REGIONAL WATER TALKS

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# MALAYSIA SESSIONS

## THURSDAY | 5 AUGUST 2021

02.30pm – 04.00pm

## Moderator

**Associate Professor Dr. Norhayati Abdullah**
Associate Director
UTM International Kuala Lumpur, Universiti Teknologi Malaysia

## Speakers

**Ir. Muhamad Sobri bin Zakaria**
Executive Director of Water & Sewerage Regulatory Department, National Water Services Commission (SPAN)

**Mr. Narendran Maniam**
CEO of Indah Water Konsortium Sdn Bhd (IWK)

**Tuan Haji Anuar bin Abdul Ghani**
Director of operations
Ranhill SAJ Sdn Bhd

**Anne Lim**
Division Marketing Manager
Endress+Hauser Malaysia

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## Housekeeping Rules

**All microphone & video of attendees have been muted**


**If you have any question to ask our speakers, do list them down at the Q&A box**

**If there's any internet disruption during the webinar, please be patient and try to sign in again**

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# Poll Questions

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## THURSDAY | 5 AUGUST 2021

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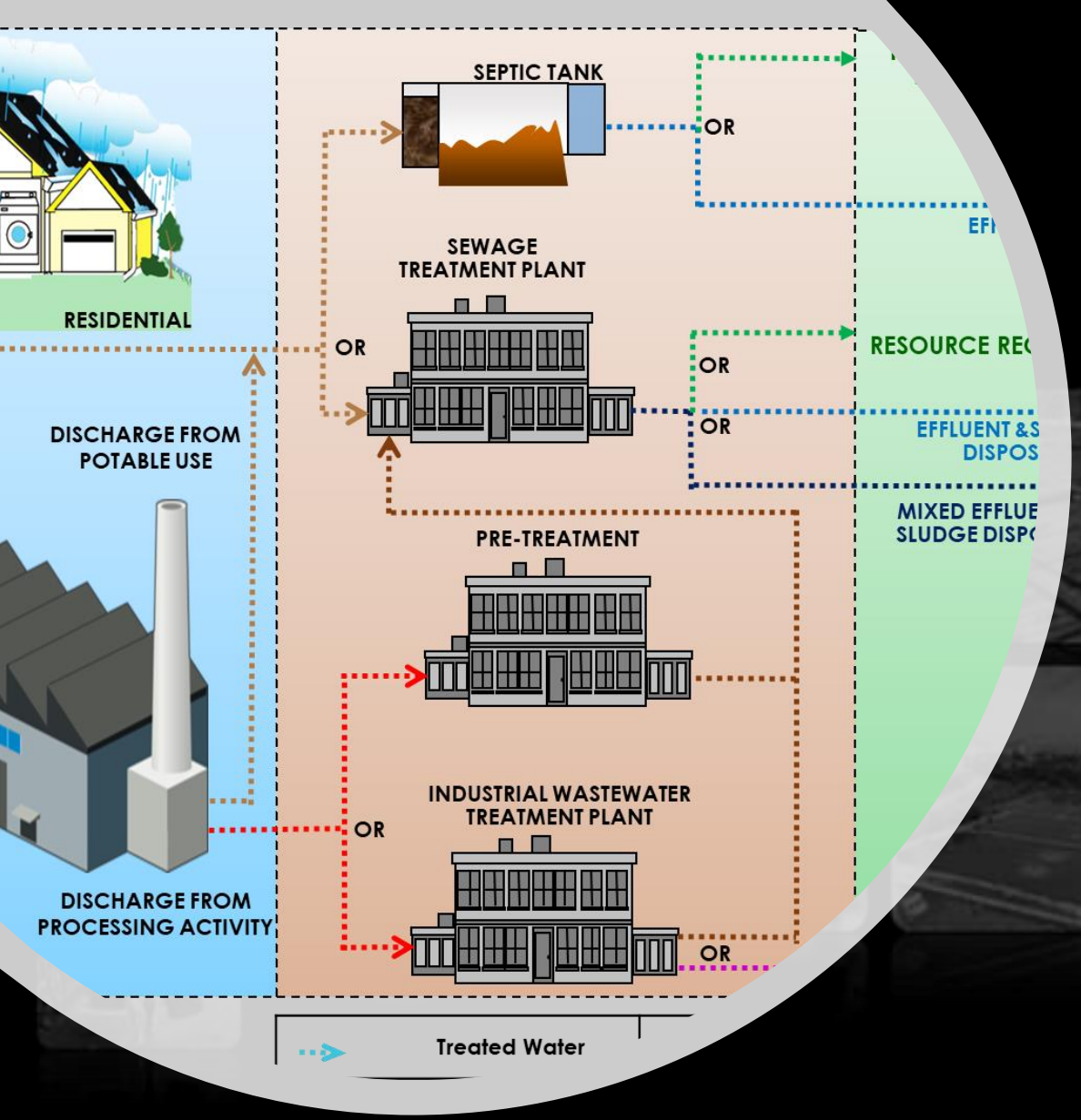
### Speaker

**Ir. Muhamad Sobri bin Zakaria**
Executive Director of Water & Sewerage Regulatory Department, National Water Services Commission (SPAN)

### Topic

**Proposed Changes in WSIA for Water Reclamation and Resource Recovery**




SPAN

Suruhanjaya Perkhidmatan Air Negara

# Proposed Changes in WSIA for Resource Recovery

Ir. Muhamad Sobri Bin Zakaria

Executive Director

Water & Sewerage Regulatory Department

Waste is wealth and we need to do something to manage it. We should utilise it to create something better out of it.

# PRESENTATION OUTLINE


## OVERVIEW
- SPAN's Journey

## RESOURCE RECOVERY FRAMEWORK
- Proposed Concept Models
- Fees and Charges

## ENABLING TOOLS
- Setting Targets (Green Technology Master Plan)
- Technical Standards

## ISSUES AND CHALLENGES
- Amendment To Water Services Industry Act 2006 (Act 655)

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Suruhanjaya Perkhidmatan Air Negara

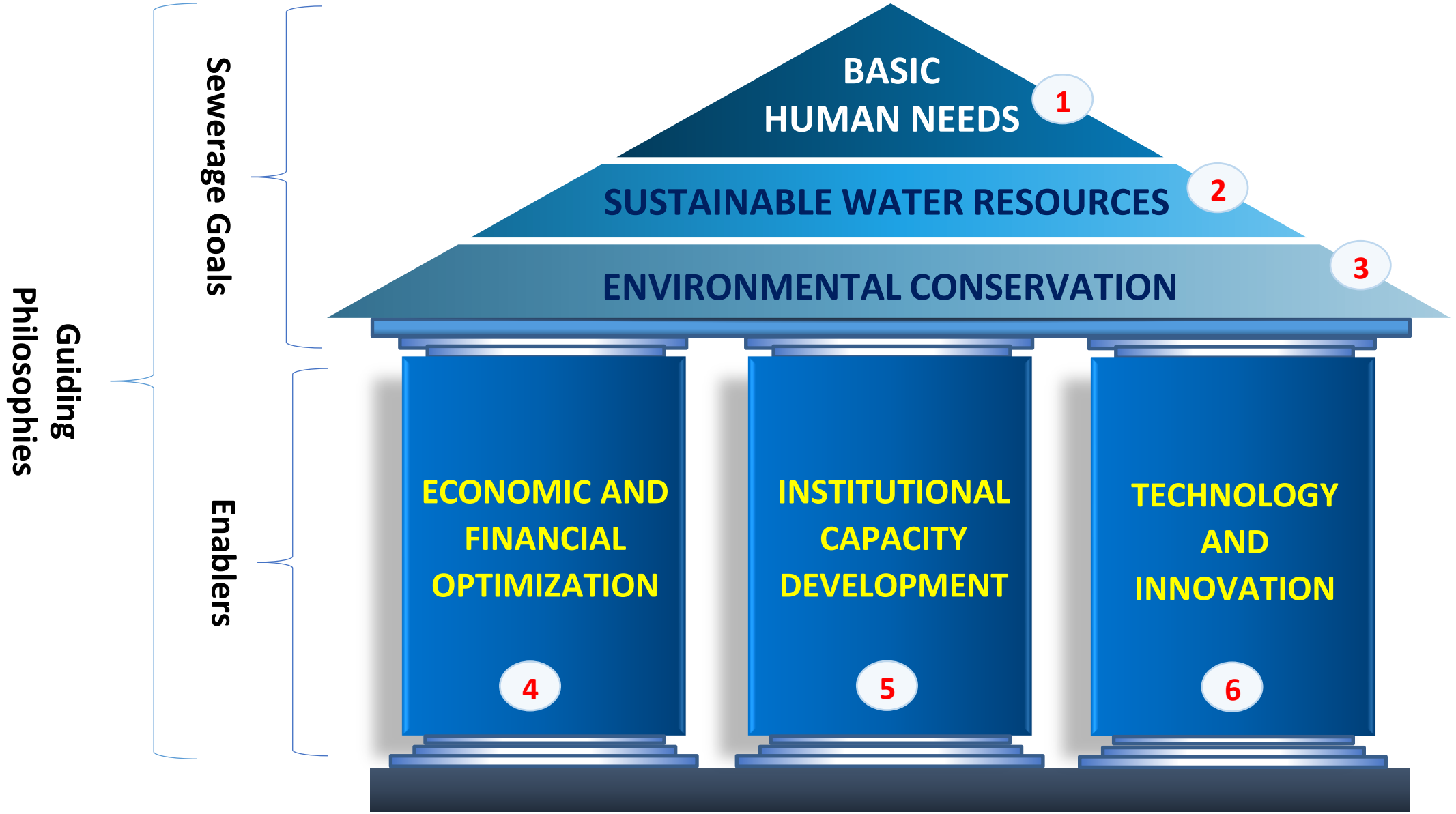

# OVERVIEW

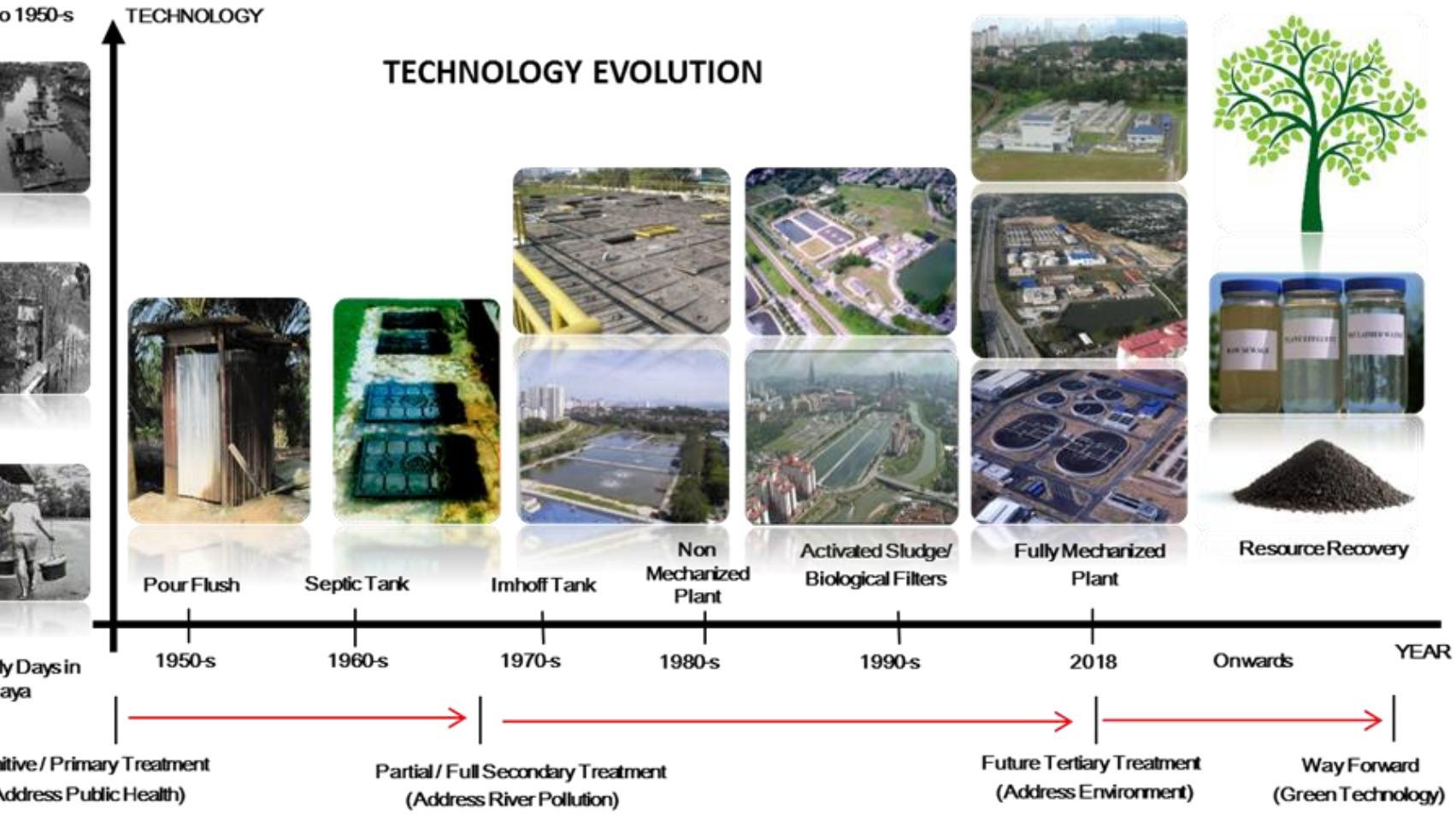

## SDG 6

- From 1970’s high investment in sewerage infrastructure
- 80% Connection
- 96% Access to Sanitation
- 76% Population in Urban Area

## SPAN’S JOURNEY THUS FAR

- Safe
- Equitable
- Sustainable
- Protecting Public Health
- Protecting Water Resource and Environment


Guiding Philosophies
Sewerage Goals
BASIC HUMAN NEEDS
1
SUSTAINABLE WATER RESOURCES
2
ENVIRONMENTAL CONSERVATION
3
Enablers
ECONOMIC AND FINANCIAL OPTIMIZATION
4
INSTITUTIONAL CAPACITY DEVELOPMENT
5
TECHNOLOGY AND INNOVATION
6

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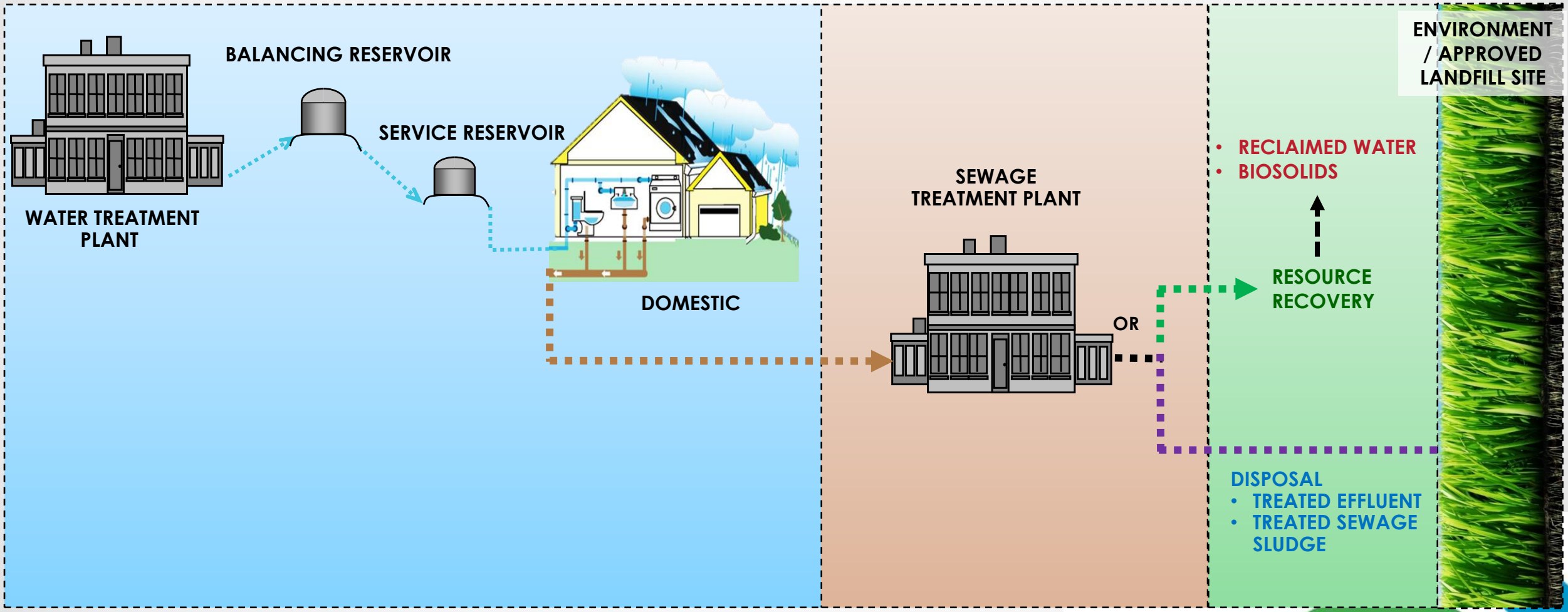
# RESOURCE RECOVERY FRAMEWORK

# HOW IS RESOURCES RECOVERED FROM SEWAGE (1)



# HOW IS RESOURCES RECOVERED FROM SEWAGE (2)

## SEWERAGE SERVICES


USE OF RESOURCES


RESOURCE RECOVERY

The use of biosolid is not governed by SPAN

### CURRENT SCENARIO

TREATED EFFLUENT → WATER OPERATOR → CONSUMER → SEWERAGE OPERATOR → ENVIRONMENT

TREATED SLUDGE → SEWERAGE OPERATOR → DISPOSAL TO LANDFILL SITE

### PROPOSED SCENARIO

TREATED EFFLUENT → WATER OPERATOR → CONSUMER → SEWERAGE OPERATOR → RESOURCES RECOVERD THROUGH EFFLUENT AND SLUDGE → CUSTOMER

TREATED SLUDGE → SEWERAGE OPERATOR → RESOURCES RECOVERD THROUGH EFFLUENT AND SLUDGE → CUSTOMER

# OBJECTIVE (ENVIRONMENTAL CONSERVATION)

1. Reduce impact on State Government with regards to source availability for the purpose of treated water distribution

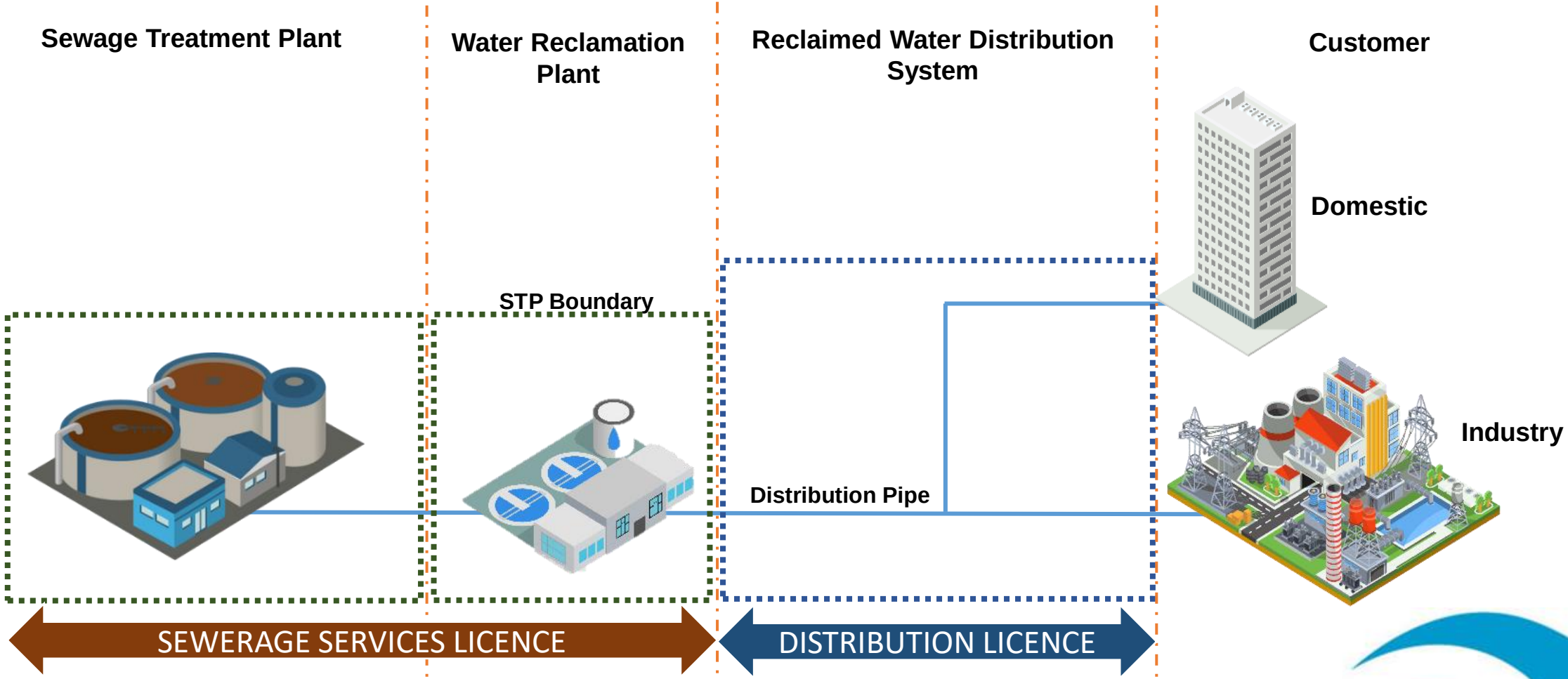
2. Reduce impact on consumers especially during water disruption


