treated water	N.A	N.A	Yes

Versatile Applications

Organic & Inorganic Destruction (IDEAL!)	Chemical Destruction	Color Destruction	Disinfectant
○ Groundwater Remediation ○ Industrial Process Water ○ Industrial Wastewater ○ Mining Industrial ○ Oil & Gas Industrial ○ Plating Industrial ○ Hospital Wastewater	○ Municipal Wastewater ○ Municipal Drinking Water ○ Groundwater Remediation ○ Industrial Process Water Industrial ○ Industrial Wastewater	○ Dyeing Industries ○ Textile wastewater ○ Soap & Detergent wastewater ○ Pulp & Paper industrial	○ Municipal Wastewater ○ Municipal Drinking Water ○ Industrial Process Water ○ Industrial Wastewater ○ Hospital Wastewater ○ Consumer Drinking Water ○ Seawater Treatment

Also can be used for:

- Sterilisation and Aquafarming
- Odour Removal and River Decontamination
- Air Quality Improvement

Case Study #1: Trio Packing

Application	Carton Box Printing Wastewater
Industry	Printing industry
Process	Neutralization - Sedimentation – Plasma+nano-bubble - ACF
Capacity	1.5m3/5hr batch
Results	• COD reduced from > 60,000ppm to < 600ppm with less than 4amps electricity consumption. • Fully automatic plant

Raw wastewater

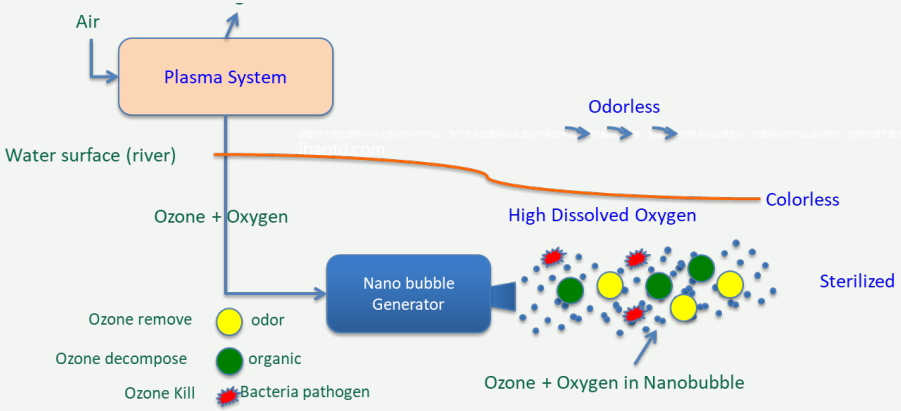
After sedimentation

After Plasma oxidation

After ACF, to discharge

Case Study #2: Black Smelly Water Treatment

Application	River pollution control
Industry	Municipality
Process	Plasma + nano-bubble
Capacity	4 sets of nano-bubbles to clear 800m black river
Results	• DO increase from < 0.5ppm to 3-5ppm • H2S decreased from > 2ppm to < 0.5ppm



Conventional surface aeration method

V.S.

Our Plasma + Nanobubble technology

TheJakartaPost

Ministry installs nano bubble equipment for Sentiong River

The Jakarta Post

Jakarta / Mon, August 13, 2018 / 07:49 am

Home / Indonesia / The LHK Ministry installed 4 "Nano Bubble" in the Sentiong River

The LHK Ministry installed 4 "Nano Bubble" in the Sentiong River

August 11, 2018 Indonesia 21 Views

JAKARTA, KOMPAS.com – Directorate-General of Pollution and Damage Control Ministry of Environment and Forestry (Ministry of LHK) installs a nano-bubble in Kali Sentiong or Kali Item, Kemayoran, Central Jakarta, Saturday (08.11 .2018)

