



การประปานครหลวง

METROPOLITAN WATERWORKS AUTHORITY

# Countermeasure on Raw Water Quality Deterioration

**Metropolitan Waterworks Authority**

Bangkok, Thailand



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# OUTLINE

- 1. Overview of MWA**
- 2. Problems : Raw Water Crisis**
- 3. Policies for Crisis Management**
- 4. Countermeasure of MWA**





# Metropolitan Waterworks Authority



*Ministry of Interior*

*Established in 1967 as a  
State Enterprise under  
Ministry of Interior.*



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# MISSIONS

## Metropolitan Waterworks Authority Act (1967)

1



*Survey and Provide  
Raw Water Sources*

2



*Produce,  
Transmit and  
Distribute Water  
to People  
in Responsible*

3



*Take part in other  
businesses that benefit  
to Waterworks*



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# MWA at a glance

Kingdom of Thailand



Metropolitan Area



- **Service Area** : 3,195 sq.km ; covering 3 provinces
- **Max. Production Capacity** : 6.32 millions cu.m/day
- **No. of Customers** : 2.23 millions
- **No. of Populations served** : approx. 10 millions
- **No. of Personnels** : 5,339
- **Water Sources** : 100% surface water from 2 sources ; the Chaopraya river & Maeklong dam
- **% Water losses** : 23.37



## Bangkhen WTP.



ISO 9001:2015  
ISO 14001:2015

## Mahasawat WTP.



HACCP 2011

## Samsen WTP.



HACCP 2010

## Thonburi WTP.



# 14 Distribution Pumping Stations



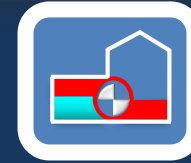
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Raw  
water



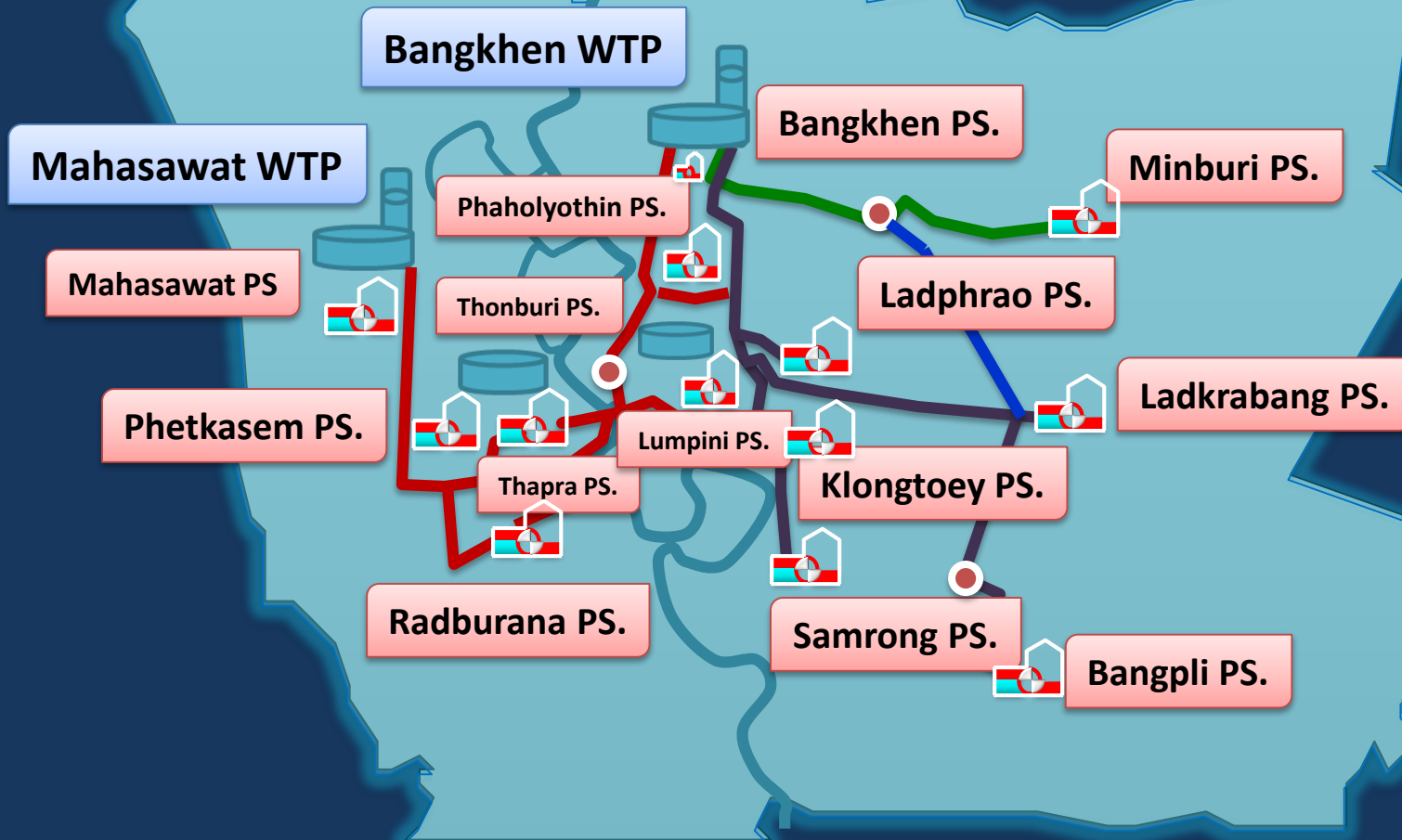
Plant  
System



Distribution  
System



Pipe  
System







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# Online Real Time Water Quality

www.mwa.co.th

Real Time Water Quality  
(คุณภาพน้ำประปา ณ เวลาปัจจุบัน)