RECLAIMED WATER

3. Cultivate a recycle and reuse economy

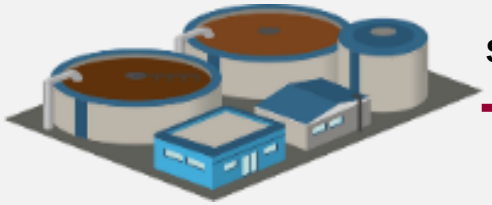
4. Addditonal income support for operator

# LICENSING REQUIREMENT FOR RESOURCE RECOVERY



# RESOURCE RECOVERY CONCEPT MODEL 1

| Treated Effluent Source | Water Reclamation Plant (Operations & Maintenance) | Reclaimed Water Distribution System (Operations & Maintenance) | USER |
|---|---|---|---|
| SEWERAGE OPERATOR | COMPANY A | WATER OPERATOR | DOMESTIC / INDUSTRY |
| Sewage Treatment Plant | Water Reclamation Plant | Distribution | |



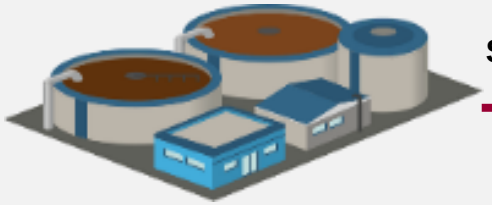
Supply of Treated Effluent

Supply of Reclaimed Water

Distribution of Reclaimed Water

# RESOURCE RECOVERY CONCEPT MODEL 2

| Treated Effluent Source | Water Reclamation Plant (Operations & Maintenance) | Reclaimed Water Distribution System (Operations & Maintenance) | USER |
|---|---|---|---|
| SEWERAGE OPERATOR | SEWERAGE OPERATOR | WATER OPERATOR | DOMESTIC / INDUSTRY |
| Sewage Treatment Plant | Water Reclamation Plant | Distribution | |



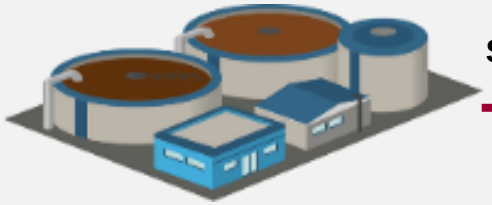
Supply of Treated Effluent

Supply of Reclaimed Water

Distribution of Reclaimed Water

# RESOURCE RECOVERY CONCEPT MODEL 3

| Treated Effluent Source | Water Reclamation Plant (Operations & Maintenance) | Reclaimed Water Distribution System (Operations & Maintenance) | USER |
|---|---|---|---|
| SEWERAGE OPERATOR | WATER OPERATOR | WATER OPERATOR | DOMESTIC / INDUSTRY |
| Sewage Treatment Plant | Water Reclamation Plant | Distribution | |



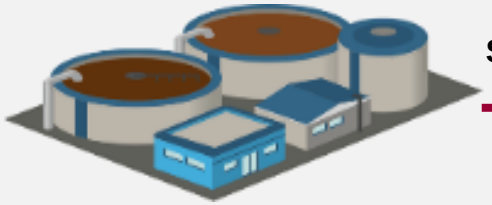
Supply of Treated Effluent

Supply of Reclaimed Water

Distribution of Reclaimed Water

# RESOURCE RECOVERY CONCEPT MODEL 4

| Treated Effluent Source | Water Reclamation Plant (Operations & Maintenance) | Reclaimed Water Distribution System (Operations & Maintenance) | USER |
|---|---|---|---|
| SEWERAGE OPERATOR | SEWERAGE OPERATOR | SEWERAGE OPERATOR | DOMESTIC / INDUSTRY |
| Sewage Treatment Plant | Water Reclamation Plant | Distribution | |



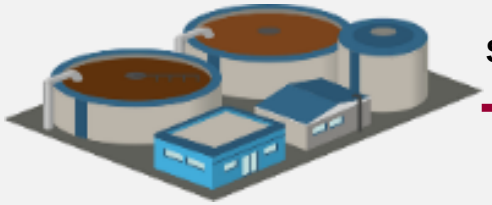
Supply of Treated Effluent

Supply of Reclaimed Water

Distribution of Reclaimed Water

# RESOURCE RECOVERY CONCEPT MODEL 5

| Treated Effluent Source | Water Reclamation Plant (Operations & Maintenance) | Reclaimed Water Distribution System (Operations & Maintenance) | USER |
|---|---|---|---|
| SEWERAGE OPERATOR | COMPANY A | COMPANY A | DOMESTIC / INDUSTRY |
| Sewage Treatment Plant | Water Reclamation Plant | Distribution | |



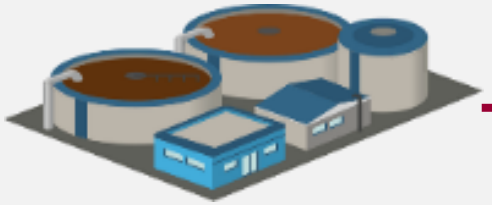
Supply of Treated Effluent

Supply of Reclaimed Water

Distribution of Reclaimed Water

# RESOURCE RECOVERY CONCEPT MODEL 6

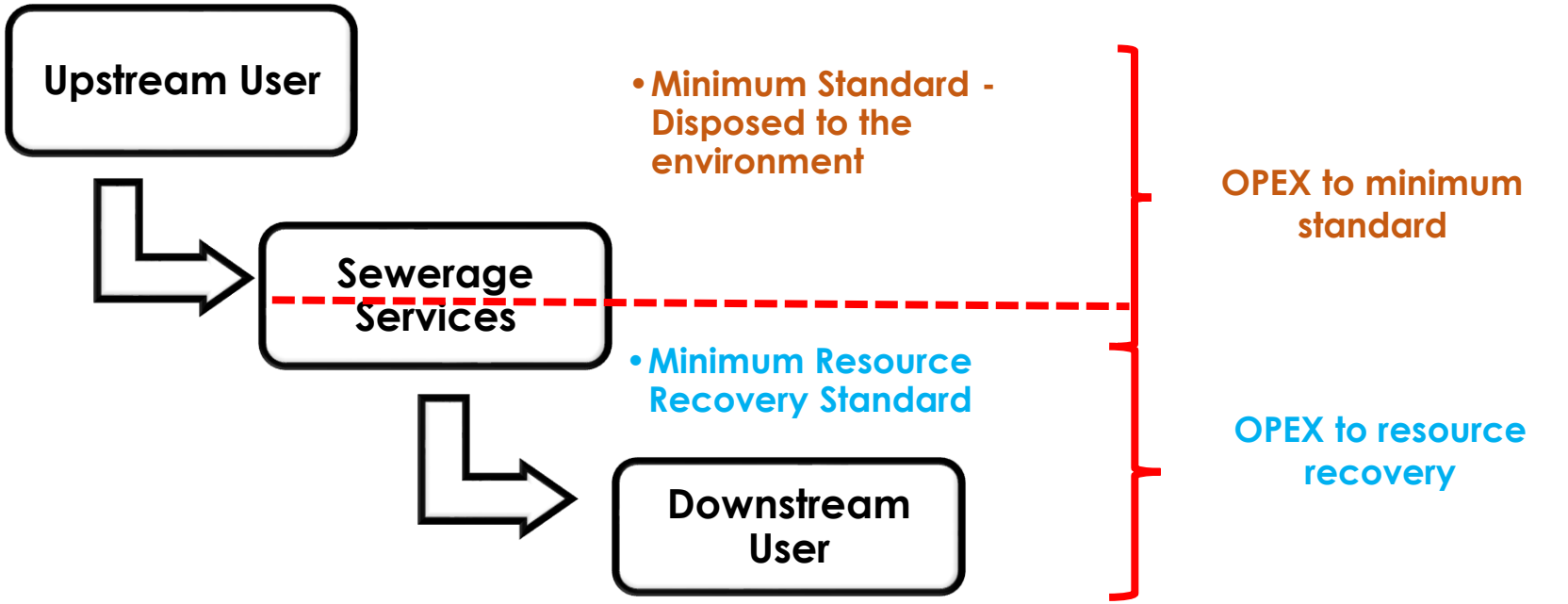
| Treated Effluent Source | USER |
| --- | --- |
| SEWERAGE OPERATOR | INDUSTRY / LANDSCAPE |
| Sewage Treatment Plant | |



Supply of Treated Effluent

# PROPOSED TARIFF MECHANISM

## SEWERAGE SERVICES TARIFF AND RECLAIMED WATER TARIFF




| | CATEGORY 1 | CATEGORY 2 |
|---|---|---|
| FEES & CHARGES | • Not fixed by SPAN<br>• Rate and terms as per Commercial Arrangement between interested parties<br>• SPAN is able to recommend to the Minister in accordance with Section 84(1) | • Evaluation through Business Plan |

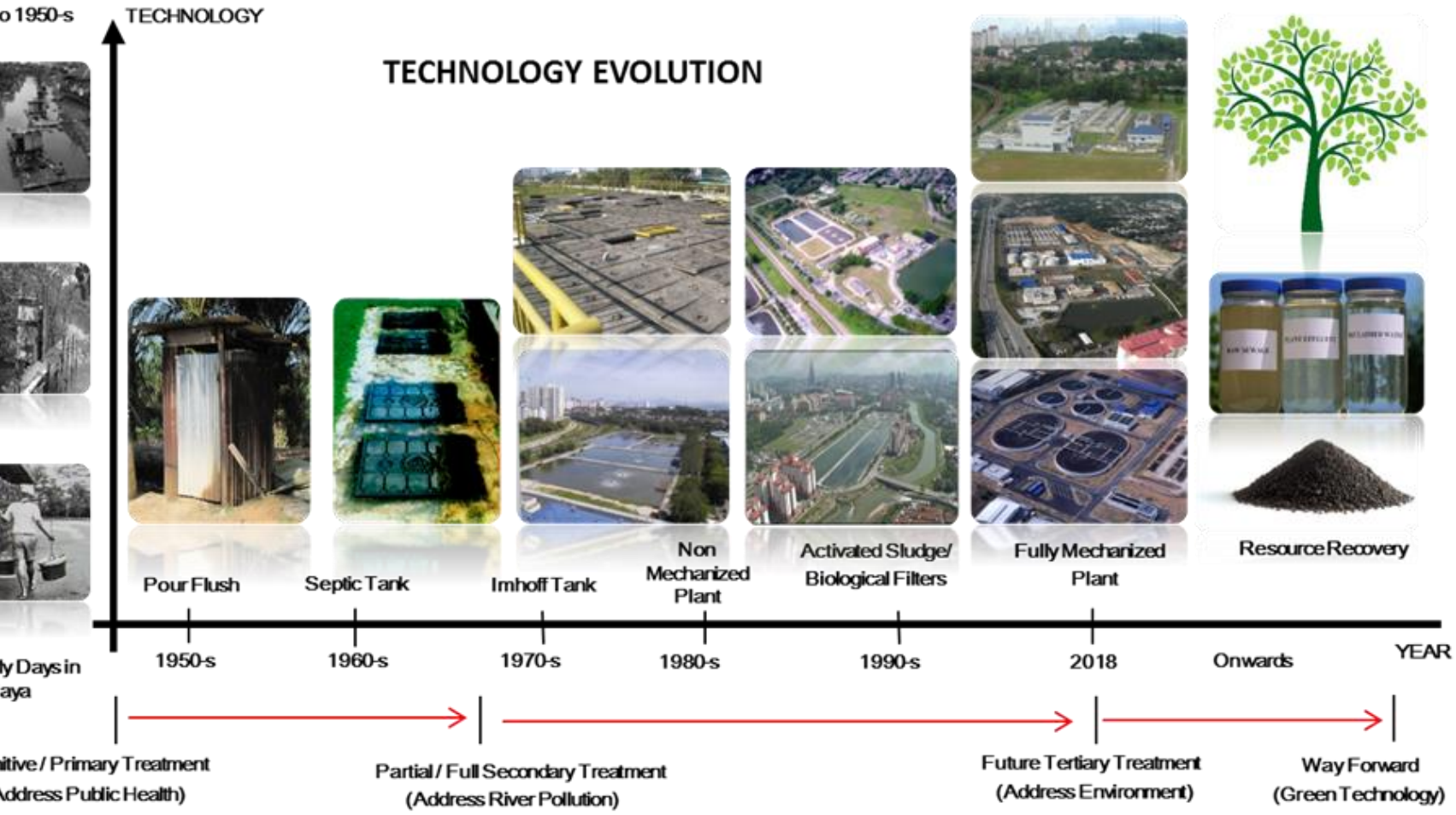
## REGULATING THE FEES AND CHARGES

**CATEGORY 1**

Commercial Arrangement


**CATEGORY 2**

- Planned development/area/catchment that is designed for use and supply of reclaimed water
- Users do not have a choice with regards to source and distributor

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# ENABLING TOOLS

# CATCHMENT PLANNING

**Strategic planning to encourage resource recovery and use from sewage treatment**

## Green Technology in Planning Documents

*Environmental Conservation*
*Resource recovery shall be considered from point source up to by product of sewage treatment to minimize pollution, reduction of carbon footprint and maximize economic benefits*

## Development of Technical Standards

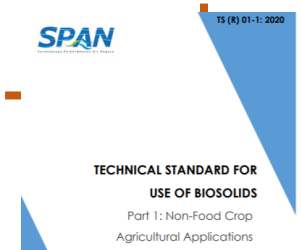
- Stipulation of minimum mandatory requirement of quality that is to be adhered
- Include resource recovery as one of the main criteria in the aspect of planning and design of sewerage infrastructures of > 10,000 PE

# DEVELOPMENT OF TECHNICAL STANDARD

## Development of Technical Standard


### Biosolids

- ***Biosolid Part 1 : Agriculture for Non-Food Crop***
- ***Biosolid Part 2 : Agriculture Use for Food Crop***



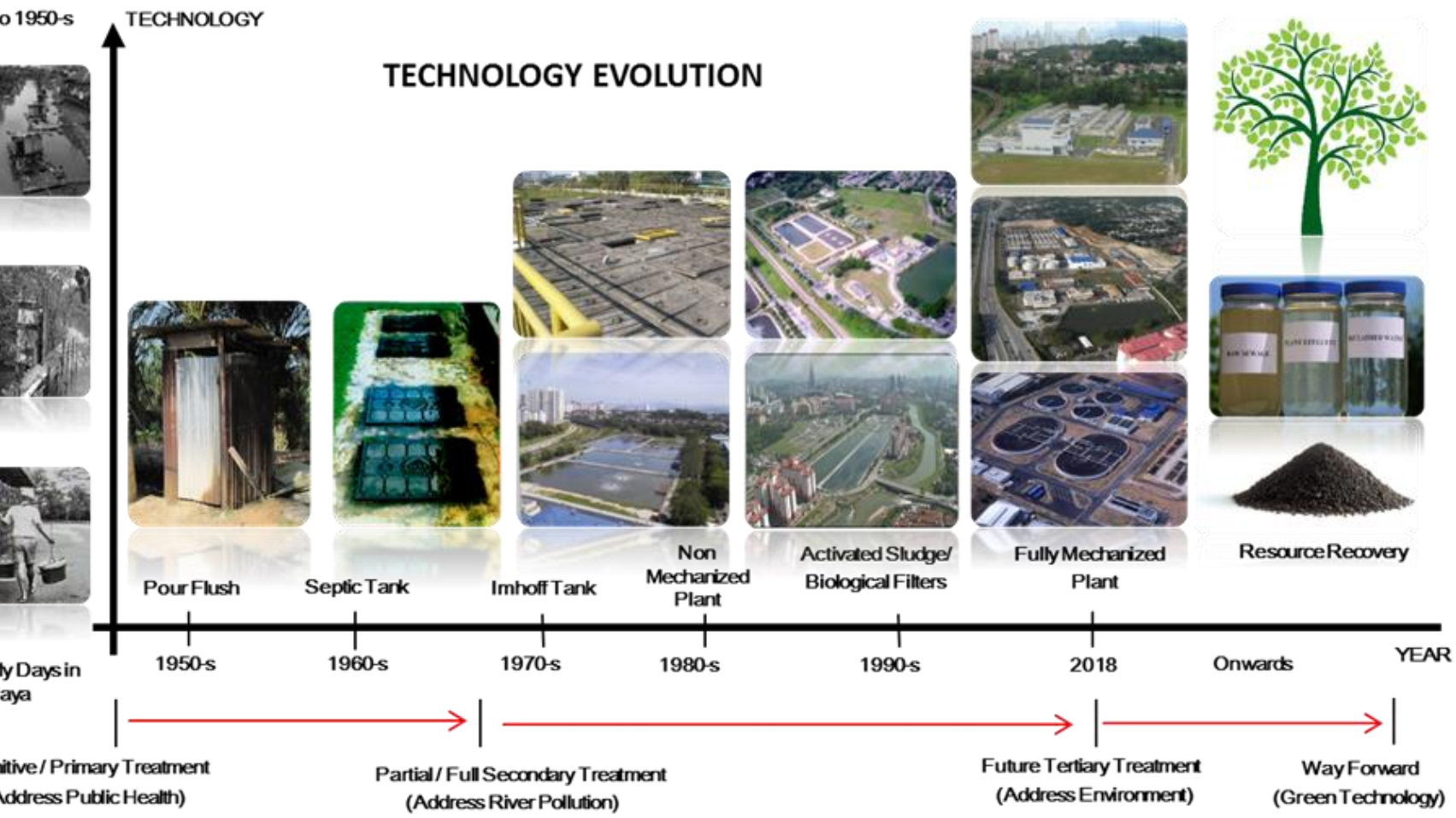


### Reclaimed Water

- ***Reclaimed Water Part 1 : Industrial Applications***
- ***Reclaimed Water Part 2 : Non-Agriculture Use***



**http://www.span.gov.my/article/view/guidelines-for-sewerage**

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# ISSUES AND CHALLENGES

# ISSUES AND CHALLENGES

Sewage Treatment Plant

Treated Effluent

**1/3** recycled

Biosolid

**50%** recycled

**50%** recycled for electricity generation

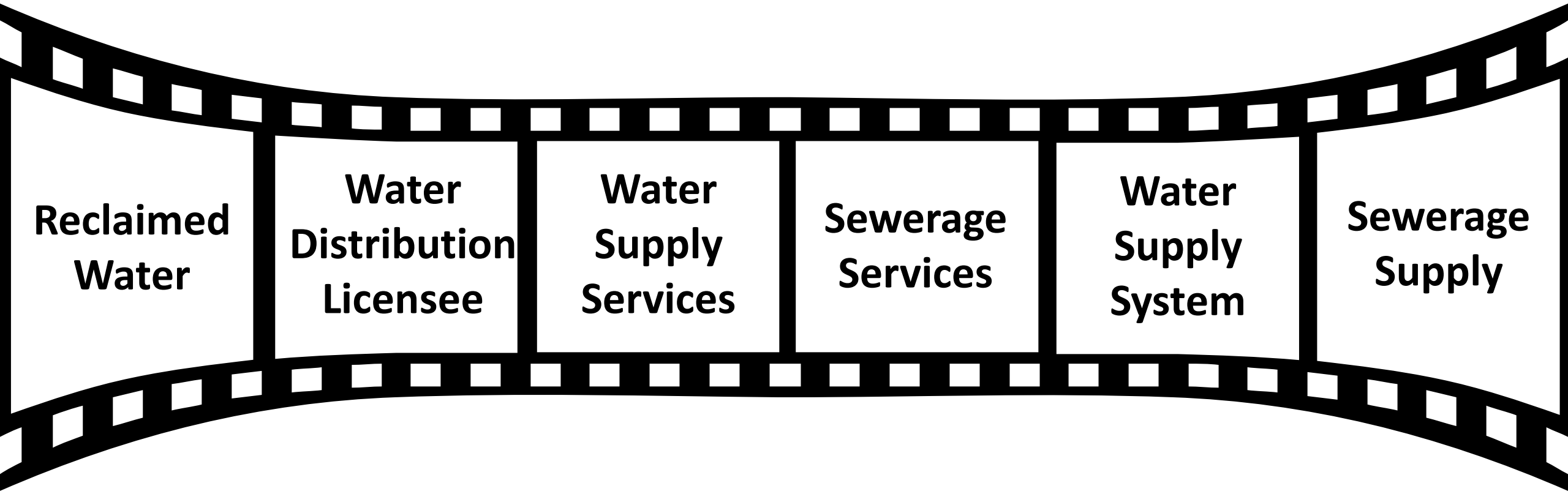
**2030**

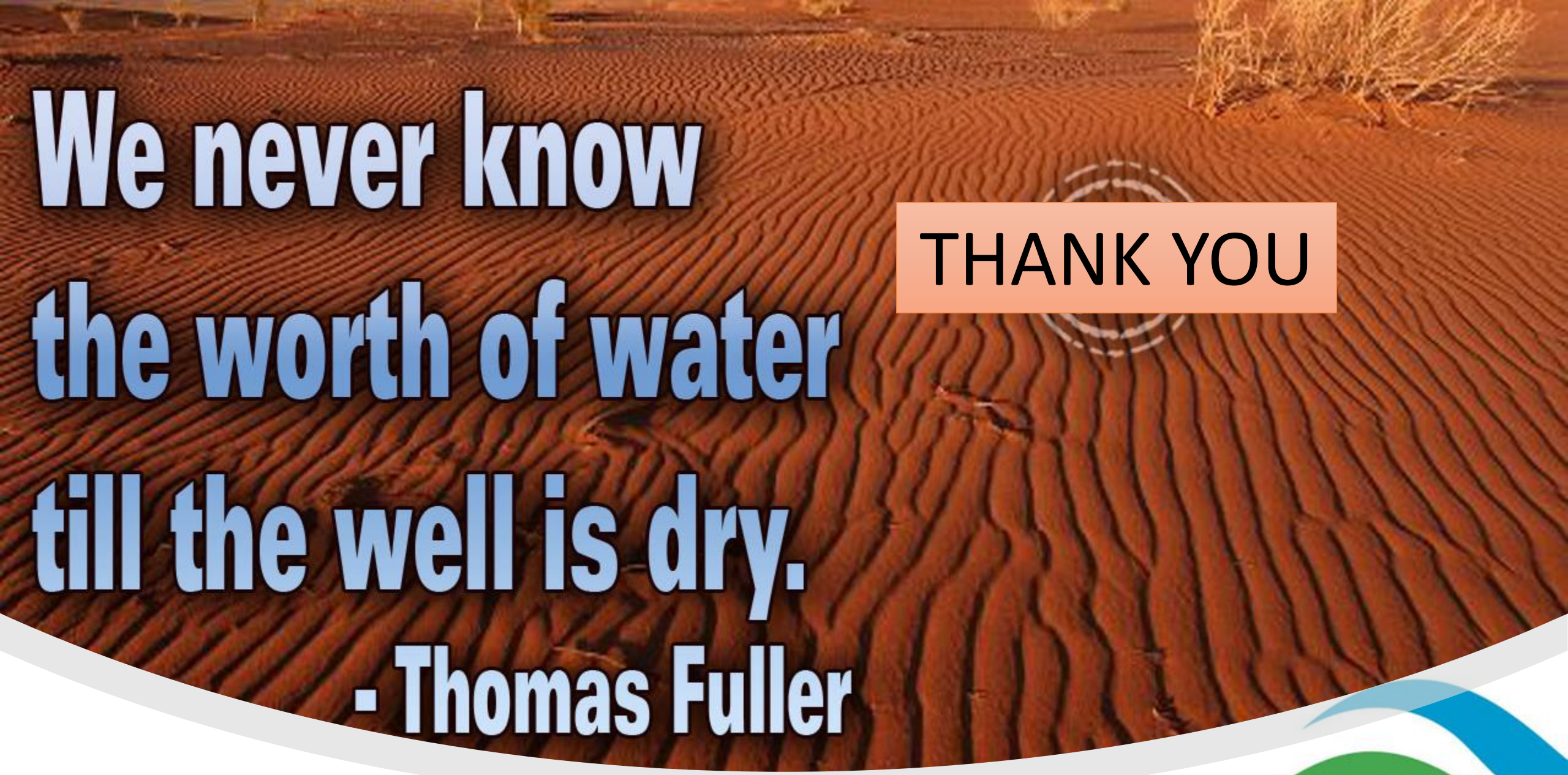
Green Technology Master Plan (GTMP)