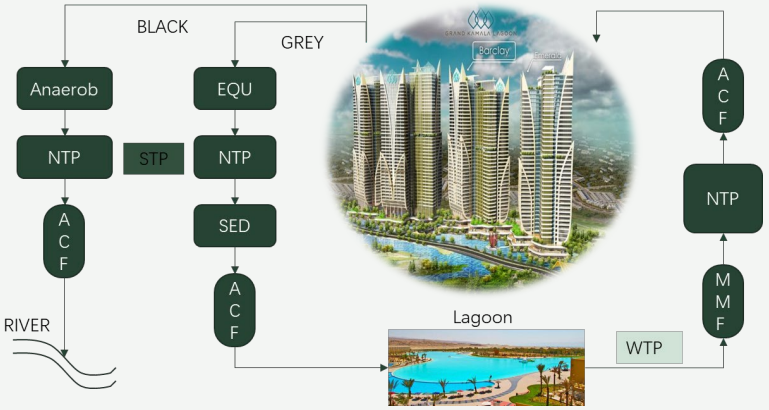
Case Study #3: Treatment of POME

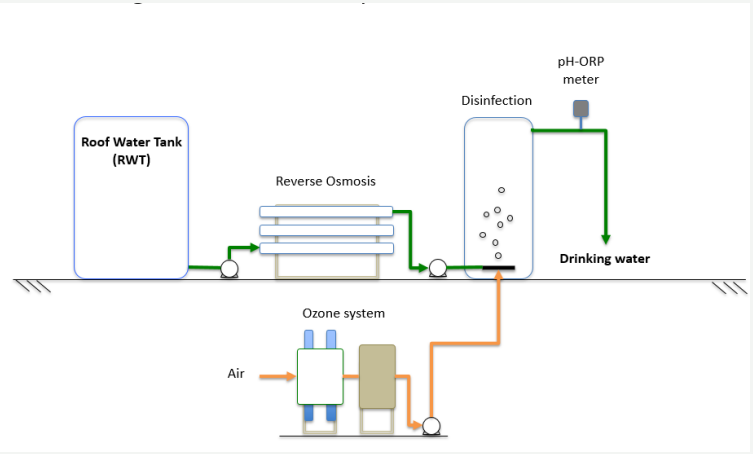
Application	Palm Oil Milling Effluent
Industry	Processing industry
Process	Neutralization – Plasma+nano-bubble + Sedimentation – Plasma+nano-bubble - ACF
Capacity	500 m3/d

Results	• Effluent BOD < 100, COD<350
	• 2-stage plasma design,
	  ○ first plasma to enhance sedimentation, saving coagulation & flocculation chemicals.
	  ○ Second plasma to further reduce COD.
	• Plasma + nano-bubble replaced huge aerobic ponding system, much smaller footprint and less operational problems.

Case Study #4: domestic water and wastewater treatment

Application	Domestic water treatment, sewage treatment and grey water recycling
Industry	Municipal, Grand Kamala Lagoon @ Bekasi, Indonesia
Capacity	980 m3/d
Highlights	• Contaminated lagoon water was used as the source water for the domestic water source, high TSS, COD and bacteria was detected, Plasma with ozonation provide oxidation and disinfection. • Drinking water future treated with BWRO & plasma ozone disnfection • Grey water treated with Plasma+nano-bubble – Sedimentation – ACF • Black water treated with anaerobic (septic tank) - Plasma+nano-bubble – ACF





Thank You.

SG Enviro Pte Ltd

(CO REG NO: 201831895H)

Office & Laboratory: 84 Toh Guan Road East #04-06/07 , Singapore 608501

Workshop & Fabrication: 51 Kranji Crescent, #02-00, Singapore 728661

Email: enquiry@sg-enviro.com

TEL: +65 6908 6783 FAX: + 65 6368 0948

Website: www.sg-enviro.com

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission
Embassy of Israel
Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Speaker

Mr Micky Shoham
Regional Sales Manager of WaterGen

Israeli / Singapore Presenters:

BIOKUBEN

WFI

SG ENVIRO

Watergen


Watergen
Creating
a New Source
of Drinking Water

Global problem

2 Billion

People

drink water contaminated with feces, risking cholera, dysentery, typhoid, and polio

80%

of Diseases

are caused by poor water sanitation

1.7 Million

Children

under the age of five die every year of illness due to shortage of clean drinking water

50%

of World Population

will be living in water-stressed areas by 2025

1 Million

Plastic Bottles

are thrown away every minute
91% are not recycled

The plastic bottle disaster

Every minute **1 million** Plastic bottles are thrown away.

91% are not recycled

Watergen

While others are restraining demand by…

The 4R model:

Reduce

Reuse

Recycle

Reclaim

An Israeli tech company;
Established 2009

Advanced **Water Lab**

Most advance research

12 PhD’s

3 Academic Research Centers

World’s most energy-efficient atmospheric water generator

In House **R&D**

42 Granted Patents

27 Pending Patents

3 R&D Divisions

Presence in more than 80 countries around the world

Energy **Efficient**

Radiative Cooling

Liquid Desiccants

Solid Desiccants

Global Recognition & Awards

Global Recognition

World economic forum
Technology pioneer

One of Israel's most influential inventions

One of the world's 50 most innovative companies

Smart home division
Mark of excellence

Innovation Awards

TIME Magazine
The Best Innovation in 2019

CES 2019 Innovation Awards

CES 2020 Innovation Awards

CES 2020 Innovation Awards

Research Centers

Watergen

International Media Coverage

and many more...

International Recognition

Presenting Watergen to Bill Ford
Executive Chairman, Ford Motor Co.