ปทุมธานี  
(Pathumthani)

Thai English

คุณภาพน้ำทุกสถานี

วันที่ 29/1/2566

เวลาปรับปรุงค่าล่าสุด 14:18:03

( เปลี่ยนแปลงค่าทุก 10 วินาที )

xxx.xxx = ค่าออกซิเจนละลาย (mg/l)

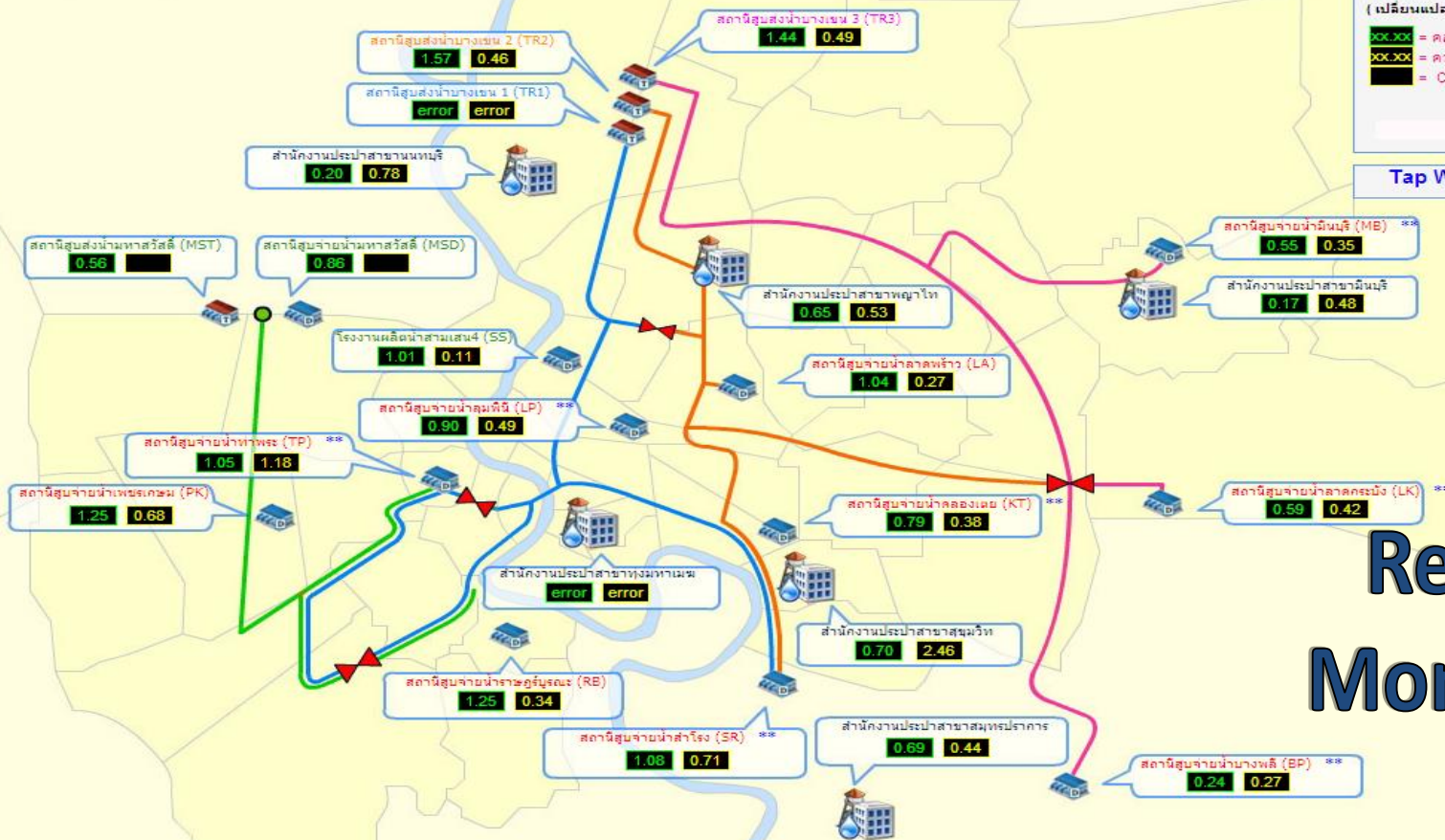
xxx.xxx = ความขุ่น (NTU) \*\* ADSL

xxx = Communication Failed

Refresh Page

Tap Water Quality-Target

สถานะปกติ สถานะวิกฤติ



Real-time  
Monitoring  
24 Hrs

ระบบตรวจสอบคุณภาพน้ำประปาระยะไกลของการประปานครหลวง (กปน.) เป็นเว็บไซต์แห่งแรกของโลกที่แสดงผลคุณภาพน้ำประปาแบบเป็นปัจจุบัน