**Target Must Be SET to Achieve Goals**

- **Legal provision**
- Awareness and acceptance of people on use
- More focus on industrial premises
- Introduce incentive for use of resource recovery

# PROPOSED AMENDMENT TO WSIA






THANK YOU

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# Individual Q&A Session

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### Speaker

**Mr. Narendran Maniam**
CEO of Indah Water Konsortium Sdn Bhd (IWK)

### Topic

**Water reclamation for Non Potable use- opportunities and challenges**

# WATER RECLAMATION FOR NON-POTABLE USE


## BY NARENDRAN MANIAM

**INDAH WATER KONSORTIUM SDN BHD (IWK)**



**ASIAWATER Virtual Conference - Regional Water Talk**
**Country Session - Malaysia**
**5 August 2021**

# OVERVIEW OF INDAH WATER KONSORTIUM SDN BHD (IWK)

# IWK's Coverage as of Q2 2021

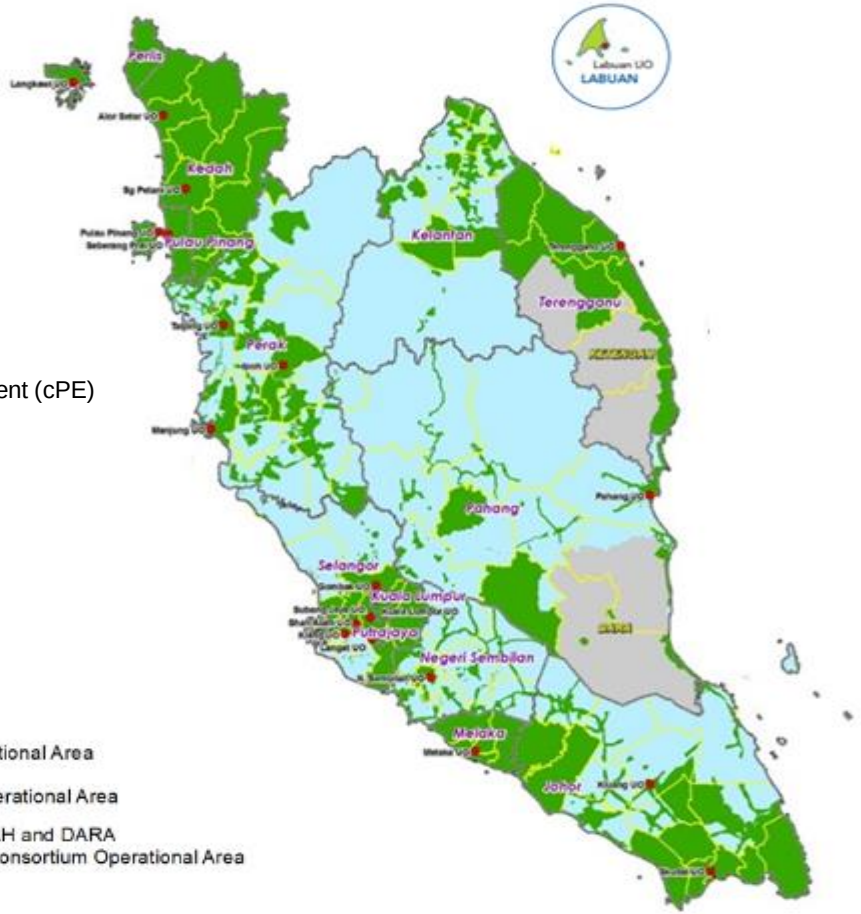
## OUR COVERAGE OF SERVICES

**11**
States & **3** Federal Territories

**101**
out of **155** Local Authorities

**27.39 mil**
Connected Population Equivalent (cPE)

**81,954 km²**
Area of service coverage




**Legend**

- Unit Office
- State Boundary
- Local Authority Boundary
- Non - Local Authority Operational Area
- Indah Water Konsortium Operational Area
- Sabah, Sarawak, KETENGAH and DARA are not under Indah Water Konsortium Operational Area

UO Unit Office

## Capacity

| | |
|---|---|
| **7,111** | Sewage Treatment Plants |
| **1,297** | Network Pump Stations |
| **20,397 km** | Pipelines Length |
| **1** | Water Reclamation Plant |

## Resources

- **3,410** Human Capital
- **22** Unit Offices
- **59** Reporting Centers
- **632** Vehicles
- **5** Laboratories
- **1** Research Center
- **1** Training Center
- **1** Museum

Note:
1. cPE excludes individual and Communal Septic Tanks

# IWK's Business Activities

Indah Water

## OPERATION AND MAINTENANCE OF PUBLIC SEWERAGE SYSTEMS

Provide scheduled operation and maintenance of public sewers, NPSs and public STPs within our service areas

## SEPTAGE MANAGEMENT AND DESLUDGING SERVICES

Perform scheduled desludging services for septic tanks on government premises and demand desludging for septic tank users within our service areas

## SEWERAGE TECHNICAL AND ENVIRONMENT SERVICES / CONSULTANCY WORKS

Provide HAZOP Consultancy service. HAZOP is a procedural tool designed to discover safety and operability deficiencies in a plant's design and operation

## TREATMENT OF TRADE EFFLUENT SERVICE

Determine suitable industrial waste to be treated in existing STPs that comply to the effluent requirement and without additional modification costs to the STPs

## SEWERAGE PLANNING, SEWERAGE ASSET DATA MONITORING AND CERTIFYING SERVICES

Provide certification services: evaluating, certifying and approving of sewerage facilities applications on behalf of SPAN

## SEWERAGE TECHNICAL AND OPERATIONAL SKILL TRAININGS

Deliver professional technical and non-technical training on sewerage planning, engineering, environmental monitoring and analysis, operational, preventive maintenance, and Health & Safety in sewerage systems

## SEWERAGE CAPITAL WORKS AND REFURBISHMENT MANAGEMENT

Provide project management and monitoring of capital works for both Government & SPAN funded sewerage projects and IWK's internal projects

# WATER RECLAMATION FOR NON-POTABLE USE: TOWARDS CREATING A 2ND TAP FOR INDUSTRIAL USE

# Ensuring Business Sustainability for IWK

We are still guided with our 5 year business roadmap (2019-2023) and key strategies

**1**

**STRENGTHENING IWK BUSINESS SUSTAINABILITY**

**2**

**EXPANDING COVERAGE AND INCREASING EFFICIENCY OF WASTEWATER SERVICE**

**3**

**EMPOWERING GREEN ECONOMY OF WASTEWATER INDUSTRY**

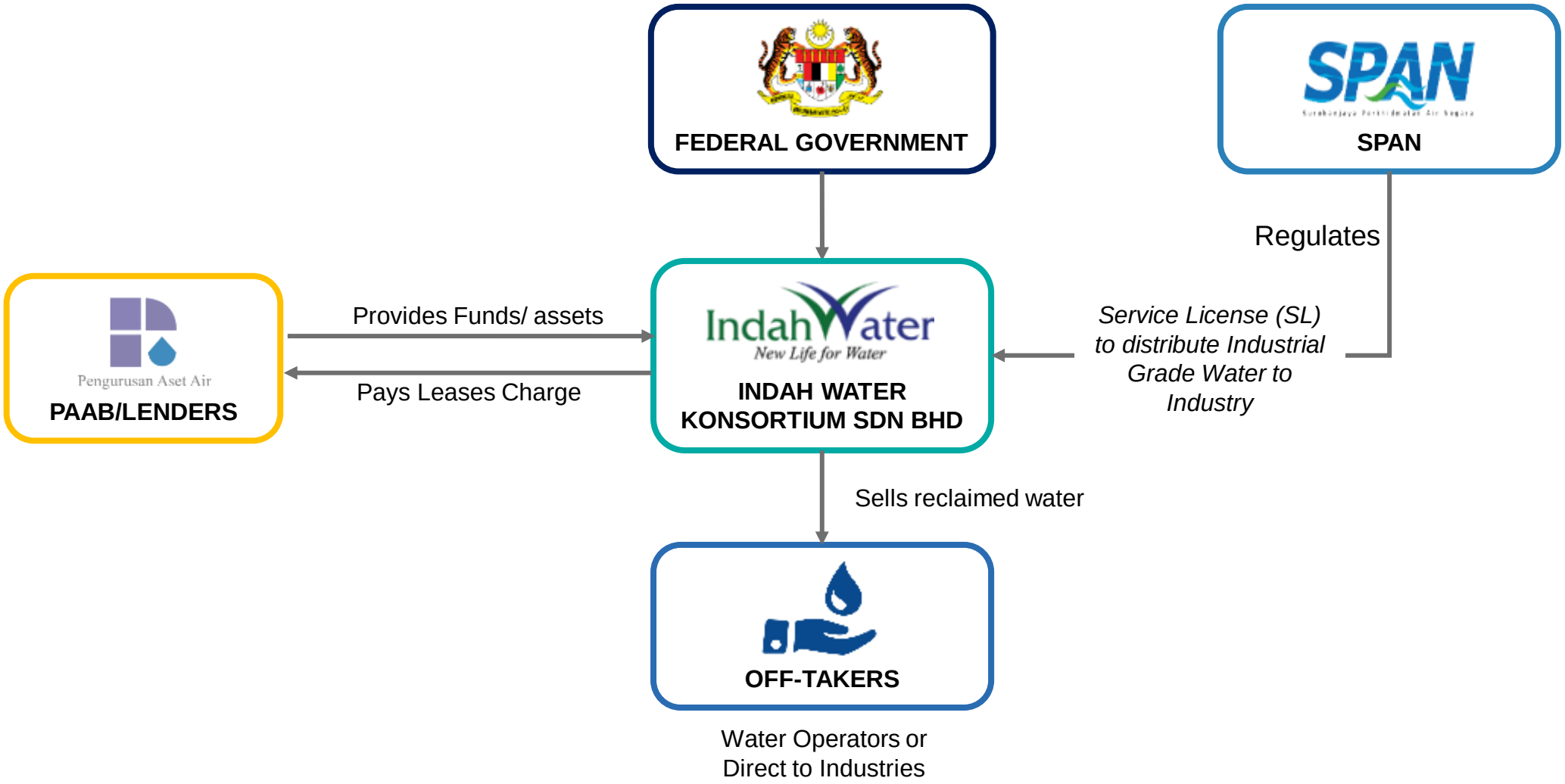
**4**

**TOWARDS INTEGRATION OF WASTEWATER AND WATER INDUSTRIES**

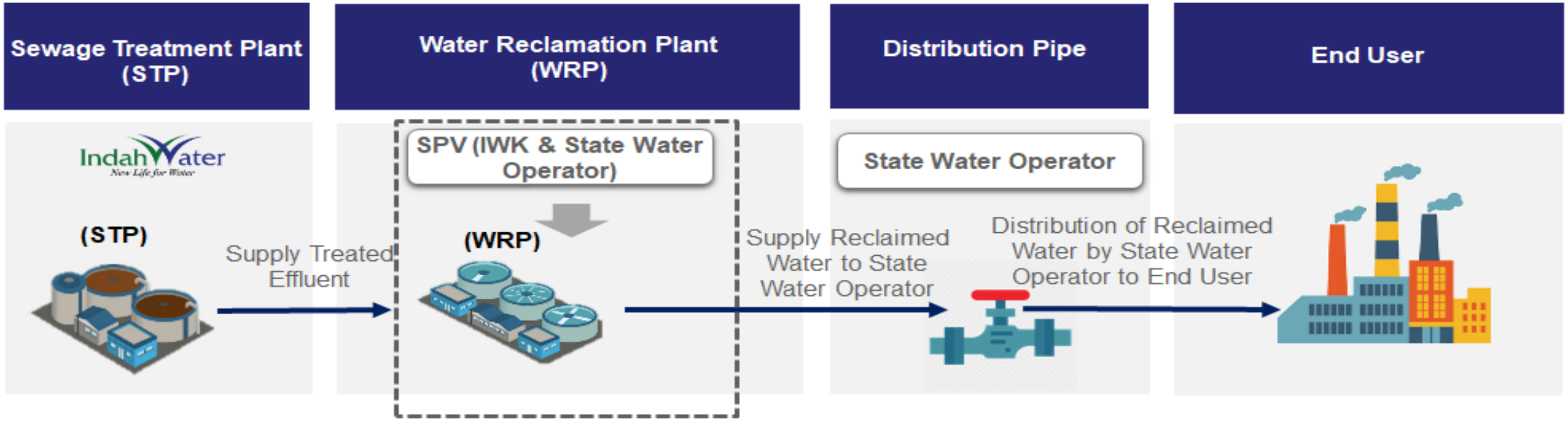
Under our Strategic Thrust #3, we have been actively working on enhancing effluent reuse via Water Reclamation Plant (WRP) projects.

# Expansion of Reclaimed Water Business

## GOVERNMENT'S STRATEGIC DIRECTION FOR 'REUSE WATER' AS NEW SOURCE



# Spurring the WRP Projects as 2nd Tap for Industrial Use




IWK will supply Treated Effluent to WRP

- SPV will develop, own, operate and maintain the WRP.
- The WRP is equipped with Pre-treatment, Ultrafiltration and Reverse Osmosis System.

Reclaimed water produced from WRP will be channeled to dedicated distribution pipe owned, operated and maintained by Water Operator.

Reclaimed water will be supplied to end users for their non-potable use.

# Spurring the WRP Projects as 2nd Tap for Industrial Use

**Pilot Initiative and Collaboration**
IWK had initiated a collaboration with Pengurusan Air Selangor Sdn. Bhd. (“Air Selangor”) to undertake a WRP business within Selangor, Wilayah Persekutuan Kuala Lumpur and Putrajaya via an establishment of a Special Purpose Vehicle (“SPV”).


***KASA Sustainability Journey 2030***

| 2023 | 2025 | 2030 |
|---|---|---|
| 100 MLD | 500 MLD | 1,500 MLD |

Air Selangor

## 2020 - 2021


SAMB

## 2021 - 2025

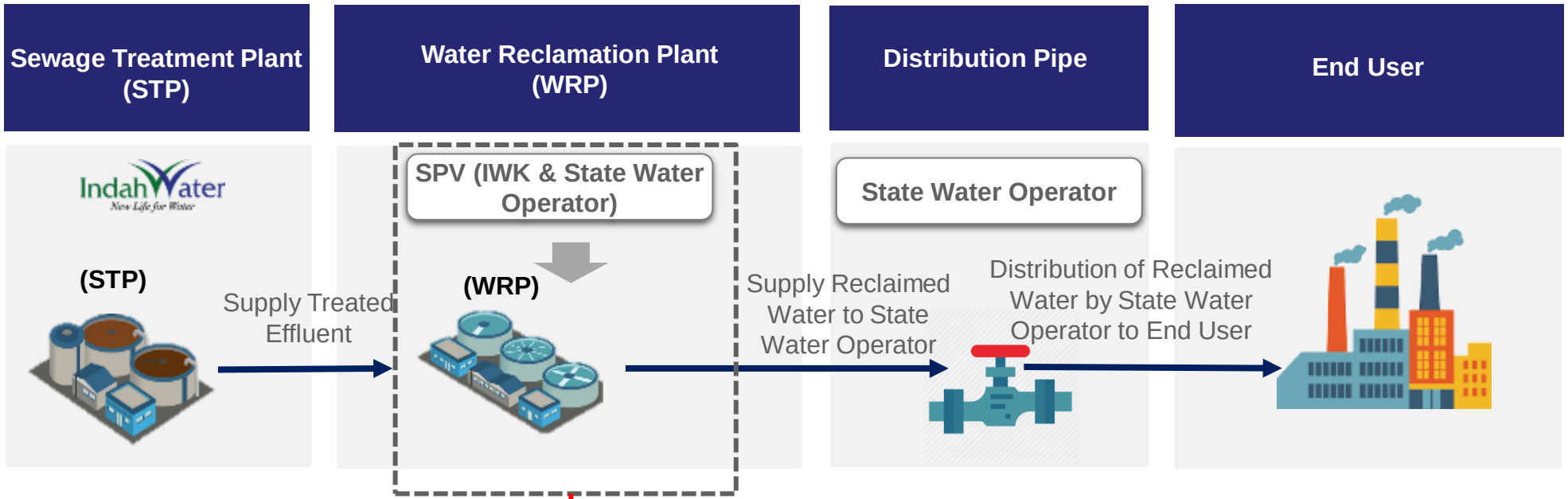
**Future Collaboration**
- In March 2020, IWK has presented the project framework to SPAN Melaka and SAMB on development proposal of WRP in order to address water scarcity challenges in Melaka.
- IWK has preliminary identified **four Sewage Treatment Plant (“STP”)** located in Melaka which are suitable (geographical and sociological) to develop and build WRP.