With Ban Ki-moon, former Secretary-General of the UN at TAU, Israel

How it works

Step 1

Air filtration

Step 2

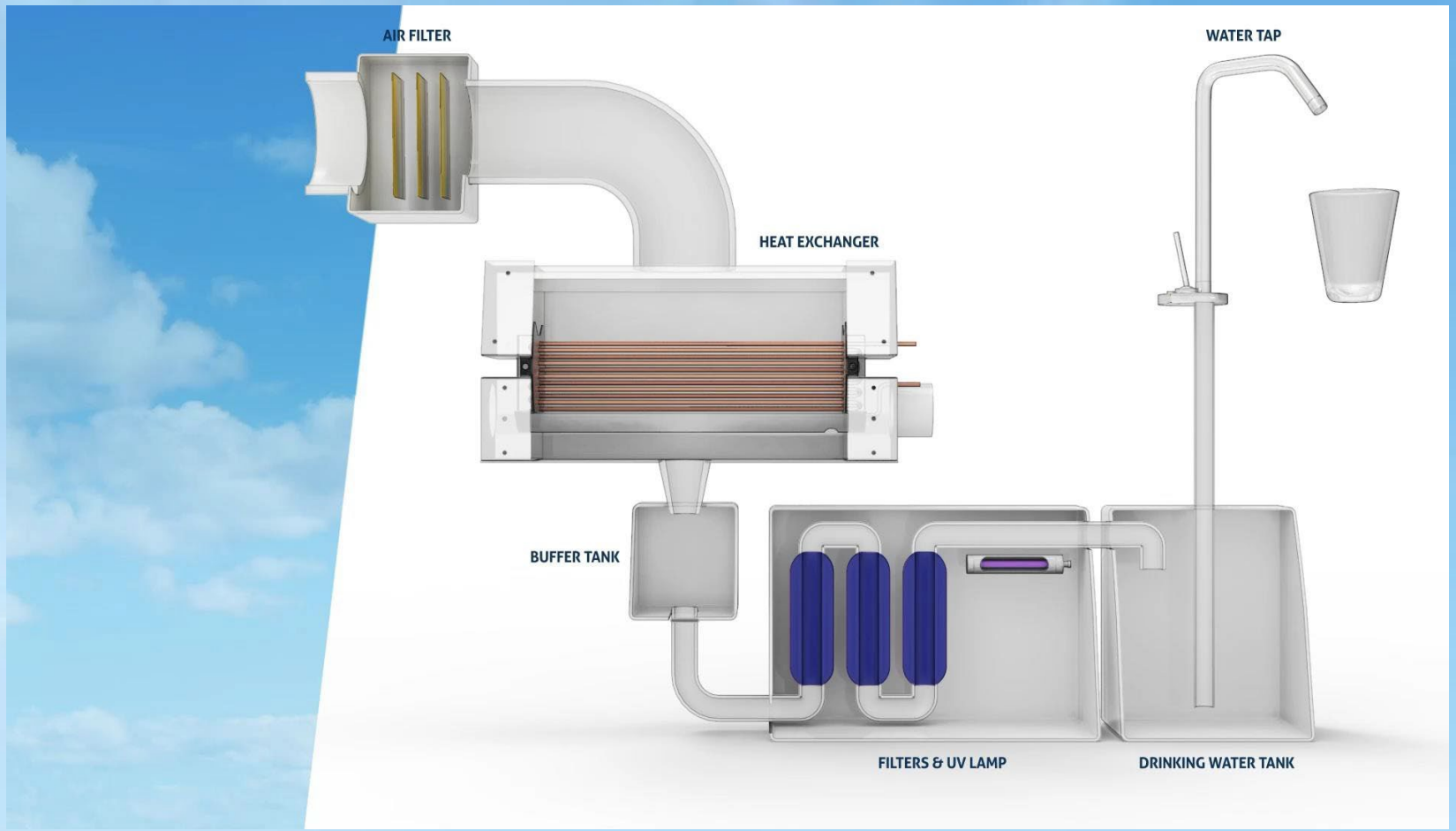
Genius heat exchange process

Step 3

Purification, mineralization, UV

Step 4

Water circulation at 5°C



Watergen

International Certificates

to secure drinking water safety NSF 55/53/61

NSF

CDC

CE FC PS E JET IECEE CB SCHEME IAPMO EGS C US AWQC 厚生労働省 Ministry of Health, Labour and Welfare eti Conformity Services CCC WaterMark JIS מתי

Watergen

Watergen’s patented heat exchanger technology

Energy efficient & cost effective: up to 5L per 1kWh

Producing from RH20%/15°C

Products from 25 up to 6,000 liters per day

Truly GENius

Patented heat-exchange technology in all our products

Sustainable

Food grade polymers

Certified quality

Watergen

Watergen's Products

Watergen GEN-L

6,000 liters / 1,321 gallons
(per day)

Perfect for villages, Off-grid settlements and factories. Units can be integrated into AWS farms.

Watergen GEN-M PRO

900 liters / 238 gallons
(per day)

Large scale water from air generator for commercial, residential and industrial applications, such as schools, train & bus stations, sports arenas, construction sites, mines and hospitals.

Watergen GENNY

30 liters / 7 gallons
(per day)

Fresh, cool water on tap. No plumbing, refills or infrastructure required – simply plug in GENNY in your home or office and start drinking.

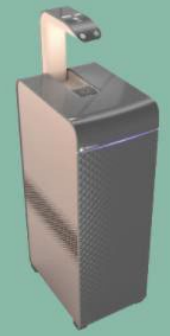
Coming soon

Watergen M1

220 liters / 58 gallons
(per day)

Medium scale transportable water from air generator for residential buildings, private homes, first response teams, rural small villages, construction sites, temporary hospitals and army bases.

Genny Home



18 liters / 4.8 gallons
(per day)

Premium quality hot and cold drinking water from air at your home. Complete independence from municipal grid Plug & Drink.

Mobile box

24 liters / 6.3 gallons
(per day)

For family outings in nature
Small scale water from air generator for camping sites, RVs and travel.