## 2030

Collaboration with other State Water Operator

# Financial Valuation For IWK And CWR

## Commercial Modelling & Proposed Pricing




**Options on project financing for new WRP development**

**1** **Fully internal funding of shareholder advances**

- For WRPs with small investment
- E.g. WRP SAM163 Setia Alam

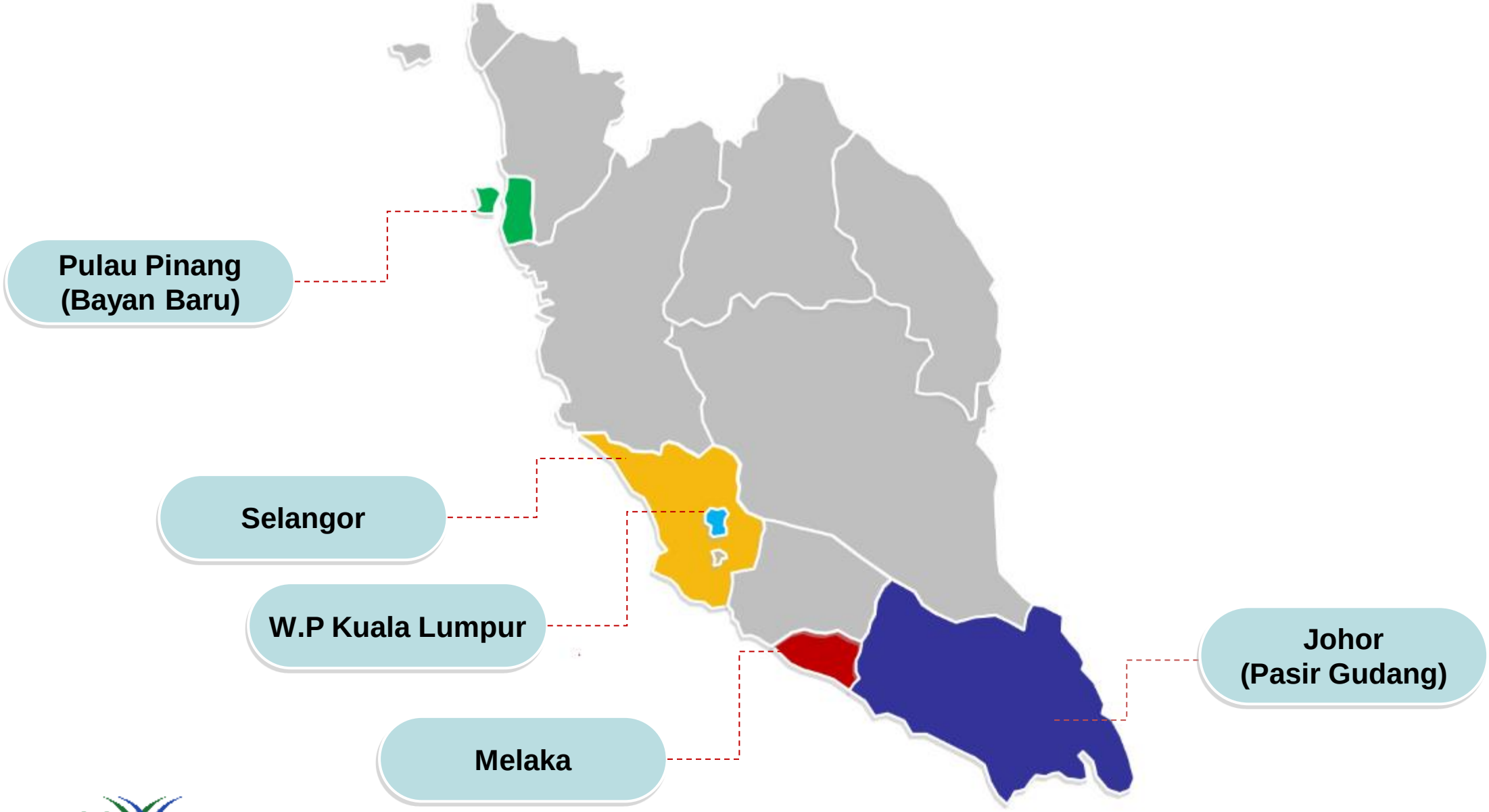
**2** **Project Financing from Bank**

- Suitable for WRPs with large investment
- 90:10 or 100% ratio
- Tenure: 10 years
- Attractive financing rate due to nature of the project

**3** **Project Financing from PAAB**

- Suitable for WRPs with large investment
- Longer tenure allows better bankable model
- Attractive financing rate due to nature of the project

# Spurring the WRP Projects as 2nd Tap for Industrial Use



# Water Reclamation Technology

Wastewater Treatment Plant

*Bio-effluent*

Water Reclamation System
DAF/Filtration + UF + RO

DAF (Dissolved Air Floatation

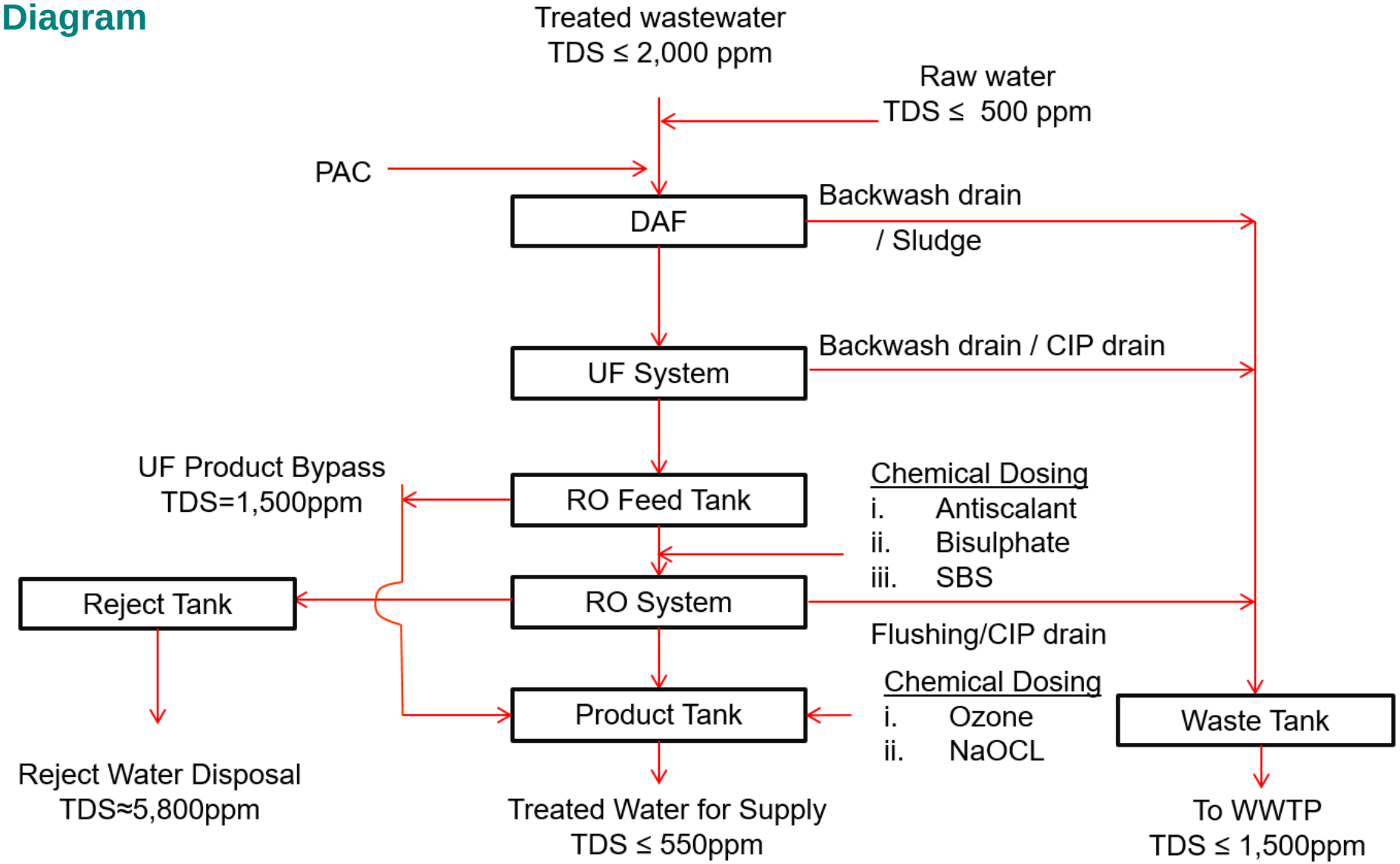
Ultra Filtration (UF)

RO (Reverse Osmosis)


Reclaimed Water RO quality for
industrial customer

# Water Reclamation Technology

## Process Block Diagram – DAF+UF+RO



# WRP – Conceptual Design

- Treated effluent from wastewater treatment plant will undergo further purification in the reclamation facilities.
- With the assumption of treated wastewater capacity of 10 MLD (10,000 m3/day), the recovery of 70% of wastewater can be produced with blending. Without blending the maximum recovery foreseen to be 60% only, subject to incoming water quality.
- The reclamation water quality produced is as shown:-

| Parameters | Raw Effluent * | DOE Standard A |
|---|---|---|
| pH | 6.0 -9.0 | 6.5 – 8.5 |
| Turbidity, NTU | - | ≤ 5 |
| $BOD_5$, mg/L | ≤ 20 | - |
| COD, mg/L | ≤ 80 | - |
| SS, mg/L | ≤ 50 | - |
| Total Dissolved Solid, mg/L | Nil | 500 |
| Ammoniacal Nitrogen, mg/L | ≤ 10 | - |

***Note: To be determined based on actual supply water characteristics produced.***

- Rejected water shall comply to DOE discharge standard A.

# A Hybrid Reclamation System

**10 MLD WWTP**

Equalization Pond

SBR

Holding Pond

**DOE Standard A**

Sludge Facilities

**7 MLD RWTP**

Dissolved Air Flotation

Multimedia Filtration

Ultrafiltration

Reverse Osmosis

**Industrial Use**

# WRP – Investment Costs

**7 MLD RWTP**

***Assumptions:***

| | | |
|---|---|---|
| BOT Years<br>years | = | 20 |
| Interest Rate | = | 8% |
| Minimum Take-Off-Pay (MTOP)<br>$m^3$/day | = | 7,000 |
| Operation Days<br>days | = | 360 |

**Capital Costs**

| | | |
|---|---|---|
| Costs (Excl. Land) | = | RM 20,000,000 |
| Capital Cost | = | **RM 0.41/$m^3$** |

**Tariff Calculated**

| | | |
|---|---|---|
| Capital Cost | = | RM 0.41/$m^3$ |
| Operation Cost | = | RM 0.98/$m^3$ |
| Interest Cost | = | RM 0.63/$m^3$ |
| Total | = | **RM 2.02/$m^3$** |

**Operation Costs**

| | | |
|---|---|---|
| Chemical | = | RM 0.24/$m^3$ |
| Power | = | RM 0.42/$m^3$ |
| Maintenance | = | RM 0.02/$m^3$ |
| Labour | = | RM 0.11/$m^3$ |
| UF Replacement | = | RM 0.09/$m^3$ |
| RO Replacement | = | RM 0.08/$m^3$ |
| Admin and Lab | = | RM 0.02/$m^3$ |
| Operation Cost | = | **RM 0.98/$m^3$** |

# Towards Sustainable Future

Through WRP and other green plus sustainability initiatives at IWK, it is our hope that we can steer towards a holistic approach of sustainability in the wastewater segment in this country.

| BY-PRODUCT REUSE | ENERGY EFFICIENCY | RENEWABLE ENERGY | GREEN ADMINISTRATIVE & GREEN HABITS |
|---|---|---|---|
| ➢ Bioeffluent Reuse | ➢ Energy Management | ➢ Biogas Reuse | ➢ Procurement Process |
| ➢ Biosolid Reuse | ➢ Energy Efficient Equipment | | ➢ Office & Administrative |
| | | | ➢ Green Habits |


IWK will be able to indirectly support at least 15 United Nations' Sustainable Development Goals (SDG)

# THANK YOU

**Indah Water Konsortium Sdn Bhd**
No. 44, Jalan Dungun, Damansara Heights
50490 Kuala Lumpur, Malaysia
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REGIONAL WATER TALKS

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zoom

# MALAYSIA SESSIONS

## THURSDAY | 5 AUGUST 2021

02.30pm – 04.00pm

# Individual Q&A Session

REGIONAL WATER TALKS

This session is sponsored by Endress+Hauser People for Process Automation

Organised By informa markets

zoom

# MALAYSIA SESSIONS

## THURSDAY | 5 AUGUST 2021

02.30pm – 04.00pm

### Speaker

**Tuan Haji Anuar bin Abdul Ghani**
Director of operations
Ranhill SAJ Sdn Bhd

### Topic

**Challenges of Creating a Climate Resillient Water Infrastructure**

REGIONAL WATER TALKS

Ranhill SAJ

# Challenges of Creating a Climate Resilient Water Infrastructure


By

*Anuar Abdul Ghani*

*Director of Operation*

*Ranhill SAJ Sdn Bhd*

# AGENDA

1. Introduction
2. Potential Climate Change Impacts On Water Supply Infrastructure
3. Challenges: Climate Resilient Water Infrastructure
4. Climate Change Impact In Johor
5. Infrastructure Adaptation to Climate Change in Johor
6. Conclusion

# Introduction

- The impact of climate change is increasingly important for the design, construction, and maintenance of water sector infrastructure. Average global temperatures are on the rise, causing cycles of extreme weather: droughts and flooding are becoming common; seawater levels are rising; and many locations are considerably drier, impacting water sources such as lakes and rivers.

- Water supply systems must meet the demands of expanding industry needs and rapid population growth. Pollution adds to the growing threats to water resources, increasing treatment requirements for providing safe water to consumers.

- Even without climate change, water utility companies face operational stresses to cope with basic issues of water management and service delivery and face the challenge of repairing or replacing aging infrastructure. Dealing with a host of pressing short-term issues often interferes with a utility's ability to plan for future impacts associated with climate change.

# Potential Climate Change Impacts On Water Supply Infrastructure

**Reduced precipitation**

- Direct changes in precipitation patterns and indirect changes in land use within the catchment can negatively impact surface water and groundwater availability.

**Changes in the Precipitation Patterns**

- Changes in the seasonality of precipitation patterns may affect the reliable yields from surface water such as rivers and reservoirs.

**Extreme Precipitation**

- Increased intensity of storms and extreme precipitation. Beyond the physical damage to structures, and the potential flooding, the possible occurrence of such events requires increased attention to the design of structures.

**Droughts**

- Prolonged drought can cause surface water level to drop significantly, either temporarily or permanently, thereby affecting the performance of water intake designed to abstract raw water at specific depths.

**Decrease in Water Quality**

- Multiple climate-influenced factors can negatively impact water quality, including increased siltation, algal blooms, and decreased capacity for the dilution of water contaminants.

**Increased Salinity**

- Reduce surface water dilution of salinity, impacting potable water supplies, or infrastructure longevity. Increased saline intrusion is also associated with climate change, especially in areas affected by sea level rise.

**Increased Mean Temperature**

- Evaporation losses from surface water reservoirs/dam may be expected to increase as temperatures increases, thereby reducing yields and increasing storage losses.

# Why Do We Need Climate Resilient Infrastructure?

Ensuring that infrastructure is climate resilient will help to reduce direct losses and reduce the indirect costs of disruption. New infrastructure assets should be prioritized, planned, designed, built and operated to account for the climate changes that may occur over their lifetimes.

# Challenges: Climate Resilient Water Infrastructure

**Operational Stress**

- Even without climate change, Water Operators face operational stresses to cope with basic issues of water management in service delivery and face the challenges of repairing or replacing aging infrastructure.
- Dealing with a host of pressing short-term issues often interferes with a utility's ability to plan for future impacts associated with climate change.

**Water Infrastructure Obsolete Design**

- Climate change is forecasted to render current operational designs of water infrastructure obsolete, given that maximum and minimum flow requirements will be exceeded or not met as a result of extreme weather events or droughts.
- Water supply planning has been based on historic levels of water availability and consumption, even though climate change is causing important shifts in these patterns.

**Water Supply Disruption**

- In the short-run, disruptions to service caused by climate are most frequently addressed through unpopular demand management strategies like rationing and service interruptions, which decrease revenues and increase costs of operation.

**Ad-Hoc Planning**

- Most plannings dealing with climate-related issues have been ad hoc in nature and not systematically coordinated, nor have them been based on sound principles of integrated water resource or water supply management.
- Although improvements have been implemented on the existing systems, more comprehensive planning is needed to address the long-term economic, social, and environmental impacts of climate change.

# Challenges: Climate Resilient Water Infrastructure

**Short Term Strategy**

- Majority of Water Operators have relied on short-term strategies to reduce water consumption, improve watershed management, and reduce non-revenue water losses rather than focus on comprehensive planning for the long term consequences of climate change.

**Delays and Deferred Delivery of Proposed Source Works**

- Delays in the completion of water resource projects such as construction of dams, ORS and raw water transfer have resulted in limited availability of raw water to meet the increasing water demand.
- The uncertainty in raw water availability has adversely affected the planning for the construction of water treatment plants

**High CAPEX**

- Long-term planning for the development of water infrastructure to address climate change requires a high CAPEX allocation.
- High operating costs in current water supply operation have restricted the efforts of water operators to provide budgets to upgrade the existing infrastructure.

**Delay Implementation In Water Tariff Adjustment**

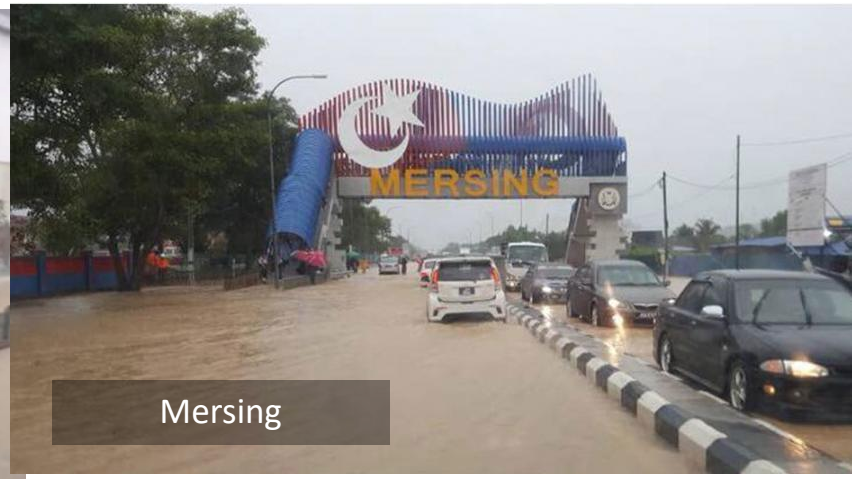
- All water operators in Malaysia face limited financial strength due to the delay in the implementation of water tariff adjustments.
- Based on the Tariff Setting Mechanism (TSM), water tariff adjustment should be implemented in stages to cover the increase in operating costs and CAPEX.

# Climate Change Impact In Johor

## Flood


Kota Tinggi 2006

Johor Bahru



Mersing

Kota Tinggi 2006


Segamat 2006

**Climate Change Impact on water supply infrastructure**

- Damage on water supply facilities such as water pumps and water treatment equipment.
- Slope failure
- Damage on pipeline infrastructure.
- Structural damage on water intake, reservoir, booster pump house and water treatment plan.

# Climate Change Impact In Johor

## Drought

Sg Gembut WTP Intake

Lok Heng WTP Intake

**Climate Change Impact on water supply infrastructure**

- River water level drop significantly, either temporarily or permanently.
- Affecting the performance of water intake designed to abstract raw water at specific depths.
- The low flow of raw water upstream results in insufficient raw water to be abstracted by water treatment plants.
- Raw water quality deteriorates and existing plant infrastructure is unable to treat raw water

# Infrastructure Adaptation to Climate Change in Johor

## Raw Water Transfer Scheme

1. **Water Transfer From Sungai Lenggor to Congok Dam**
   - To augment existing water resources for Mersing district
   - The implementation of Mersing Dam was deferred and decided to utilize Sg Lenggor raw water transfer due to low demand of the district
   - Raw water pumping capacity of 16 Mld, 600mm dia x 35km of pipe, break pressure tank and outlet to Congok Dam was commisioned on 18 May 2017

2. **Water Transfer From Sungai Lukah to Lok Heng**
   - To augment existing water resources for Kota Tinggi district
   - The implementation of Mersing Dam was deferred and decided to utilize Sg Lenggor raw water transfer due to low demand of the district
   - Raw water pumping capacity of 10 Mld, 300mm dia x 3.6km of pipe, direct to Lok Heng WTP intake, was commisioned on 12August 2020

3. **Water Transfer from Tasik Biru to Layang Dam**
   - To increase raw water capacity for Sungai Layang WTP
   - Raw water pumping capacity of 20MLD with 2km of pipeline
   - Total cost : RM380k

4. **Water Transfer from Cabang Tiram to Layang Dam**
   - To increase raw water capacity for Sungai Layang WTP
   - Raw water pumping capacity of 30MLD with 3.5km of pipeline
   - Total cost : RM 2.1mil

# Infrastructure Adaptation to Climate Change in Johor

## Proposed New Source Works

### 1 Feasibility Study of Sungai Sedili Besar Barrage

- To consolidate and study the feasibility of Barrage and ORS to increase the yield at Sedili Besar Basin to meet demand of Johor Bahru, Pasir Gudang, PIPC and Kota Tinggi up to year 2060.

### 2 Feasibility Study of Sungai Pontian Besar Barrage

- To conclude effective strategy for potential raw water source development works for sustainable clean water supply up to year 2050 for Johor Bahru & Pontian

### 3 ORS Sungai Johor

- To ascertain and develop a sustainable water resource utilizing the flow of Sg Johor that would provide additional raw water for Iskandar Malaysia.
- Specific aim is to develop an ORS capable of providing an additional 400 MLD to the overall raw water supply.

### 4 Sungai Muar Barrage

- To meet the water supply and demand requirement as well as to provide better control on saline and water quality issues faced along Sungai Muar.

# Infrastructure Adaptation to Climate Change in Johor

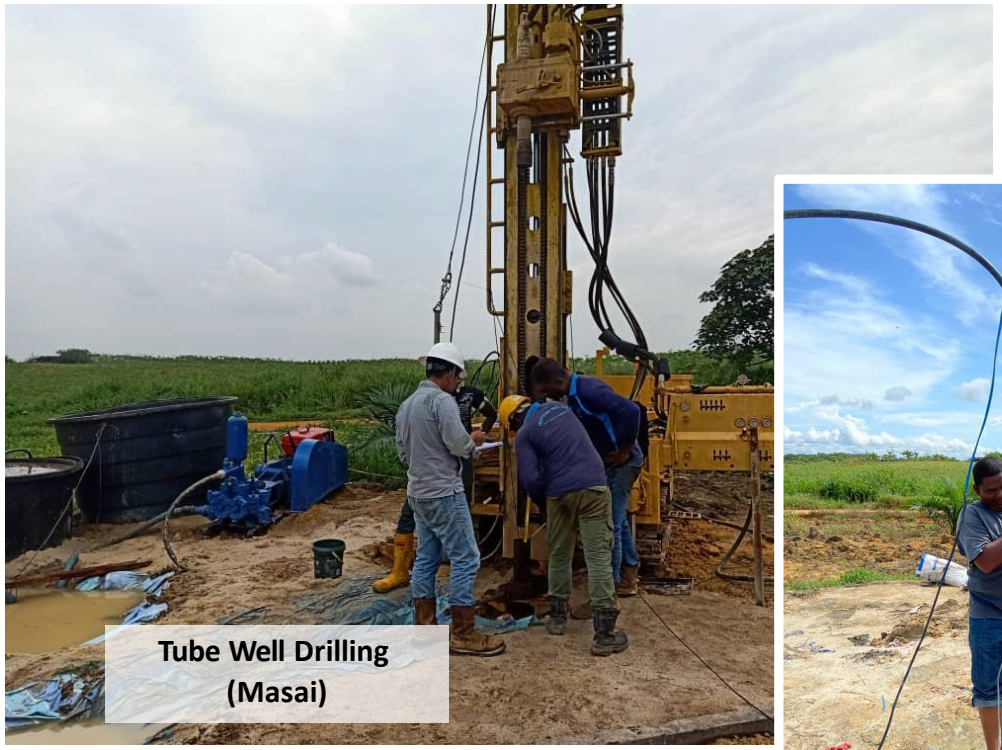
## Ground Water Study & Exploration

- Ranhill SAJ has been conducting groundwater research and exploration since 2017.
- Collaboration with several consultants, academic specialists and the Department of Minerals and Geosciences Malaysia to conduct groundwater exploration studies at several locations throughout the State of Johor

| No | Project | Year | Scope | Status |
|---|---|---|---|---|
| | **Deep Groundwater Study** | | | |
| 1 | Johor Groundwater Study – Phase 1 | 2017-2018 | Desktop Study | Completed & awaiting final report |
| 2 | Johor Groundwater Study – Phase 2 | 2018-2019 | Airborne Electro-Magnetic (AEM) Survey Study On Potential Region (1km spacing line) | |
| 3 | Johor Groundwater Study – Phase 3A | 2019-2020 | Detailed AEM survey (200m spacing line) + Ground Geophysics on Potential Areas | |
| 4 | Johor Groundwater Study – Phase 3B | 2020-2021 | Soil Investigation and Groundwater Assessment | |
| 5 | Johor Groundwater Study – Phase 4 | 2020 | High Level Conceptual Design For Groundwater Treatment Plant | |

# Infrastructure Adaptation to Climate Change in Johor

## Ground Water Study & Exploration



Tube Well Drilling (Masai)

Pumping Test Well (Ladang Keck Seng)

Pumping Test (Ladang Basir)

SI Drilling (Ladang Basir)

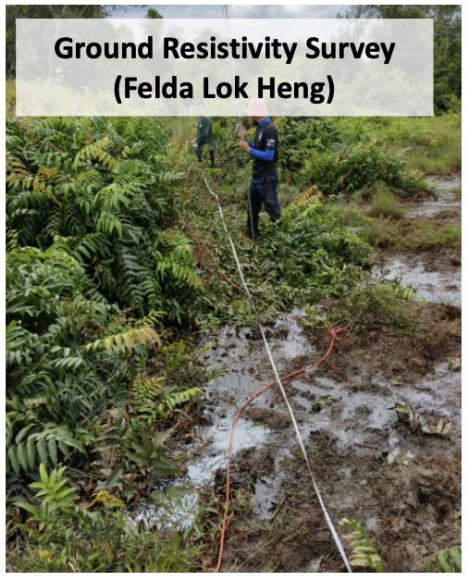
# Infrastructure Adaptation to Climate Change in Johor

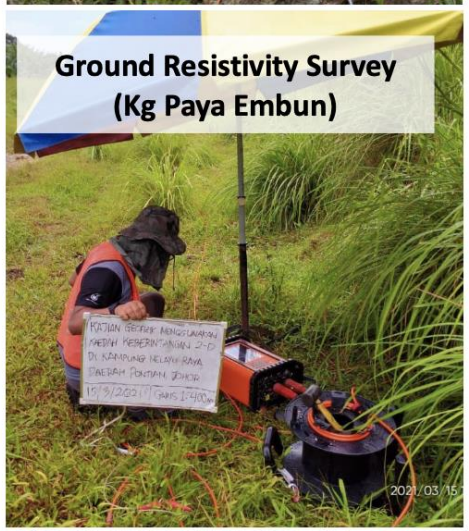
## Riverbed Ground Water Study & Exploration

| No | Project | Year | Scope | Status |
|---|---|---|---|---|
| | **Shallow Groundwater Study** | | | |
| 1 | Hydrogeological Study at Felda Lok Heng & Waha, Kota Tinggi, Johor | 2020 | Ground Geophysics & Soil Investigations | Completed (Potential 4 mld at Felda Waha) |
| 2 | Hydrogeological Study at Endau WTP (Area 1), Mersing Johor | 2020 | Ground Geophysics & Soil Investigations | Completed & low potential |
| 3 | Hydrogeological Study at Endau WTP (Area 2), Mersing Johor | 2020 | Ground Geophysics & Soil Investigations | |
| 4 | Hydrogeological Study at Sg Gembut, Kota Tinggi, Johor | 2020 | Ground Geophysics & Soil Investigations | |
| 5 | Groundwater Study At Sungai Simpang Arang, Gelang Patah, Johor | 2020 | Ground Geophysics, Soil Investigations and Test Well | Completed (Brackish) |
| 6 | Hydrogeological Study at Sg Air Hitam,Kampung Paya Embun, Pekan Nenas, Pontian, Johor | 2021 | Ground Geophysics, Soil Investigations and Test Well | Completed & awaiting final report |
| 7 | Design, Construction, Testing And Commissioning For 4 Mld Horizontal Collector Well (HCW) For Lok Heng Wtp, Kota Tinggi, Johor. | 2021 | Design & Build a 4MLD capacity Horizontal Collector Well (HCW) | Award process |

# Infrastructure Adaptation to Climate Change in Johor

## Riverbed Ground Water Study & Exploration

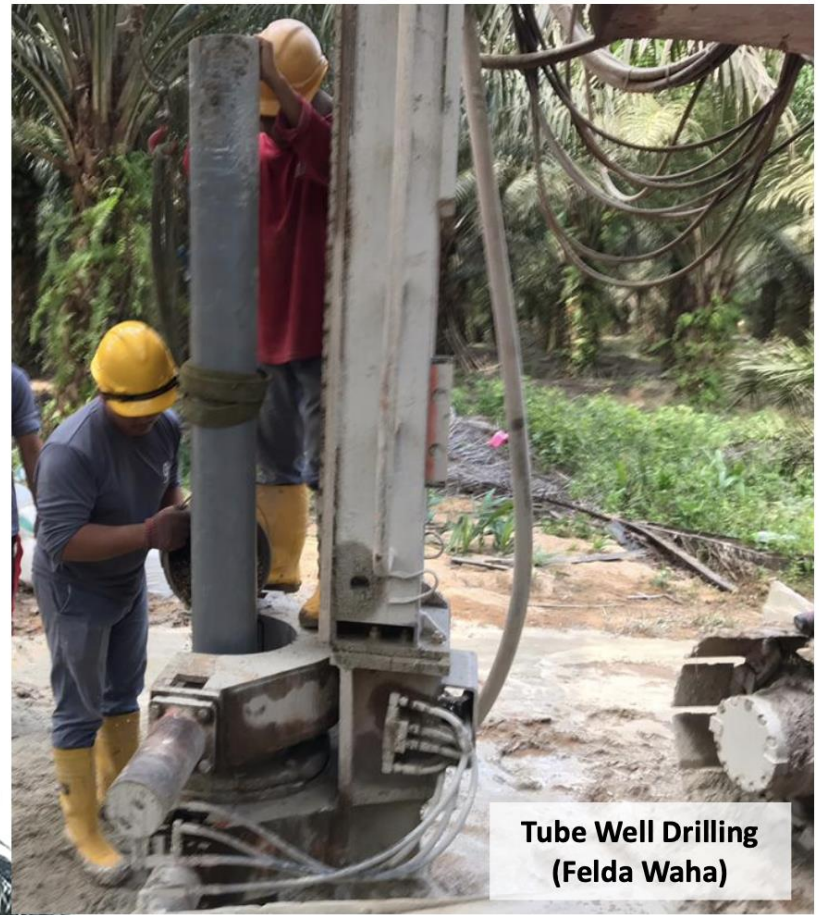

Ground Resistivity Survey (Felda Lok Heng)



Ground Resistivity Survey (Kg Paya Embun)


Tube Well Drilling (Kg Paya Embun)


Tube Well Drilling (Kg Paya Embun)

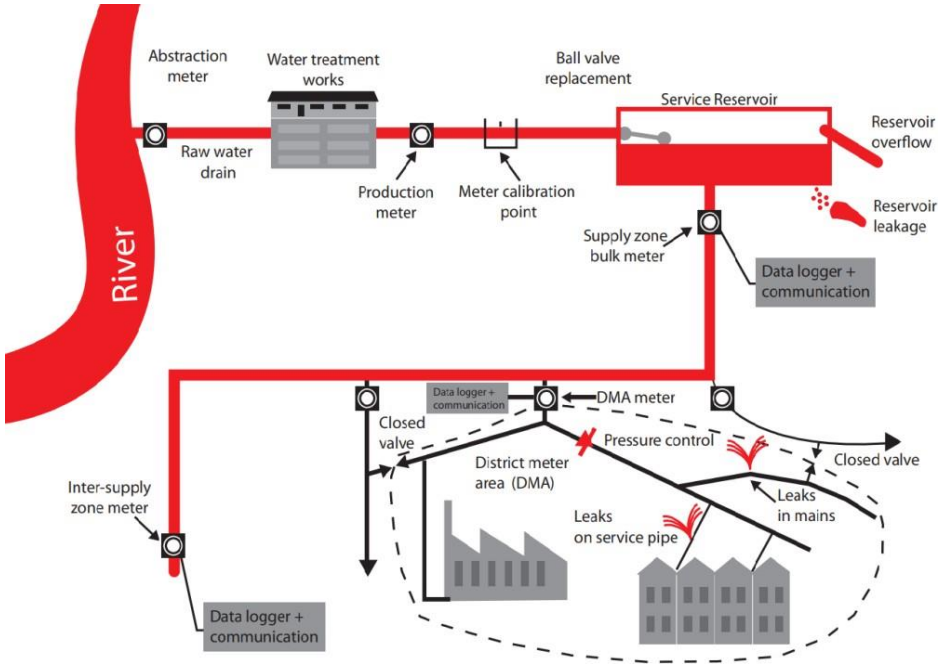

Tube Well Drilling (Felda Waha)

# Infrastructure Adaptation to Climate Change in Johor

## NRW Control

There is an increased awareness for the need to address the problem of NRW and there are important drivers pushing for their development, mainly related to:

i. Secure water availability
ii. Manage water stress
iii. Fight climate change
iv. Promote utilities sustainability

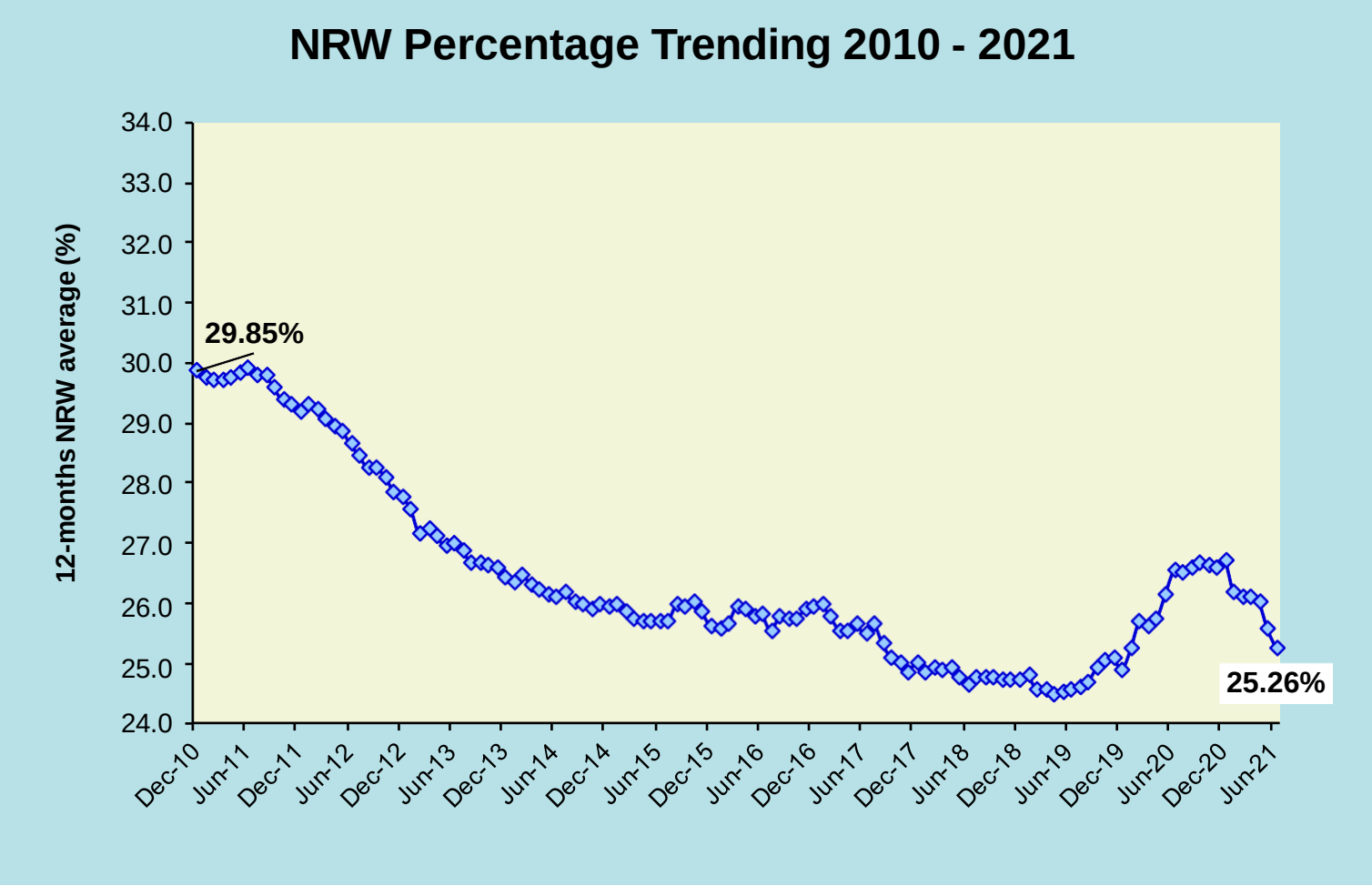



**Main drivers are:**

1. Fast growth of towns and cities
2. Negative impact of climate change and increasing water scarcity
3. Increasing demand for treated water and growing gap between demand and supply
4. Growing awareness that water systems must be efficiently operated, and maintained
5. Demand for a high-quality service
6. Increased availability of funding to improve water operations efficiency
7. Need to improve infrastructure resilience to climate change
8. Development of contractual models where the service provider assumes part of the risk
9. The need to contribute to meeting the Sustainable Development Goals

# Infrastructure Adaptation to Climate Change in Johor

## NRW Control




2020
Water Produced = 1,895 mld
NRW Volume = 506 mld
NRW % = 26.7%

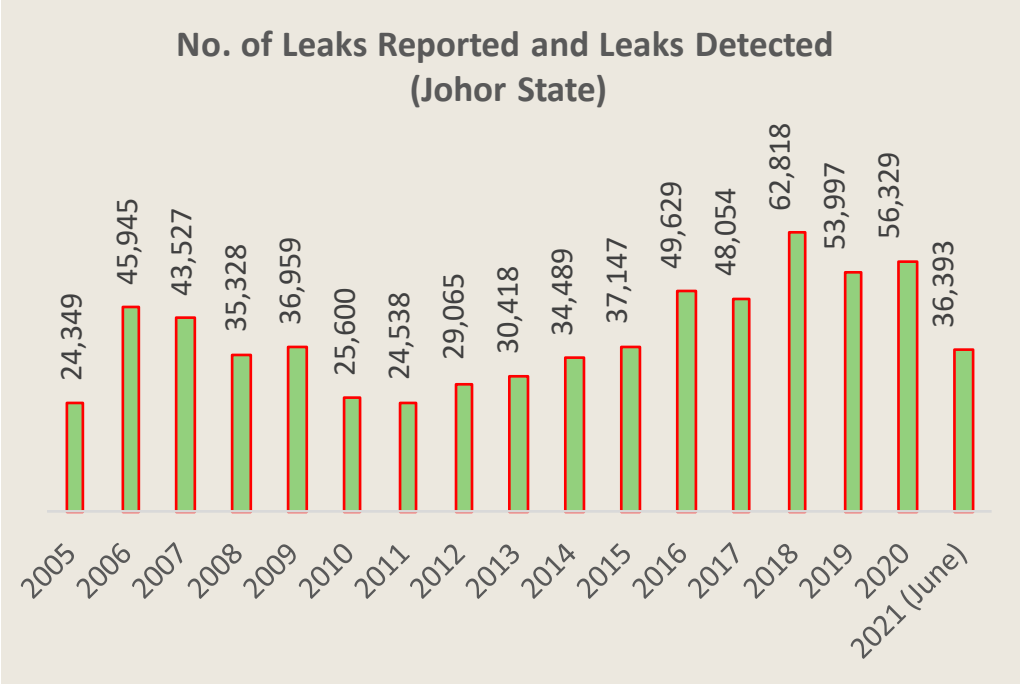
- Current pipe length excluding raw water: 23,338 km
- AC pipe length excluding raw water: 6,511 km (28%) – main contributor to physical loss due to pipe aging
- Physical losses: 148,032,405 m3 (21.3% of total NRW Volume)
  - Background losses: 144,112,279 m3 (97%)
  - Pipe burst: 3,876,815 m3 (3%)

# Infrastructure Adaptation to Climate Change in Johor

## NRW Control

### Pipe Repair and The Preservation of Water Supply

- One of the ways in which the loss of vital water can be prevented is by repairing damaged pipes.




### NRW Control Program Performance 2011 – 2021 (ALC)

| Contract | J2 | J3 | J4 | J5 | J6 |
|---|---|---|---|---|---|
| Contract Period | 2011 - 2013 | 2013 - 2015 | 2015 - 2017 | 2017 - 2019 | 2019 - 2021 |

| District | Reduction (mld) | Reduction (mld) | Reduction (mld) | Reduction (mld) | Reduction (mld) |
|---|---|---|---|---|---|
| Johor Bahru | 15.7 | 13.1 | 11.3 | 24.0 | 11.4 |
| Batu Pahat | 8.9 | 7.8 | 11.3 | 5.7 | 4.1 |
| Muar | 2.6 | 9.6 | 7.0 | 7.1 | 2.9 |
| Kluang | 5.3 | 4.9 | 2.4 | 4.6 | 1.5 |
| Kota Tinggi | 1.7 | 2.3 | 1.3 | 4.0 | 1.2 |
| Segamat | 1.6 | 2.6 | 3.4 | 3.0 | 1.5 |
| Pontian | 1.6 | 1.3 | 1.7 | 1.9 | 0.3 |
| Mersing | 1.6 | 0.1 | 0.7 | 0.2 | 0.5 |
| **JOHOR** | **39.0** | **39.1** | **39.1** | **50.4** | **23.4** |

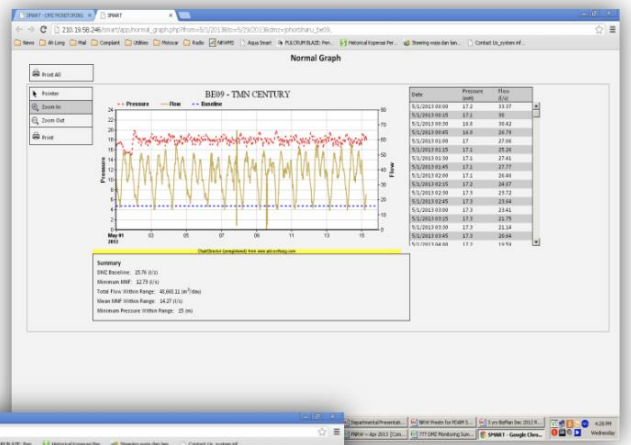
# Infrastructure Adaptation to Climate Change in Johor

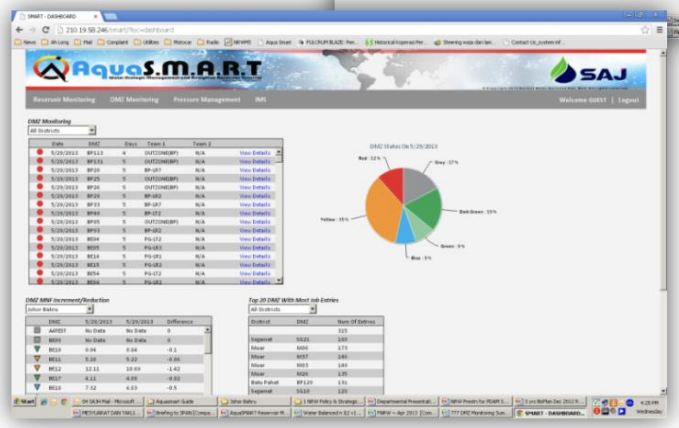
## NRW Control

## Monitoring of DMZs Night Line Trending & Reservoir Level

## Web Based AquaSMART System

- ✓ **Strategic Management and Analytical Resource Terminal** (SMART)
- ✓ **AquaSMART** is a web-based Non Revenue Water (NRW) operation system.
- ✓ AquaSMART is about capitalizing field data for immediate operational application.