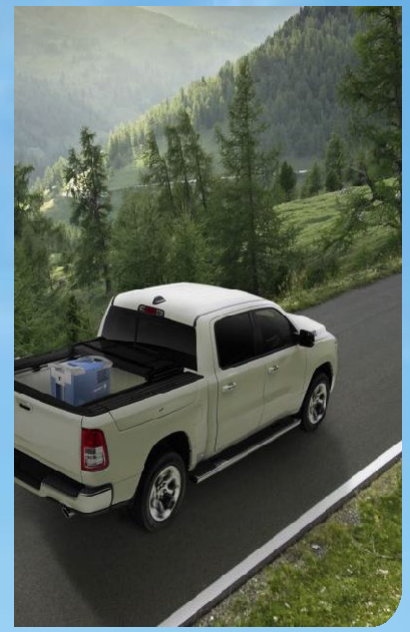
Watergen

Mobility Solutions

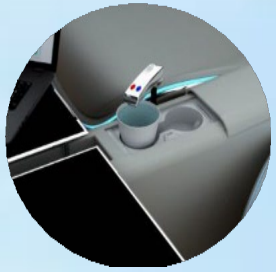
ON BOARD

TECHNICAL WATER

AFTER MARKET



MOBILE BOX



Up to 20 liters/day

Up to 20 liters/day

Up to 50 liters/day

Up to 25 liters/day

Watergen

https://outdoorx4.com/news-and-events/ford-utilizes-watergens-innovative-technology-for-its-recreational-vehicles/

Transportation

Integrated atmospheric water generator in the automotive industry

Providing the driver and passengers with cool and fresh water on-the-go.

Trucks

Public transportation

Trains

Ships & Yachts


Watergen
ON-Board
Mobile Box
Camping Area
INside
GEN-L
Industrial Area
INside
GEN-M1
Public Transportation Area
ON-Board
Public Space Area
Offices & Residential Area
GENNY
GEN-M Pro
Hotels & Resorts Area
ON-Board

Improve your contribution to the UN SDG & ESG

Watergen impacts 14 out of 17 SD Goals

ENVIRONMENTAL

SOCIAL

GOVERNANCE

Watergen

Watergen

Case Studies

Watergen’s main market segments

Humanitarian

Commercial

Mobility

Watergen’s main market segments

Humanitarian

Commercial

Mobility

South Africa, July 2020

FORD FOUNDATION

The project received a Silver ‘Stars of Africa’ Award from the American Chamber of Commerce and was selected as a recipient under Health and Wellness category.

79
schools

4
clinics

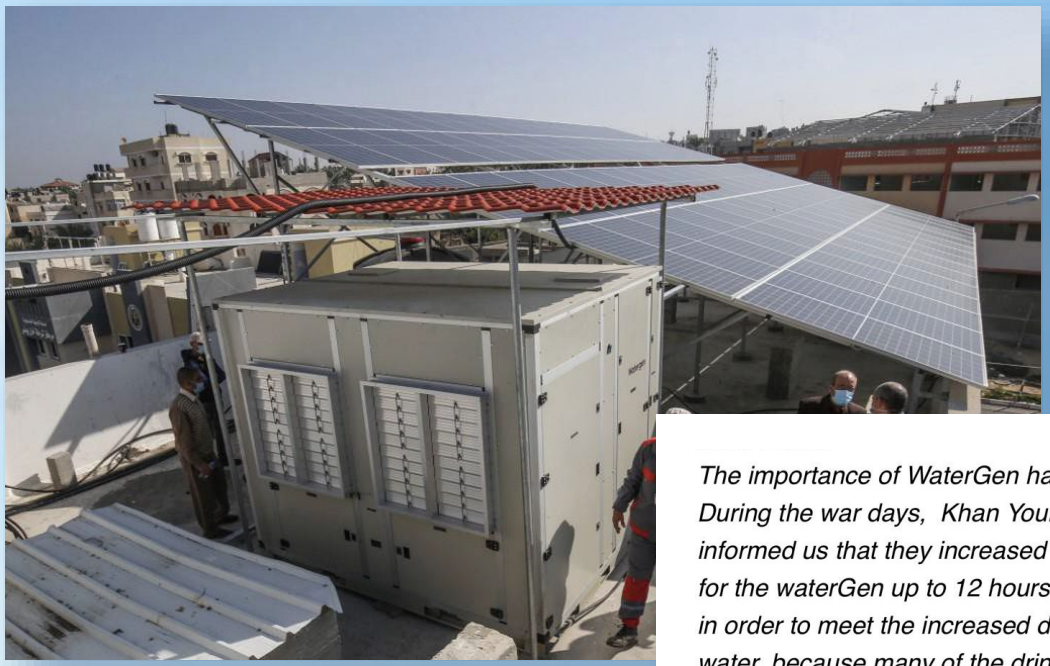
50
Childhood development centers

3400
households

Watergen

Gaza strip, January 2020

Dozens of Watergen devices have been deployed in hospitals and municipality in Gaza.