### Basic Information

- Type of Meter DMZ
- DMZ Properties (Established Date, Connection, Pipe Length, T-factor etc)
- Type of Data (Flow & Pressure)
- Daily flow, Volume, MNF, NNF, CARL, UARL, ILI


### Advantage:-

- Integrate all DMZ with SMS loggers in one system.
- Easy to monitor all DMZ in one day.
- Easy to analyzed for generating the result/making decision.
- Taking a short time to know the problematic DMZ.
- Action and response immediately.
- Can locate and specify the cases in each problematic DMZ quickly.
- Management reporting.
- Less logger battery consumption.

# Infrastructure Adaptation to Climate Change in Johor

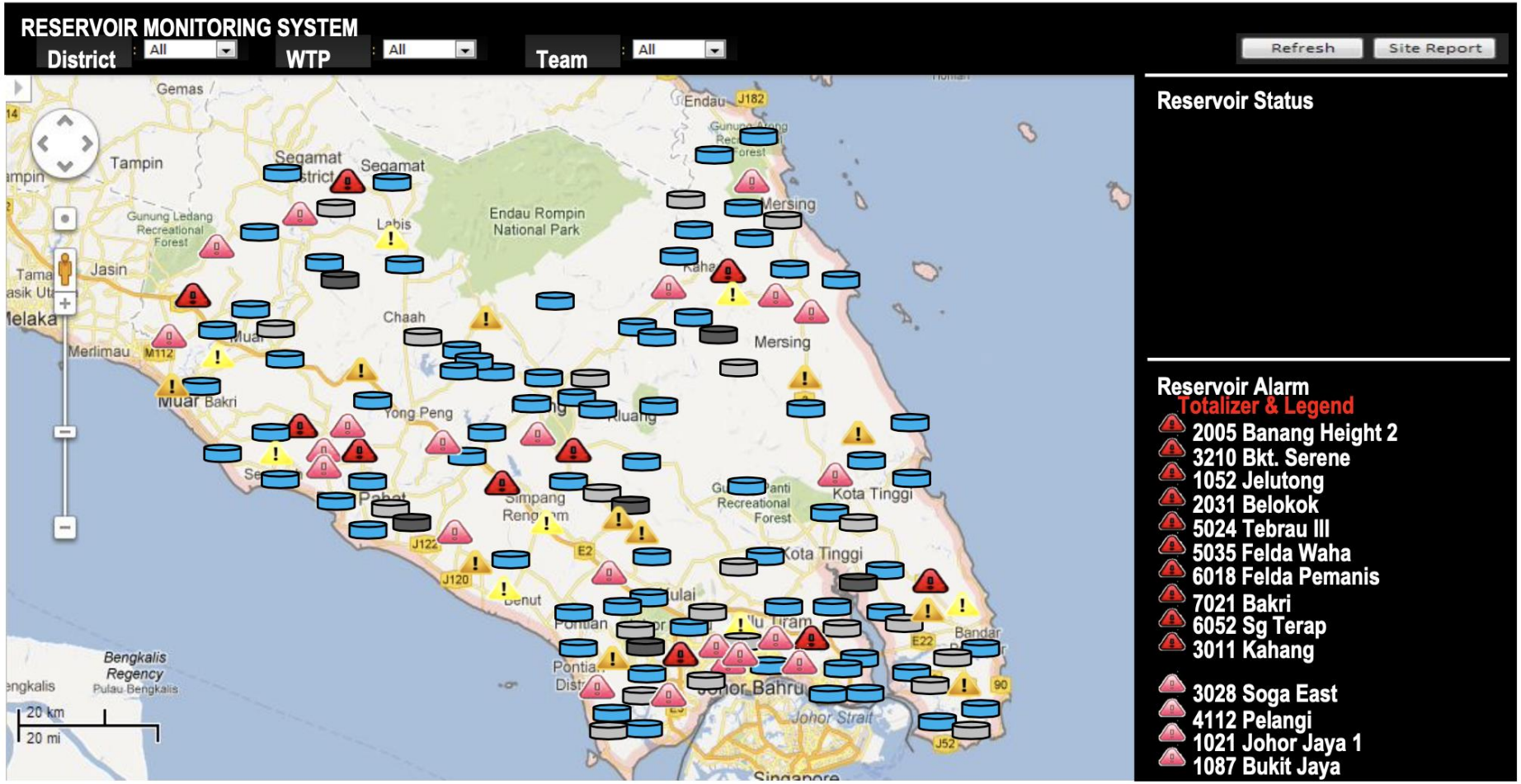
**NRW Control**

## Monitoring of DMZs Night Line Trending & Reservoir Level

## Web Based AquaSMART System

**LEGEND**

- Overflow
- (HH)
- Storage Emptying (LL)
- Low Water Level Warning (L)
- Normal (N)
- Data Problem
- Reservoir Inactive



# Infrastructure Adaptation to Climate Change in Johor

## Pipe Replacement Program

| Rehab Program (Year) | Total DMA (nos) | Total Connection (nos) | Rehab Length (km) | Total Cost Estimated (mil RM) | Target Total Saving (mld) |
|---|---|---|---|---|---|
| 2018/ 2019 | 94 | 43,144 | 183.2 | 215.0 | 42 |
| 2020 | 105 | 50,553 | 281.4 | 280.0 | 44 |
| 2021 | 91 | 53,685 | 223.0 | 275.0 | 29 |
| 2022 | 48 | 31,126 | 154.4 | 165.3 | 15 |
| **TOTAL** | **338** | **178,508** | **842.0** | **935.3** | **130** |

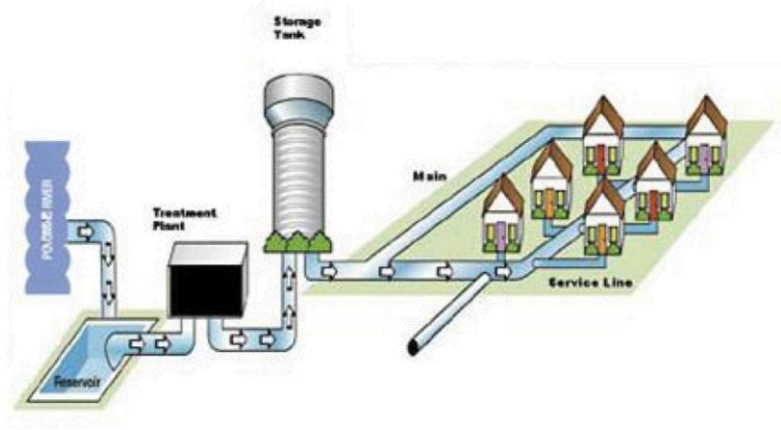
**Pipe Replacement and Reducing The Effects of Climate Change On Water Supply**

- Water supplies are becoming scarce in certain parts of the Johor, it has never been more important to prevent water waste.
- Pipe replacement has a role to play in the battle to save water and stop vital reserves from being unnecessarily diminished.

# Infrastructure Adaptation to Climate Change in Johor

## Zero Disruption Program

- In the OP5 Business Plan approved by SPAN, we will implement a zero disruption program.
- This program is a 6-year planning that involves the construction of water storage tanks at strategic locations that can last for at least 24 hours and upgrade existing distribution pipes.




| District | No. of Project | Estimate Cost (RM-Mil) | Completion Target |
|---|---|---|---|
| Johor Bahru | 9 | 152.0 | 2025 |
| Batu Pahat | 6 | 51.0 | 2026 |
| Muar | 10 | 96.0 | 2026 |
| Kota Tinggi | 4 | 3.5 | 2024 |
| Pontian | 10 | 69.5 | 2024 |
| Mersing | 4 | 5.8 | 2024 |
| Kluang | 6 | 9.0 | 2024 |
| Segamat | 1 | 11 | 2023 |
| **Total** | **50** | **397.8** | |

# Infrastructure Adaptation to Climate Change in Johor

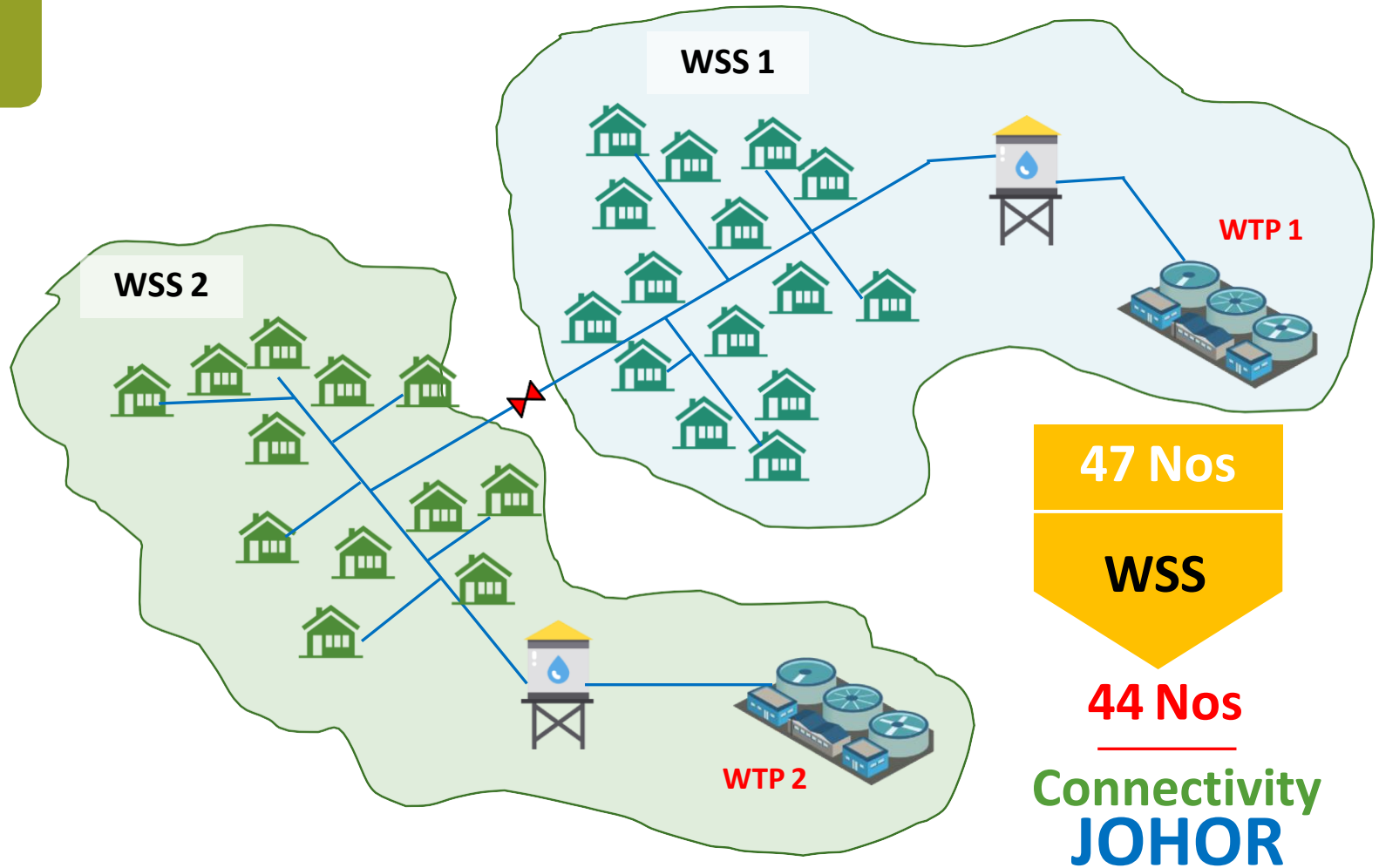
## Interconnectivity Within Water Supply System (WSS)

1. Connectivity between two or more water supply systems will help to reduce the stress in the water distribution system in times of crisis.

2. Since 2010 Ranhill SAJ has implemented a water supply system connectivity project involving almost 90% of water treatment plants in Johor and resulting in minimizing water supply disruption to consumers.

3. The process of rezoning the water distribution system will be executed when the supply boundary valve is opened to supply the problematic supply areas.

4. Only a few water treatment plants in remote areas are not connected between two or more water supply systems due to poor viability. However, we are still studying several options to ensure that disruption to these isolated plants will be minimized.




**47 Nos**

**WSS**

**44 Nos**

**Connectivity**

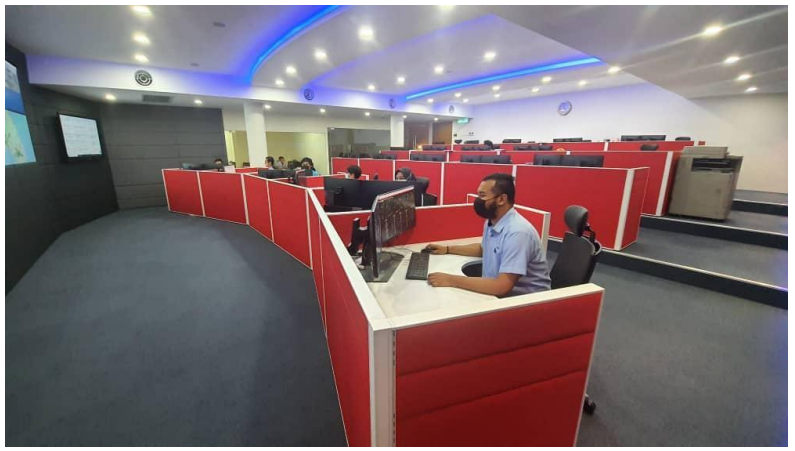
**JOHOR**

**94%**

# Infrastructure Adaptation to Climate Change in Johor

## Command Center

- We have embarked on digital transformation with the setting up of a command center at Ranhill SAJ headquarters.
- The command center will enable us to gather data on the state's water supply system and update us with real-time information.
- Any detected anomalies in the water supply system can be quickly addressed to avoid further issues.



# Infrastructure Adaptation to Climate Change in Johor

**TRIGGER ALARM (MONITORING)**

## Command Center

SCADA System

Raw Water Pump
- Pump Monitoring

WTP
- SCADA
- RMS

Hydraulic Modelling, SCADA, Telemetry, GIS, Billing System









Intake
- Detect Ammonia

RW Flowmeter
- Calculate raw water volume

TW Flowmeter
- Calculate treated water volume

Reservoir and Pump House
- Gussmann
- Aquasmart

Hydraulic System (DMA and Pressure Management)
- Aquasmart

Customer
- Mobile Apps
- SMS

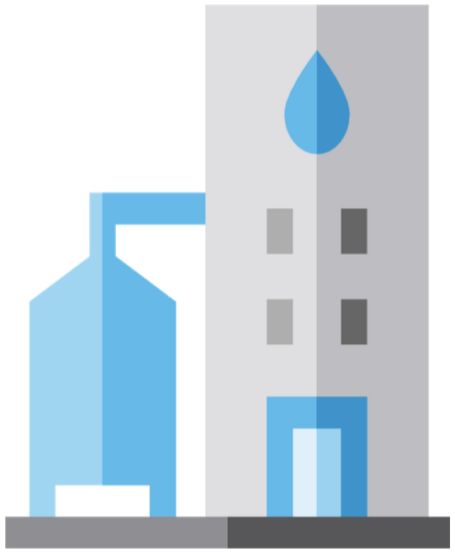
Production Volume

Buffer / NRW
Revenue

Volume Water Sold

# Infrastructure Adaptation to Climate Change in Johor

## Command Center



## WTP Dashboard

Raw and Treated Water Pump

- Remote pump control operation if necessary.
- To ensure that the plant is running at the required demand.

### Raw Water Intake

- Current level of intake at rivers and dams.
- The water level projection before it reaches alert, critical or minimum levels.

### Raw Water and Treated Water Quality

- To monitor the raw water quality at intake.
- Ensuring that the quality of treated water meets the company's standards and Kementerian Kesihatan Malaysia (KKM).

### Power Quality Monitoring

- TNB incoming power monitoring in case of tripping, low voltage or over voltage.

### Raw and Treated Water Flowrate

- Monitoring of water flow rate for raw water and treated water.

# Infrastructure Adaptation to Climate Change in Johor

## Command Center

## Reservoir & BPH Dashboard

### Booster Pump House

- Monitoring of BPH operation for power quality, level, pump operation and flow rate.
- Remote control pump operations in case of an emergency.
- Early warning detection in case of BPH is not operating (TNB failure, trip etc) or overflow occurs.

### Reservoir

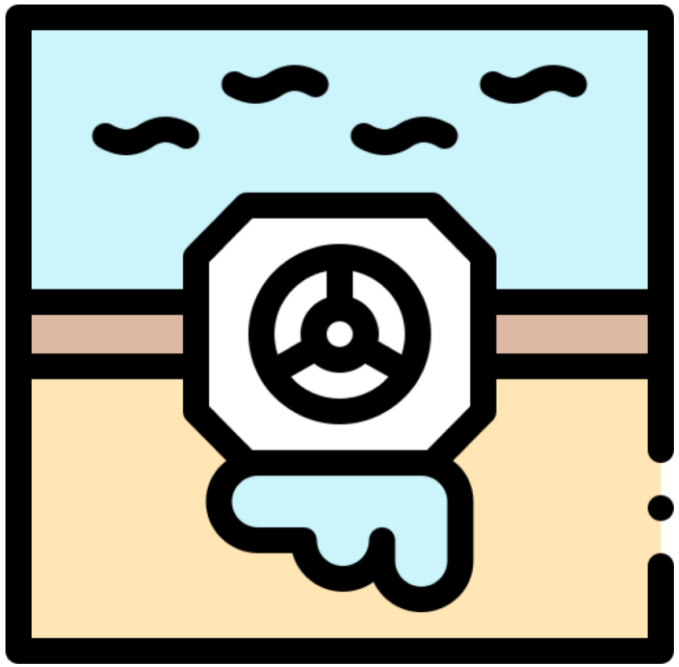
- Monitoring of tank level to avoid overflow (HH) and low level (LL).
- Alert will be triggered if level is too high or too low.

### Distribution Valve

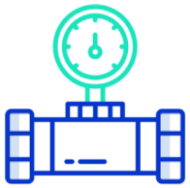
- Monitoring and remotely control distribution valve and reservoir level (on-line).

# Infrastructure Adaptation to Climate Change in Johor

## Command Center



***Hydraulic Dashboard***

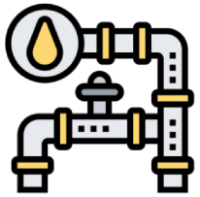


### District Meter Area (DMA)

- Monitoring of demand or water consumption of certain areas.
- Assessment of consumption during peak/off peak time.

### Pressure Management System

- Current pressure monitoring in critical areas.
- Early warning detection in case of pipe burst.
- Monitor water distribution during peak/off-peak hours, during crisis and after shutdown activities.



### Hydraulic Modelling

- Simulation of water supply system to conduct study for current water supply system.

### Water Supply System

- Monitoring the water pipeline from water treatment plant to consumers.

# Infrastructure Adaptation to Climate Change in Johor

## Other Climate Resilient Infrastructure

## Elevate Platform Level


Based on the flood event experience in 2006, we have redesigned the position of electrical equipment such as instrument panel and transformer to avoid flood by raising the level of the building platform.

# Infrastructure Adaptation to Climate Change in Johor

## Other Climate Resilient Infrastructure

## Installation of Inflatable Rubber Dam

- ✓ In the face of the prolonged dry season, we have built an inflatable rubber dam to raise the water level at the intake.
- ✓ We have built rubber dams at the Sg Mersing and Air Panas water treatment plant where they have shown excellent performance in preventing disruption of raw water flow.
- ✓ In the OP5 Business Plan approved by SPAN, we will build 2 more at Kg Tengah and Pemanis water treatment plant which are expected to be completed in 2023

# Conclusion

1. Water operators need to perform risk assessment on the existing water supply infrastructure taking into account all the possibilities and effects of climate change in order to prevent the failure of treated water supply to consumers.

2. Without adequate treated water reserved margin and sufficient raw water resources to meet the future demand, the water operators will face difficulties to face the effects of climate change.

3. Real time data analysis needs to be done by Water Operators to assess the deterioration of climatic conditions and its impact on the supply of treated water. This helps the Water Operators to be prepared for all possibilities and helps them in choosing the necessary actions to prevent the situation from worsening.

4. The Government's commitment is required to ensure that the provision of raw water resources infrastructure is completed as planned and in line with the water supply demand projections made by Water Operators.

5. In order to ensure that Water Operators could afford to pay the lease rental on loans made to develop climate resilient water infrastructure, the Government should allow water tariff adjustment to be implemented.