The importance of WaterGen has been brighten up During the war days, Khan Younis Municipality staff informed us that they increased the operating hours for the waterGen up to 12 hours during the war days in order to meet the increased demand of the drinking water, because many of the drinking water distributing companies were not able to reach to many areas in the city due to the damages on the roads and the danger of hit by stray shells. in those days many people were taking drinking water from the WaterGen L in the Municipality. I think the consuming of the water will continue with the same rate, because many people knew about the availability of such drinking water source during the war, and most probably they will continue to take their need of water from the same source.

https://www.france24.com/en/middle-east/20210105-water-from-air-israeli-firm-helps-bring-drinking-water-to-gaza

https://www.youtube.com/watch?v=dtIsbLo1o3I&t=1s

Watergen

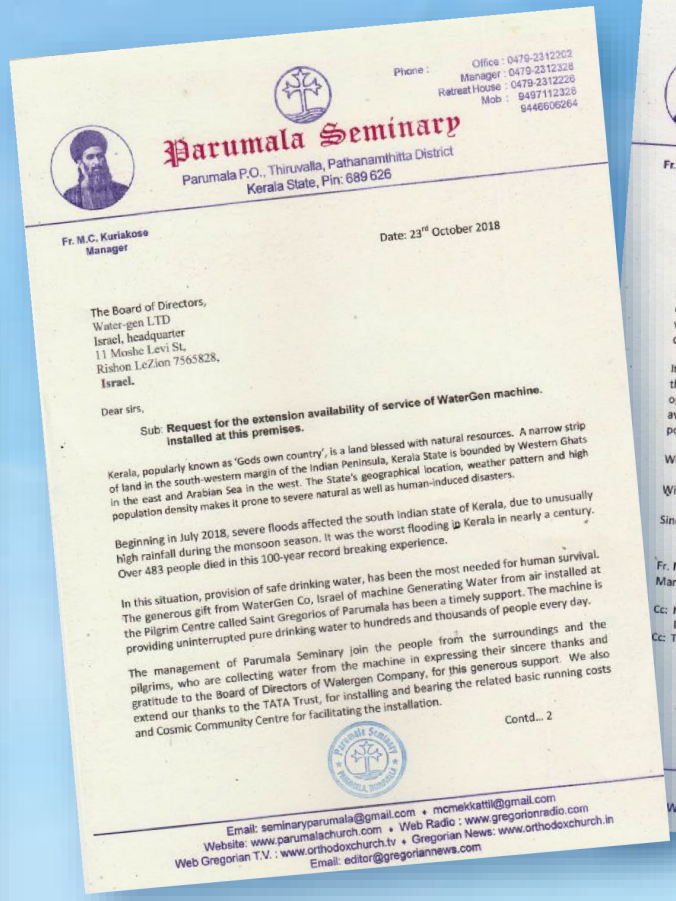
Cambodia, October 2020

Watergen provided fresh and healthy drinking water from air to hospitals in Cambodia.

Watergen

Kerala India, October 2018

Following devastating monsoons, a device was set-up at the Christian Seminary in district Kerala, in partnership with TATA Group



Parumala Seminary
Parumala P.O., Thiruvalla, Pathanamthitta District
Kerala State, Pin: 689 626

Phone : Office : 0479-2312202
Manager : 0479-2312326
Retreat House : 0479-2312226
Mob : 9497112326
9446606264

Fr. M.C. Kuriakose
Manager

Date: 23rd October 2018

The Board of Directors,
Water-gen LTD
Israel, headquarter
11 Moshe Levi St.
Rishon LeZion 7565828,
Israel.

Dear sirs,

Sub: **Request for the extension availability of service of WaterGen machine. installed at this premises.**

Kerala, popularly known as 'Gods own country', is a land blessed with natural resources. A narrow strip of land in the south-western margin of the Indian Peninsula, Kerala State is bounded by Western Ghats in the east and Arabian Sea in the west. The State's geographical location, weather pattern and high population density makes it prone to severe natural as well as human-induced disasters.

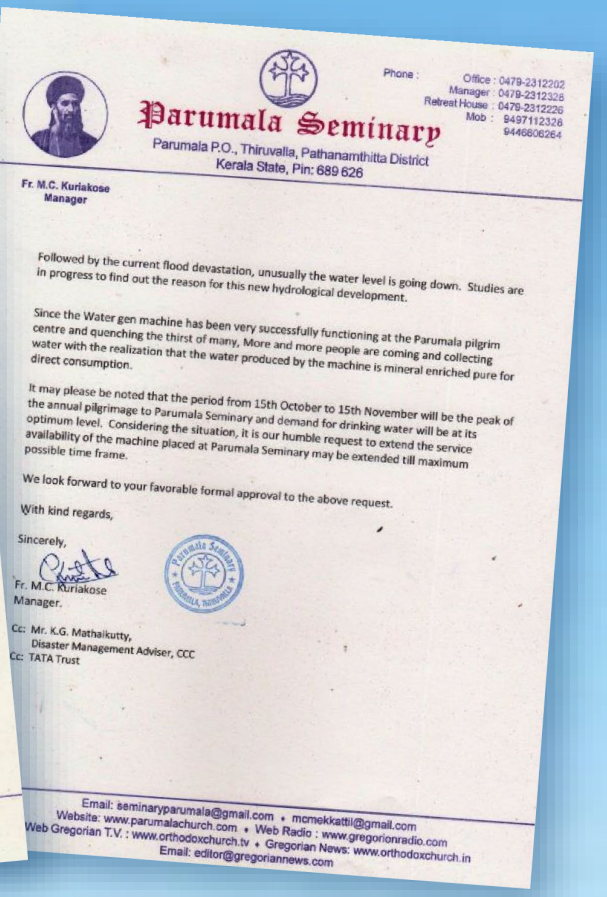
Beginning in July 2018, severe floods affected the south Indian state of Kerala, due to unusually high rainfall during the monsoon season. It was the worst flooding in Kerala in nearly a century. Over 483 people died in this 100-year record breaking experience.

In this situation, provision of safe drinking water, has been the most needed for human survival. The generous gift from WaterGen Co, Israel of machine Generating Water from air installed at the Pilgrim Centre called Saint Gregorios of Parumala has been a timely support. The machine is providing uninterrupted pure drinking water to hundreds and thousands of people every day.

The management of Parumala Seminary join the people from the surroundings and the pilgrims, who are collecting water from the machine in expressing their sincere thanks and gratitude to the Board of Directors of Watergen Company, for this generous support. We also extend our thanks to the TATA Trust, for installing and bearing the related basic running costs and Cosmic Community Centre for facilitating the installation.

Contd... 2

Email: seminaryparumala@gmail.com • mcmekkattil@gmail.com
Website: www.parumalachurch.com • Web Radio : www.gregorionradio.com
Web Gregorian T.V. : www.orthodoxchurch.tv • Gregorian News: www.orthodoxchurch.in
Email: editor@gregoriannews.com



Parumala Seminary
Parumala P.O., Thiruvalla, Pathanamthitta District
Kerala State, Pin: 689 626

Phone : Office : 0479-2312202
Manager : 0479-2312326
Retreat House : 0479-2312226
Mob : 9497112326
9446606264

Fr. M.C. Kuriakose
Manager

Followed by the current flood devastation, unusually the water level is going down. Studies are in progress to find out the reason for this new hydrological development.

Since the Water gen machine has been very successfully functioning at the Parumala pilgrim centre and quenching the thirst of many, More and more people are coming and collecting water with the realization that the water produced by the machine is mineral enriched pure for direct consumption.

It may please be noted that the period from 15th October to 15th November will be the peak of the annual pilgrimage to Parumala Seminary and demand for drinking water will be at its optimum level. Considering the situation, it is our humble request to extend the service availability of the machine placed at Parumala Seminary may be extended till maximum possible time frame.

We look forward to your favorable formal approval to the above request.

With kind regards,

Sincerely,

Fr. M.C. Kuriakose
Manager.

Cc: Mr. K.G. Mathaikutty,
Disaster Management Adviser, CCC
Cc: TATA Trust

Email: seminaryparumala@gmail.com • mcmekkattil@gmail.com
Website: www.parumalachurch.com • Web Radio : www.gregorionradio.com
Web Gregorian T.V. : www.orthodoxchurch.tv • Gregorian News: www.orthodoxchurch.in
Email: editor@gregoriannews.com

Watergen

Colombia, March 2021

Watergen devices were delivered to a boarding school in La Guajira, a region suffering from extreme water scarcity. Thousands of children can now enjoy a constant supply of fresh drinking water of the highest standards.

Watergen

Sierra Leone, March 2019

Pure drinking water from air for a girls school in Sierra Leone.

Watergen

Thailand, October 2020

Tipco Foods and Watergen joined together to help provide elderly citizens with access to free, clean and safe drinking water of the highest standards.