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# MALAYSIA SESSIONS

## THURSDAY | 5 AUGUST 2021

02.30pm – 04.00pm

# Individual Q&A Session

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# MALAYSIA SESSIONS

## THURSDAY | 5 AUGUST 2021

02.30pm – 04.00pm

### Speaker

**Anne Lim**
Division Marketing Manager
Endress+Hauser Malaysia

### Topic

**Digitalization towards Water Sustainability and Resilience**

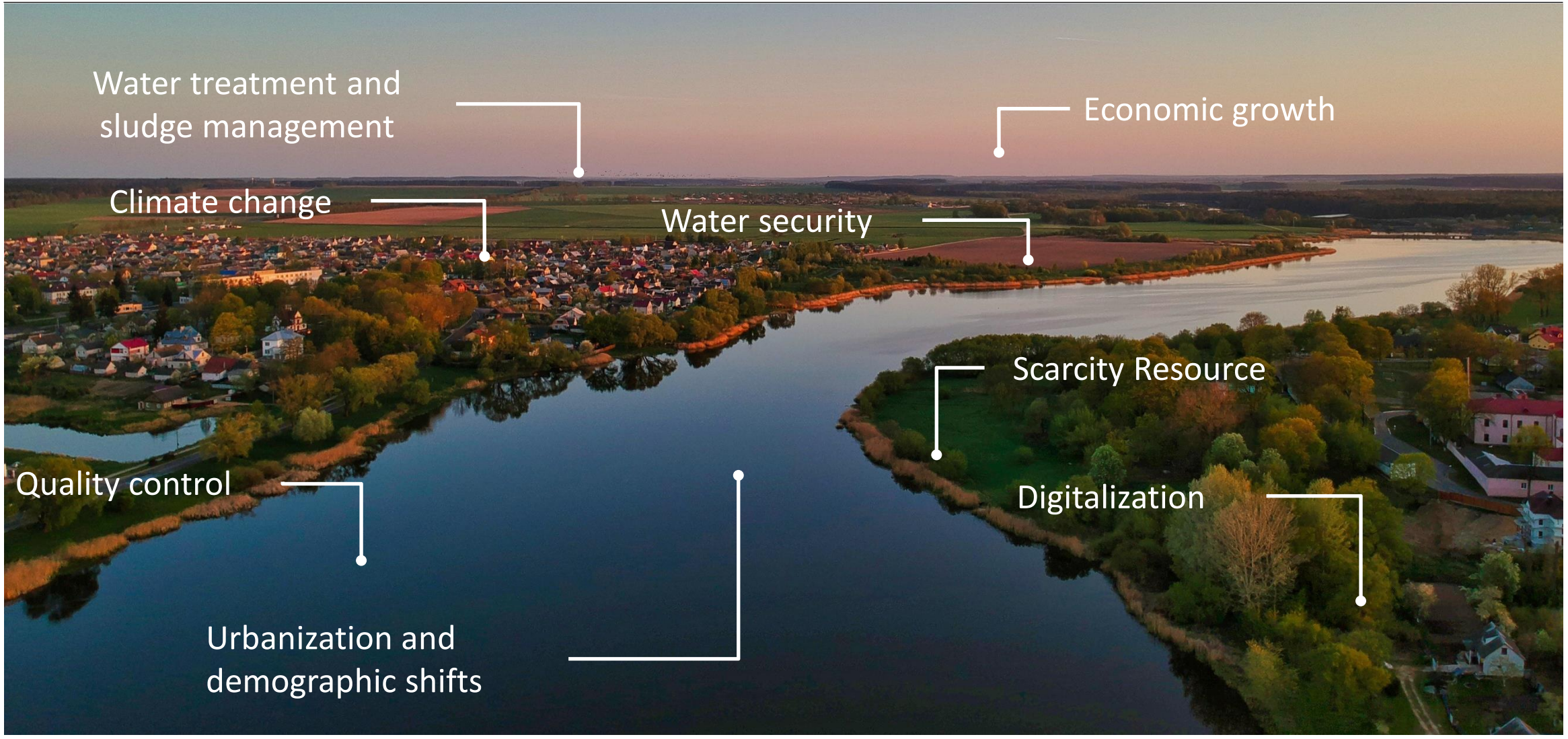
# Digitalization towards Water Sustainability and Resilience

Optimize and automate your water networks anywhere, anytime




Endress+Hauser
People for Process Automation

# Water Industry Hot Spots and Challenges



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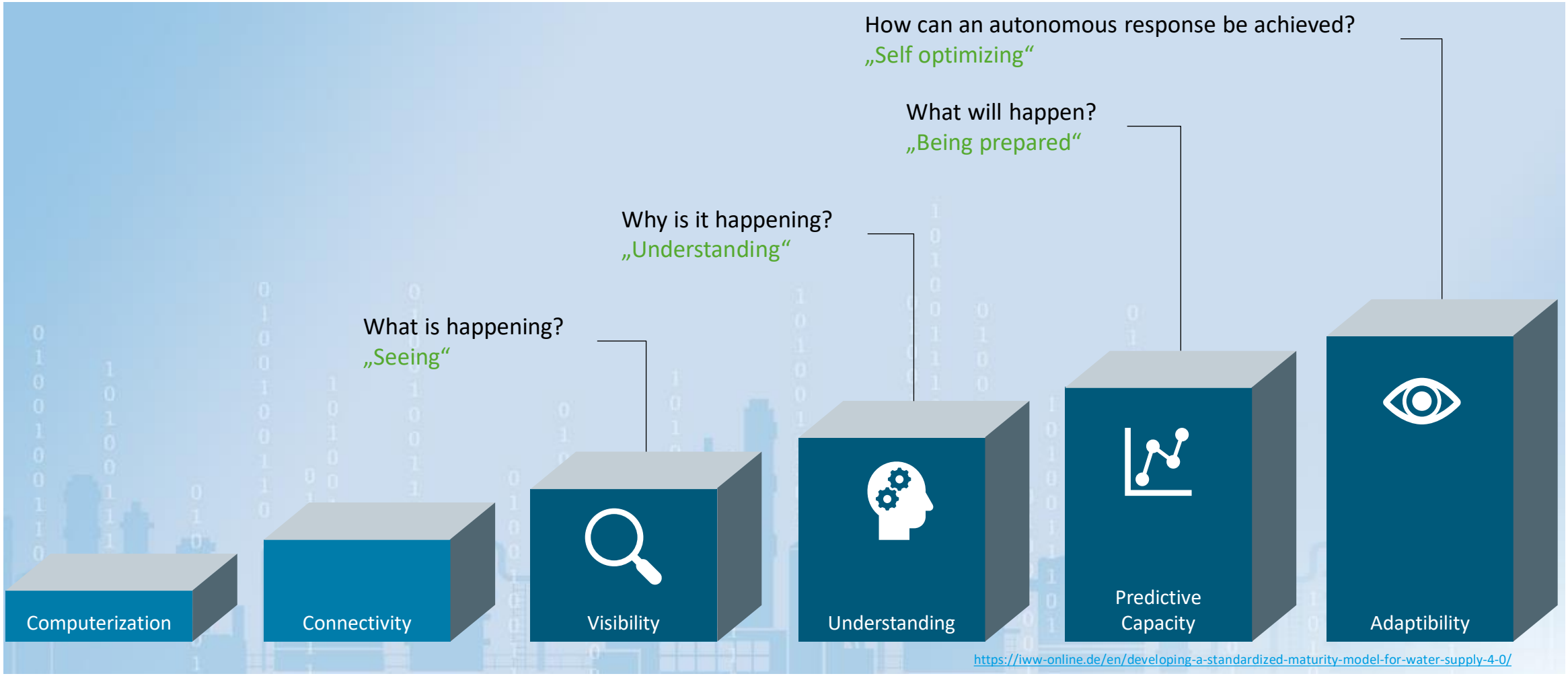
# Digital Maturity Model



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# Producing Data

**>40 million**
sensors installed globally

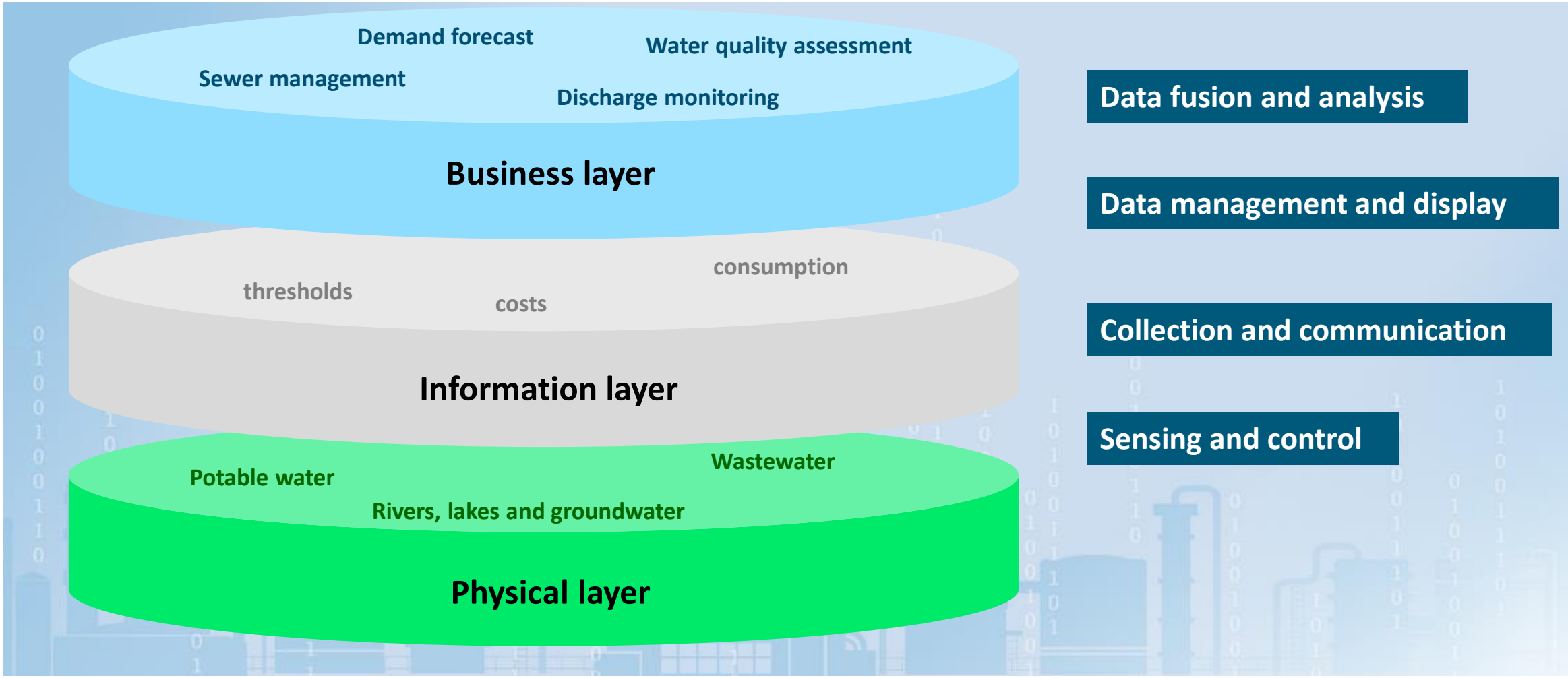
**>90%**
equipped for digital communication

**This data holds the key to new optimization and value creation opportunities**



Endress+Hauser

# Digitalized Water Management Outlook



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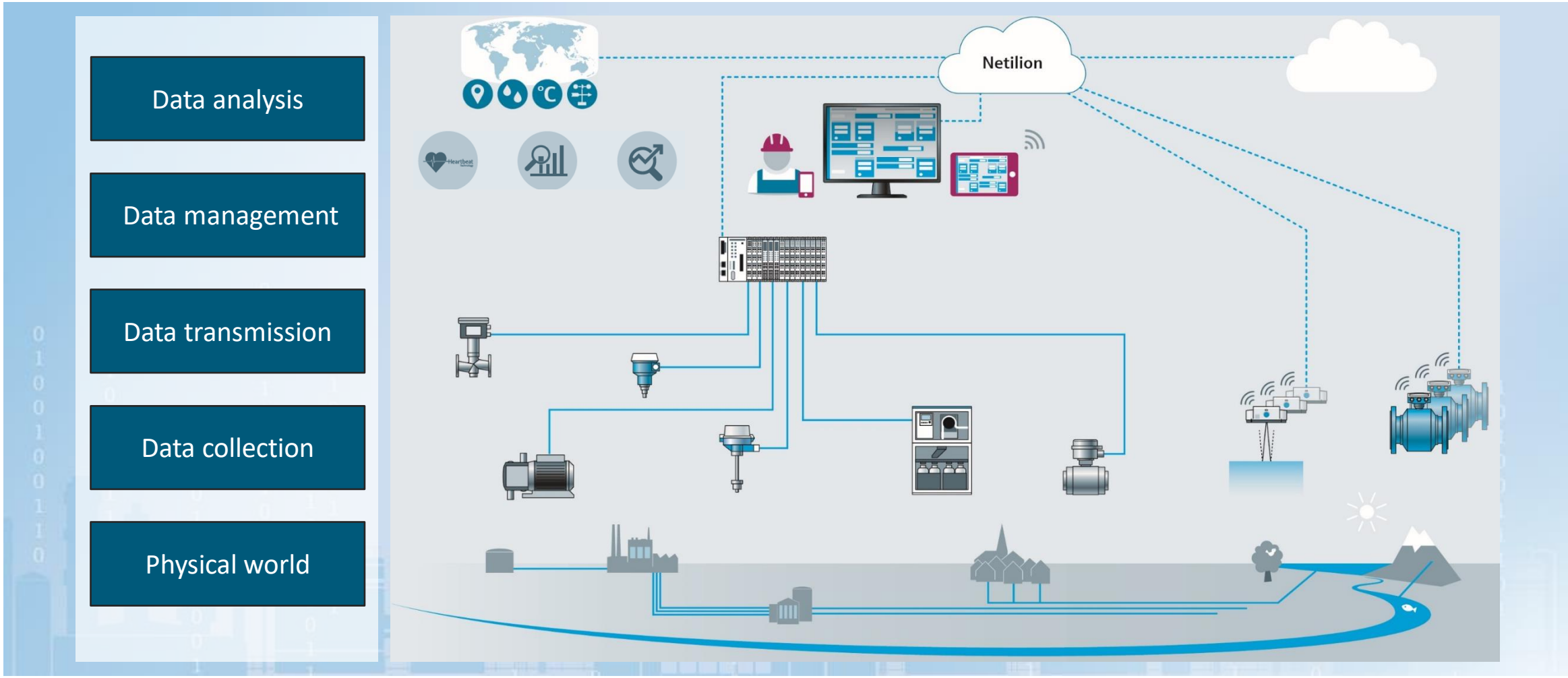
# The Future of Water is Digital, Secure and Efficient



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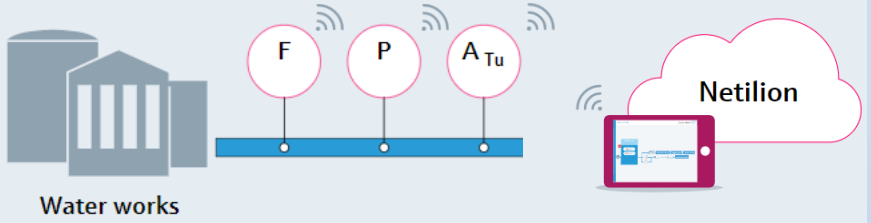
# Distributed Water Applications


## 3: Water Distribution




**Remote Monitoring & Maintenance to:**

- Detect water losses
- Report water consumption
- Enable consumption-based billing
- Remote verification to ensure accuracy

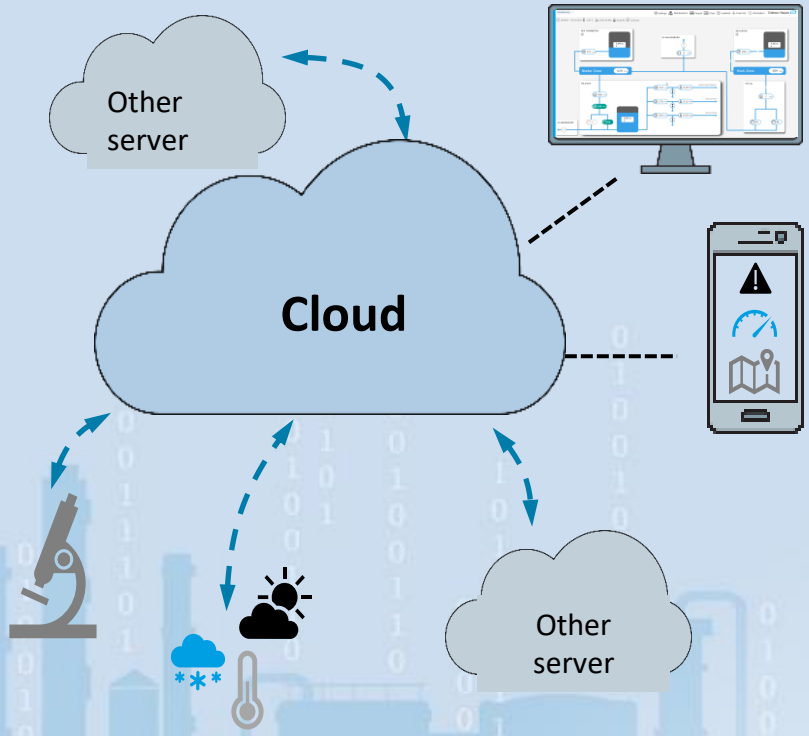


Endress+Hauser

# Battery Powered and IIoT Ready Instrumentations

Battery Powered
Radar Level Sensor

Battery Powered
Magnetic Flowmeter



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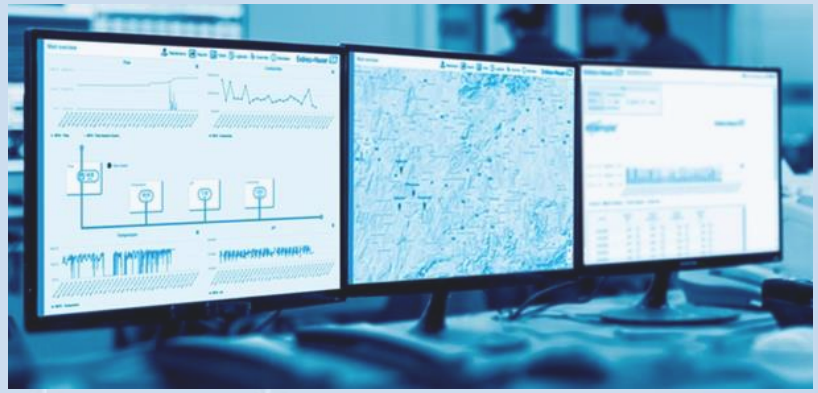
# Digital Service - Management, Visualization and Analysis

**Web-based Monitoring**
SCADA visualization, dashboards, data trending, reporting, alarms, notifications, …

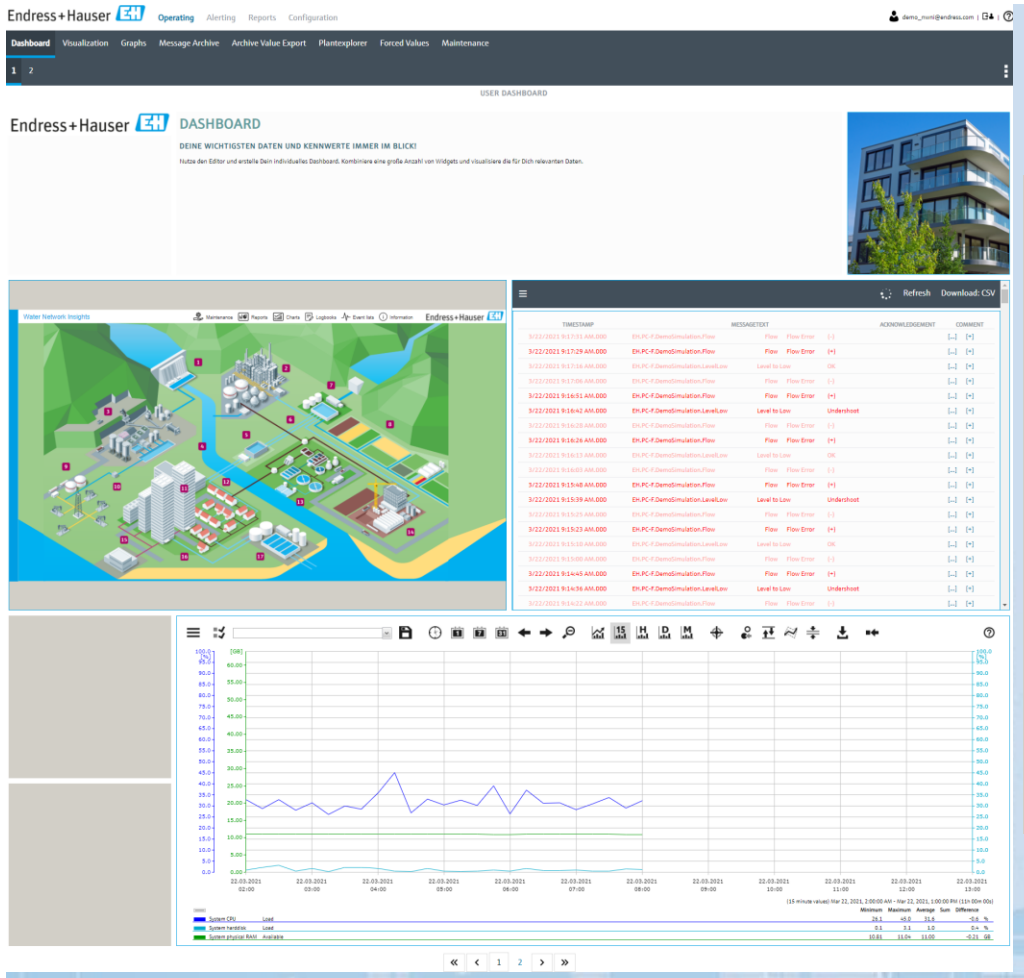
**Data Integration and Data Fusion**
E+H and all third-party field devices and services