Watergen

Watergen’s main market segments

Humanitarian

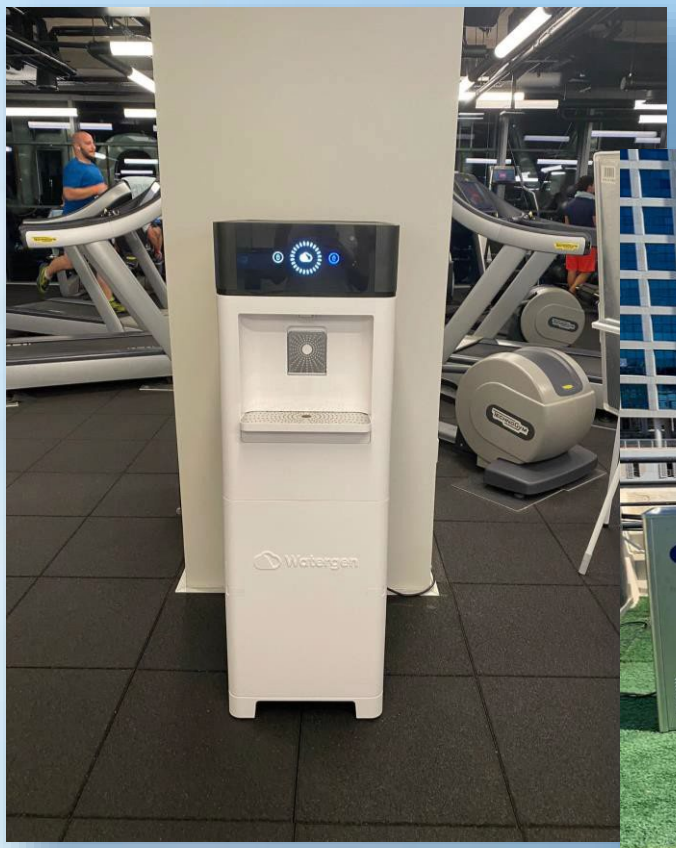
Commercial

Mobility

Microsoft, May 2020

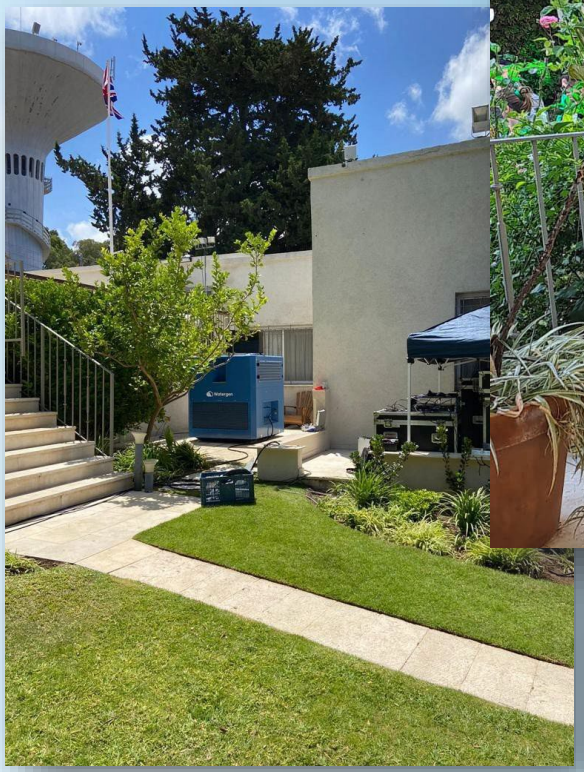
Microsoft

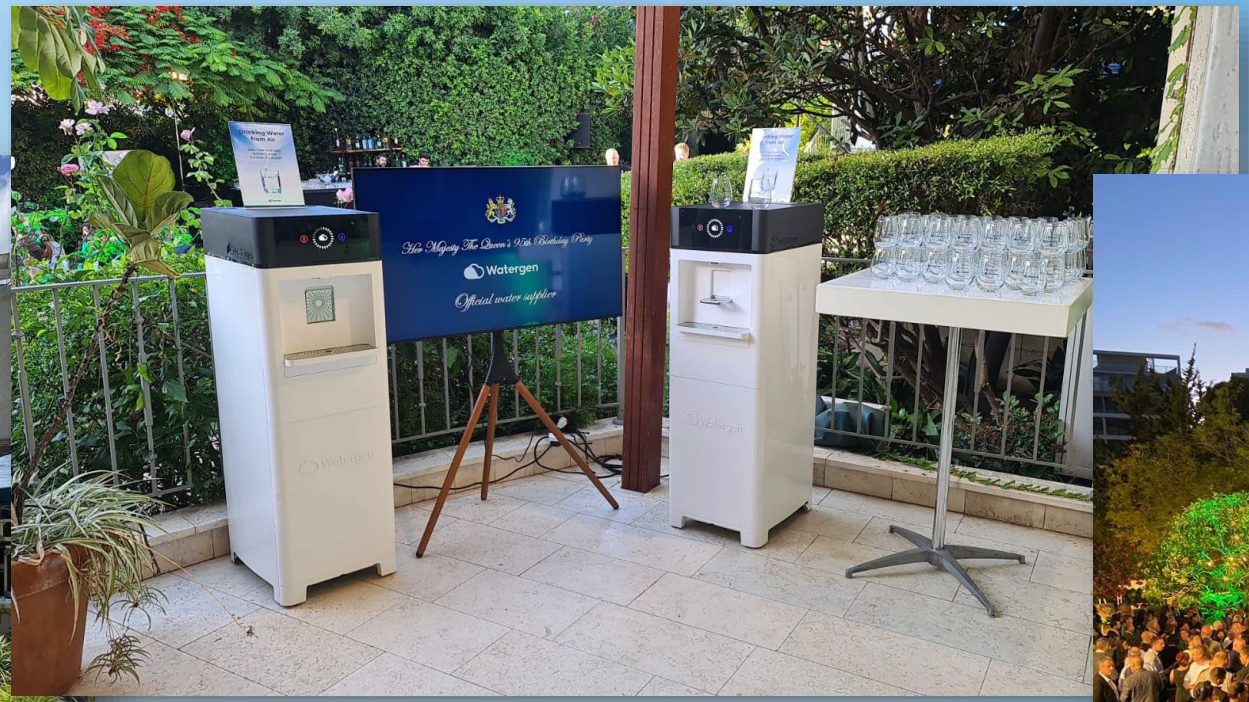
Watergen provides its best quality of drinking water for Microsoft offices.