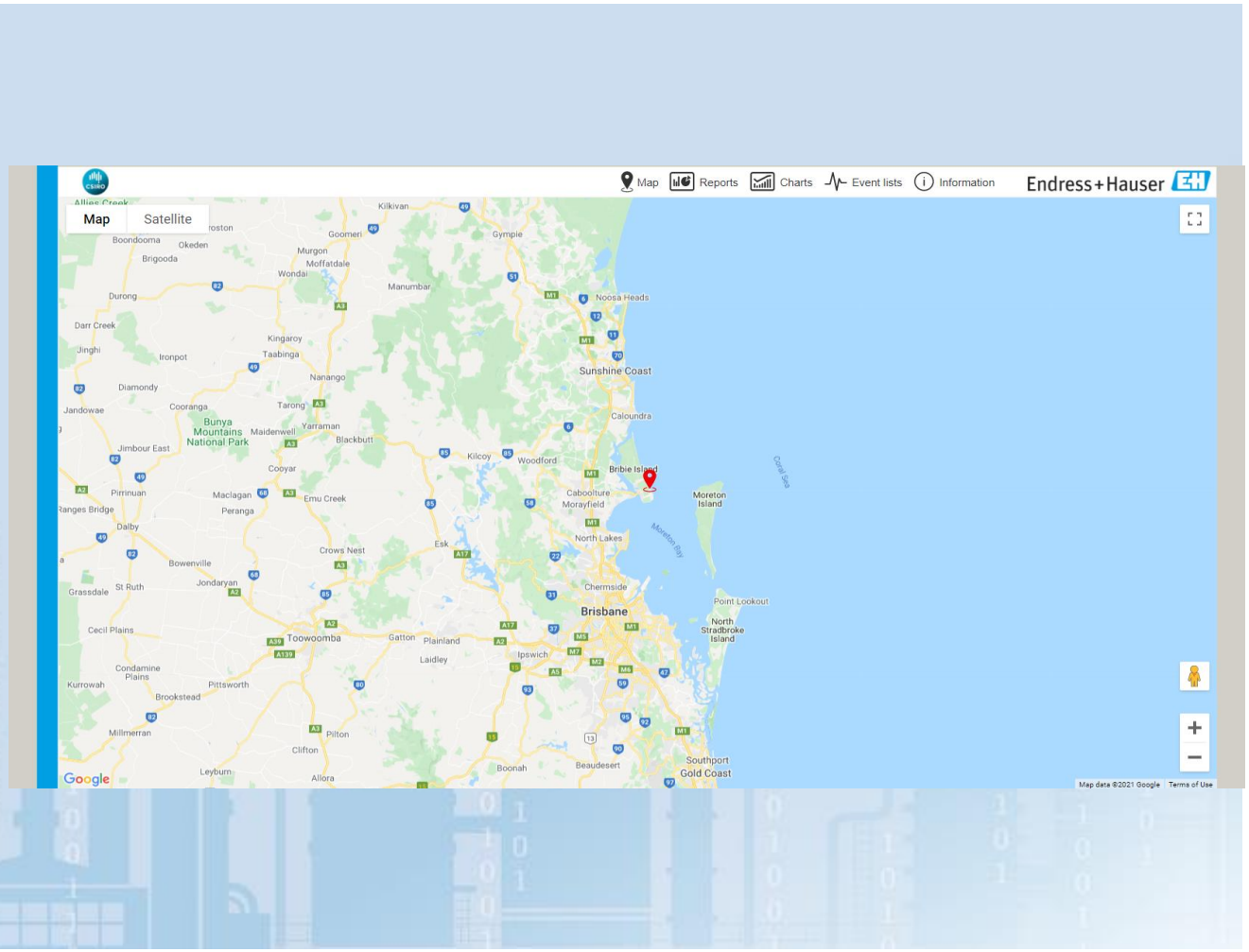
**Flexible, Scalable and Intuitive**
Optimized for diverse end devices, touch interface supported

**Cloud-based flowmeter verification**
Trigger, view and export reports



# Digital Service – Dashboard and Map View



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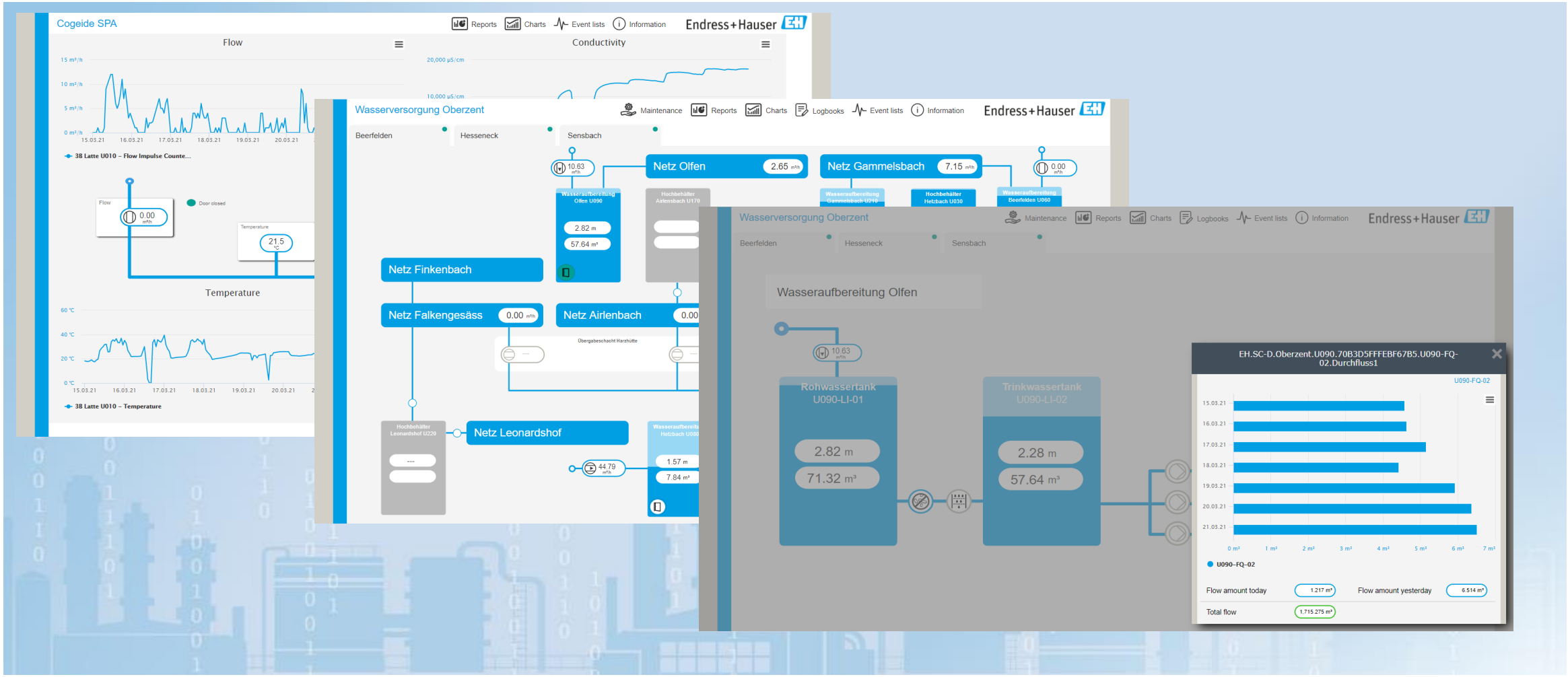
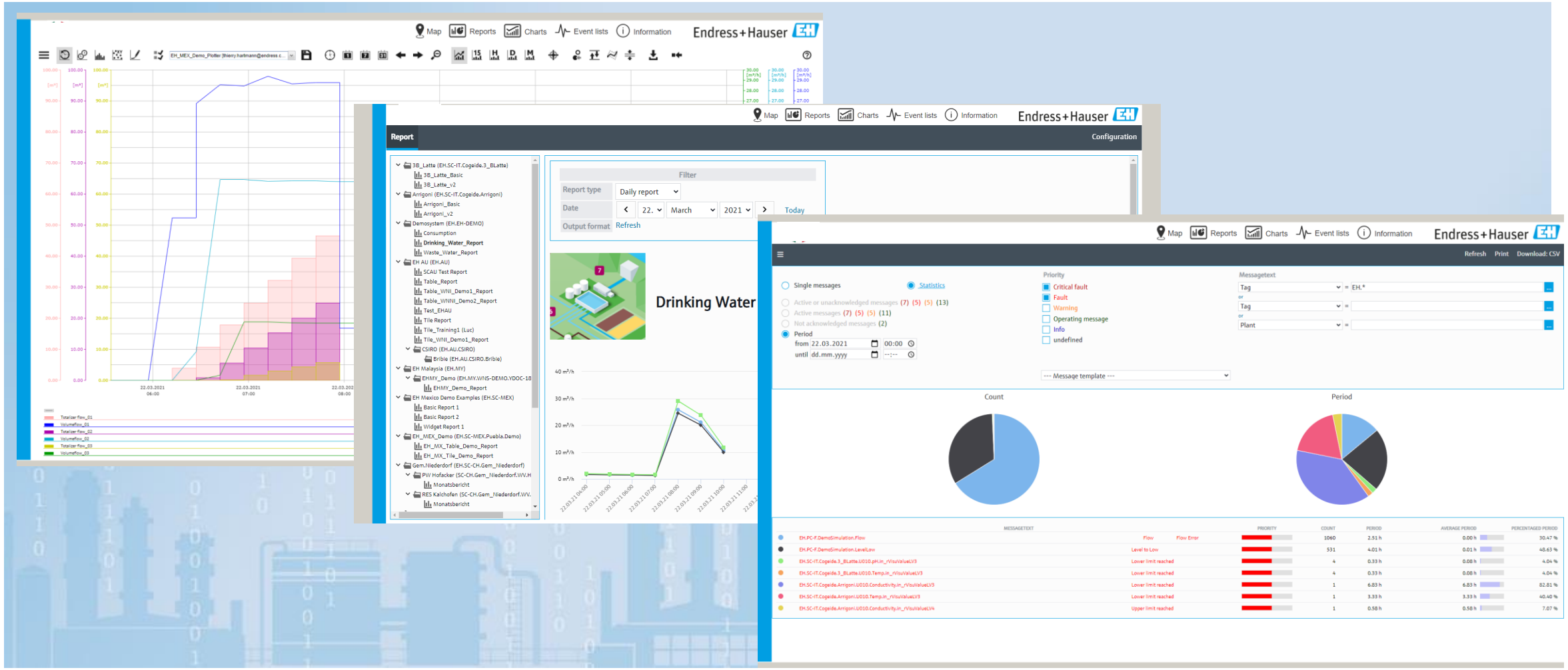
# Digital Service – PID Design View



# Digital Service – Chart and Reports



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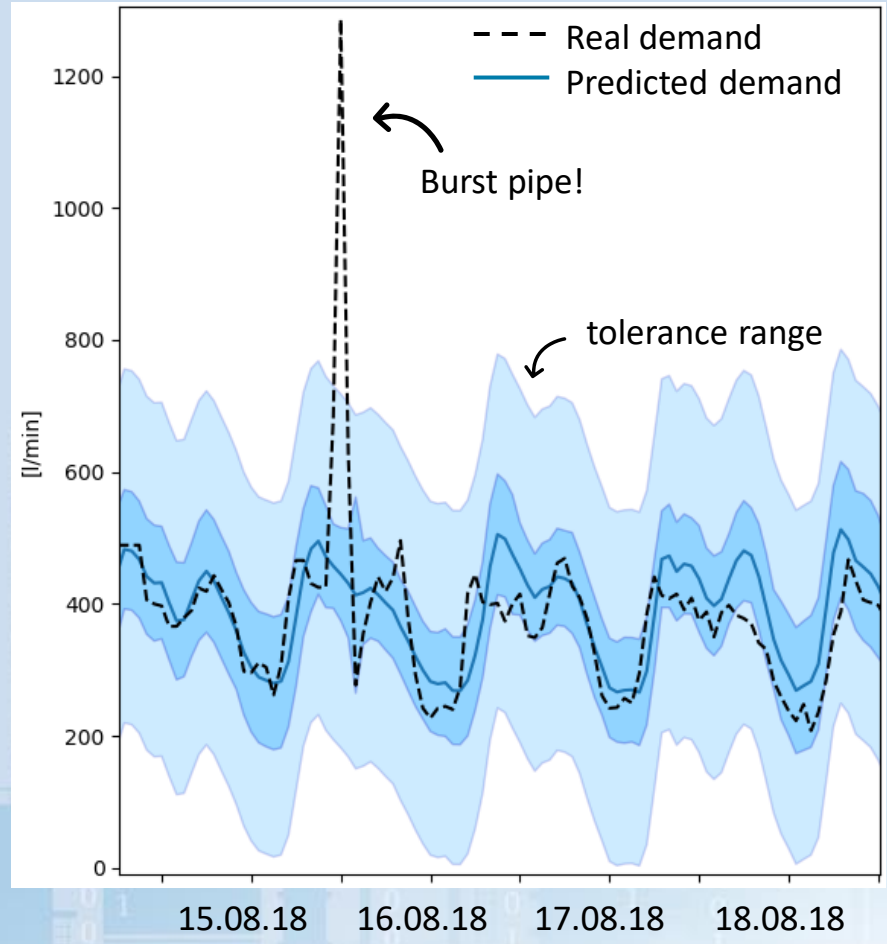
# Outlook “Demand Forecasting in Water Networks”

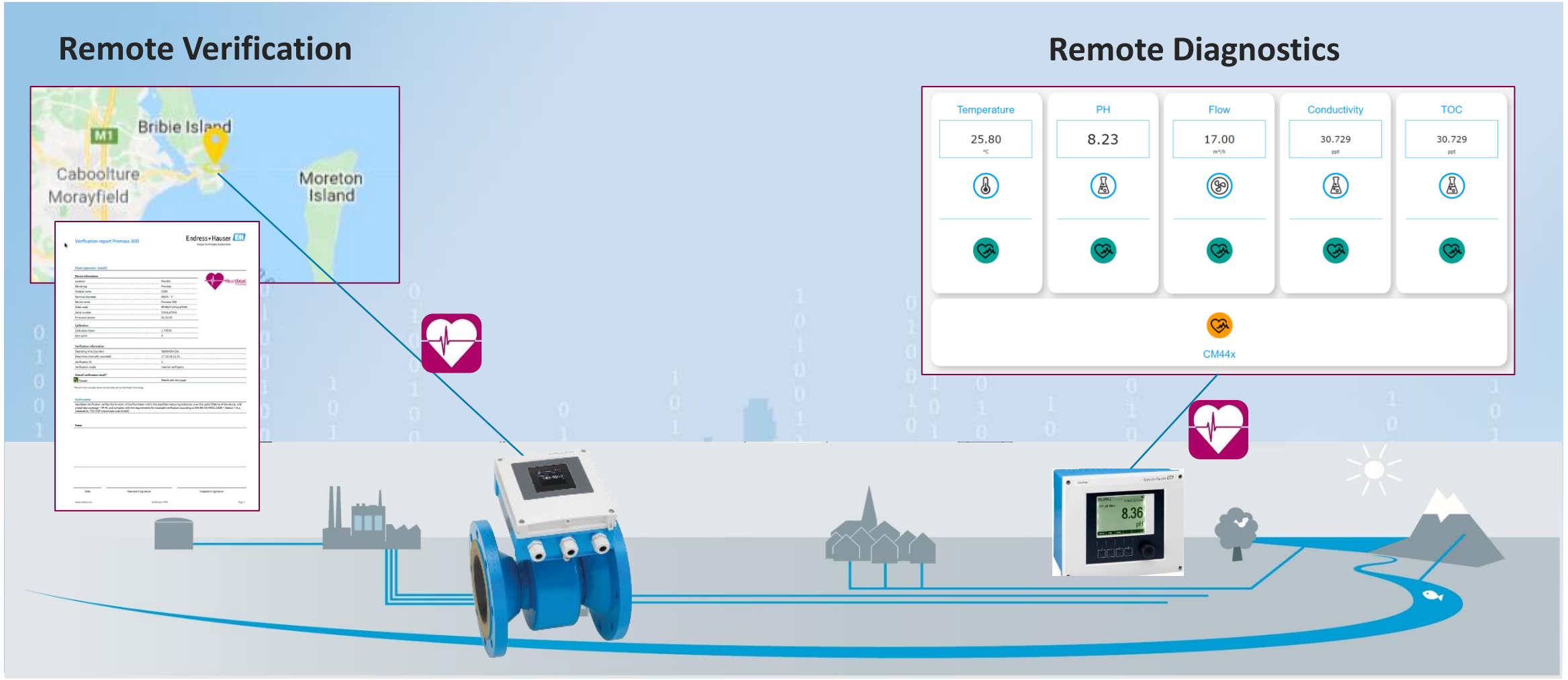
- Water treatment and pumping are energy intensive
- Energy costs are significantly lower at night

✓ Predict water demand by **supervised** *Machine Learning* approach

✓ Recurrent Neural Network combines online weather data, water demand history and calendar information



# Enable Operational Reliability Remotely with Cloud Services



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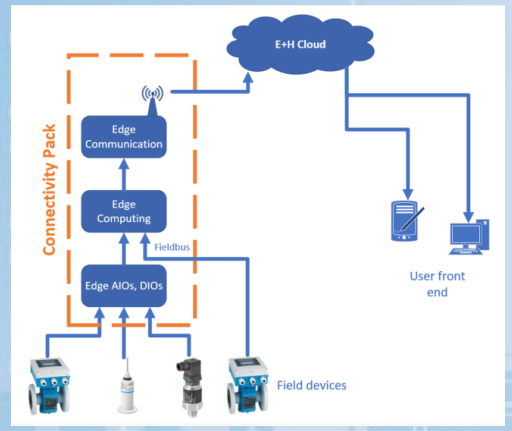
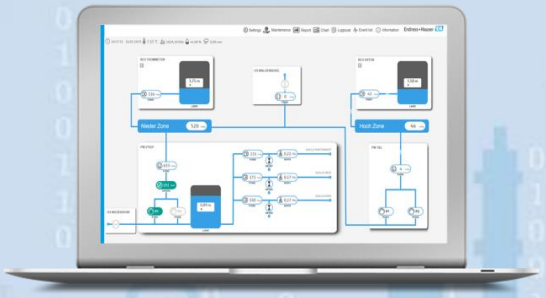
# Reference - Water Distribution Networks in Remote Regions



## Customer Challenges

- Geographically distributed infrastructure
- Operation very time consuming as only 4 operators an area greater than 165 km² (~165km pipes)
- Poor (or lacking) mobile network coverage

## Scope of Customer Solution

- Instrumentation: Flow, Level, Pressure
- Digital Services: Visualization, reports, graphs, warning, alarm
- Connectivity via LoRaWAN



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# Reference – Consumption-Based Effluent Monitoring and Billing


## Customer Challenges

- Changes in regulations (European Water Framework, 'polluter pays' principle)
- Billing pro rata by pollution required
- Insufficient transparency and varying degrees of pollution

## Scope of Customer Solution

- Instrumentation: Flow, pressure, pH, conductivity, temperature
- Digital Services : Visualization, reports, graphs, warning, alarm



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# Digitalization towards Water Sustainability and Resilience

## Let the journey begins!


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- +6012-2009280

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# MALAYSIA SESSIONS

## THURSDAY | 5 AUGUST 2021

02.30pm – 04.00pm

# Individual Q&A Session

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# MALAYSIA SESSIONS

## THURSDAY | 5 AUGUST 2021

02.30pm – 04.00pm

### Moderator

**Associate Professor**
**Dr. Norhayati Abdullah**
Associate Director
UTM International Kuala Lumpur,
Universiti Teknologi Malaysia

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# MALAYSIA SESSIONS

## THURSDAY | 5 AUGUST 2021

02.30pm – 04.00pm

## Moderator

**Associate Professor Dr. Norhayati Abdullah**
Associate Director
UTM International Kuala Lumpur, Universiti Teknologi Malaysia

## Speakers

**Ir. Muhamad Sobri bin Zakaria**
Executive Director of Water & Sewerage Regulatory Department, National Water Services Commission (SPAN)

**Mr. Narendran Maniam**
CEO of Indah Water Konsortium Sdn Bhd (IWK)

**Tuan Haji Anuar bin Abdul Ghani**
Director of operations
Ranhill SAJ Sdn Bhd

**Anne Lim**
Division Marketing Manager
Endress+Hauser Malaysia

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KEMENTERIAN ALAM SEKITAR DAN AIR
Ministry of Environment and Water

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# MALAYSIA SESSIONS

## FRIDAY | 6 AUGUST 2021

**10.00am – 11.00am**

## Water Management within Planetary Health

### Speakers

**Dato' Seri Ir Dr Zaini Ujang**
Secretary General, Ministry of Environment and Water (KASA)

### Moderator

**Datuk Ir. Abdul Kadir Mohd Din**
Immediate Past President
Malaysian Water Association

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# MALAYSIA SESSIONS

## FRIDAY | 6 AUGUST 2021

**11.30am – 12.30pm**

## Post Pandemic: Public Private Partnerships for Water Infrastructures

### Speakers

**Dato' Tan Yew Chong**
Chief Economic Advisor,
Malaysia – China Business Council
Senior Advisor, Salcon Engineering Bhd

### Moderator

**Ir. Dr. Hj. Mohmad Asari Daud**
President of Malaysian Water Association

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**&**
**Please stay safe**

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