Watergen

Exclusive water supplier, HRH Queen Elizabeth's 95th birthday party





Watergen

https://www.jpost.com/israel-news/uk-embassy-in-israel-celebrates-queens-birthday-with-eco-friendly-event-671430

Public Spaces

Watergen

Sports Events

Watergen

Watergen’s Main Market Segments

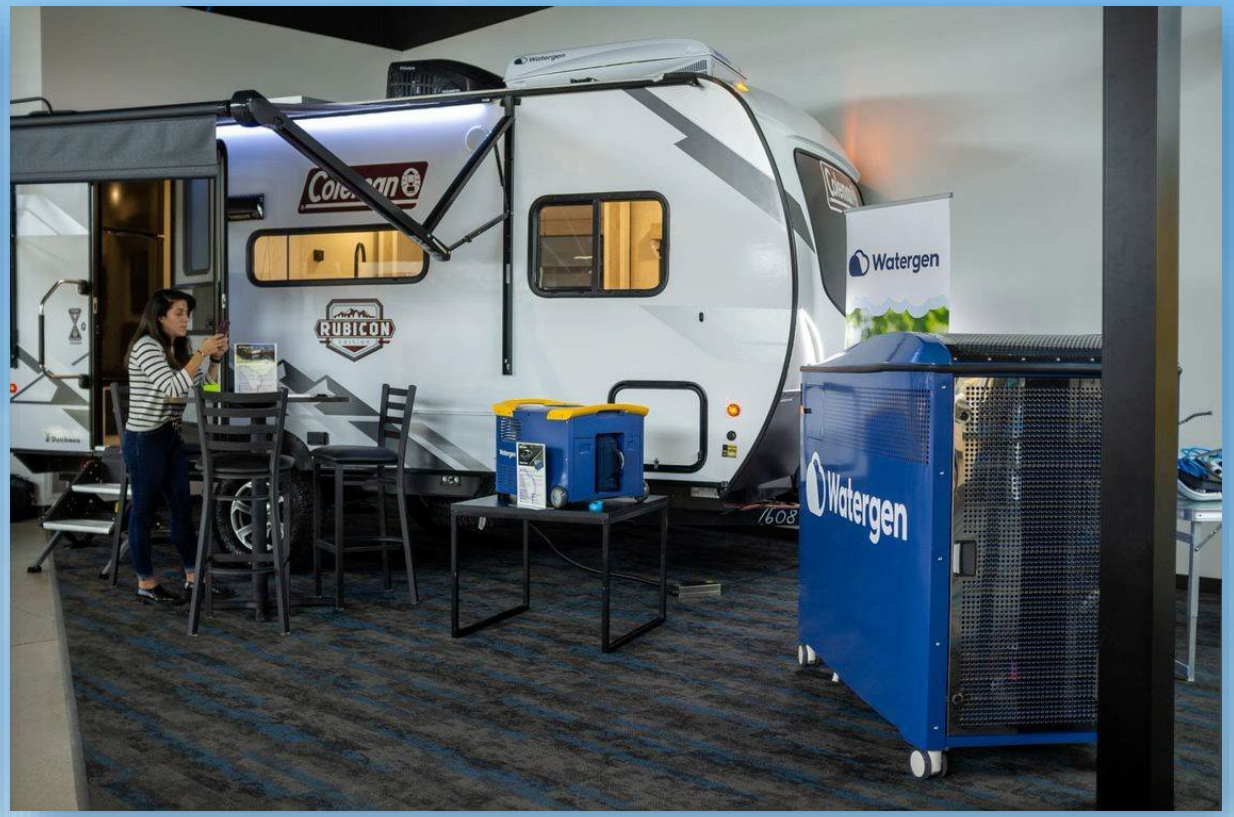
Humanitarian

Commercial

Mobility

Camping World, U.S., September 2021

Camping World exhibited a full range of autonomous outdoor solutions by Watergen.



SEMA, U.S., November 2021

As part of the collaboration with Ford, a Watergen After-Market unit on a Ford Ranger Tremor.

Watergen

WATERGEN 2020

Watergen

Follow us on

Watergen.com

Co-Organised by :

SWA
SINGAPORE WATER ASSOCIATION

ECONOMIC & TRADE MISSION
EMBASSY OF ISRAEL
SINGAPORE

ISRAEL EXPORT INSTITUTE

Supported by :

PUB SINGAPORE'S NATIONAL WATER AGENCY

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Q & A

Israeli / Singapore Presenters:

BIOKUBEN

WFI

SG ENVIRO

Watergen

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission
Embassy of Israel
Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Upcoming Events

Singapore Pavilion:
16th–18th Nov 2022, Cam Water 2022, Phnom Penh

Singapore Pavilion:
07th–09th Dec 2022, Asia Water 2022, Kuala Lumpur

Technology/Business Mission & Singapore Pavilion:
05th–06th Dec 2022, Asia Water 2022, Kuala Lumpur

Israeli / Singapore Presenters:

BIOKUBE-R

WFI

SG ENVIRO

Watergen

Co-Organised by :

SWA Singapore Water Association

Economic & Trade Mission
Embassy of Israel
Singapore

Israel Export Institute

Supported by :

PUB Singapore's National Water Agency

Sg-IL Connects: Sustainable Water Resources For The Future

09th November 2022, Wednesday,
4:00pm to 5:30pm SGT

Thank You

For further queries on the event, please contact :

Singapore Water Association
T: (65) 65150812
E: enquiry@swa.org.sg
www.swa.org.sg

Israeli / Singapore Presenters:

BIOKUBEN

WFI

SG ENVIRO

Watergen