สมุทรสาคร  
(Samutsakorn)

สมุทรปราการ  
(Samutprakan)





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# Importance of MWA's tap water



## Bangkok, Nontaburi, and Samutprakarn

- Center of Businesses and Investments
- Center of Country's Security
- Center of Population & Economy



**Tap Water for daily life**



**Tap Water for Country's Security**



**Tap Water for Businesses  
and Investments**



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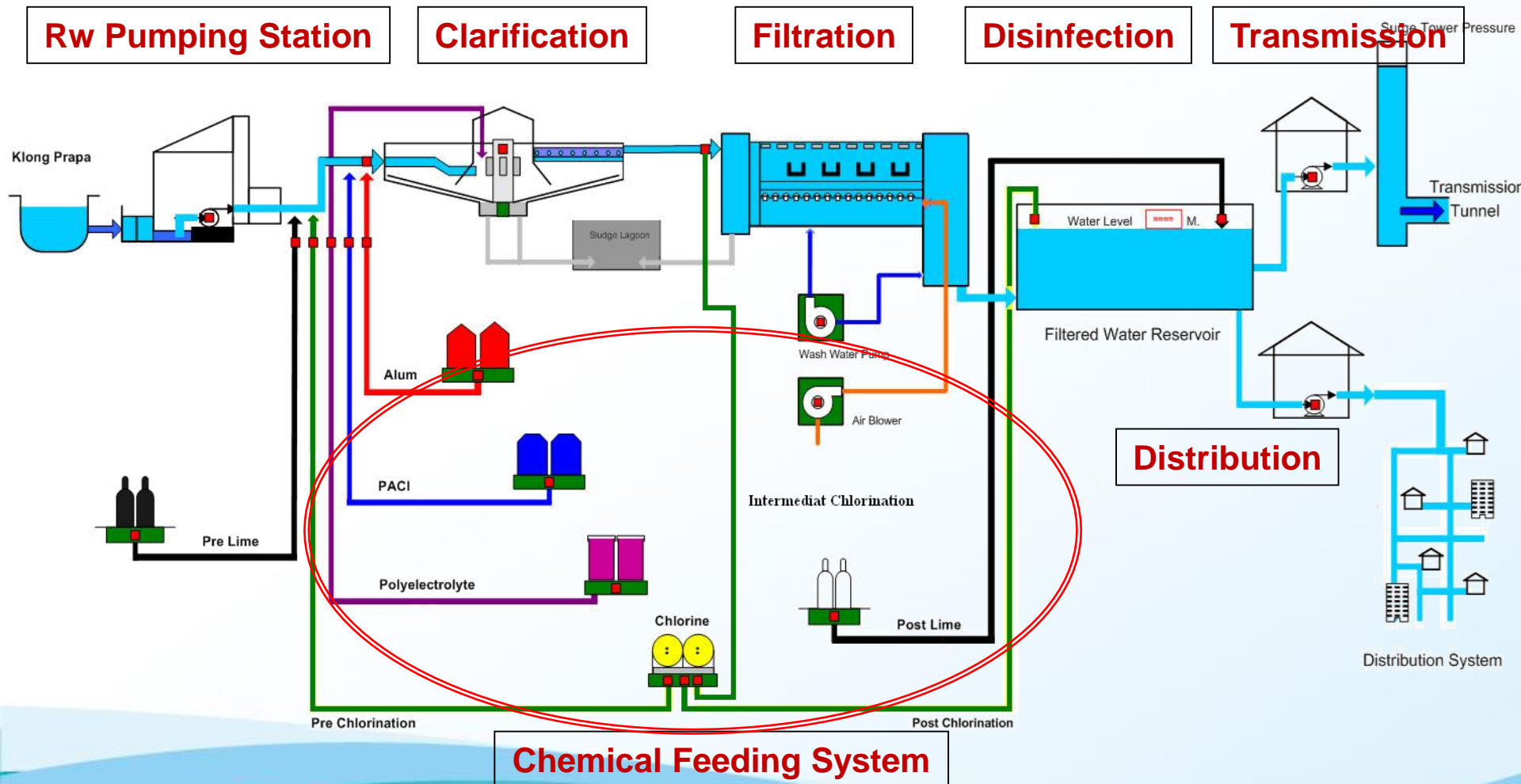
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# Water Treatment Process



*Conventional Water Treatment Process*



# Problems currently faced

- ✓ *Within the past 20 years*
- **Severe problems** from raw water crisis → affected mostly on both raw water **quantity** and **quality issue**

## Quantity

- Drought
- Flood

## Quality

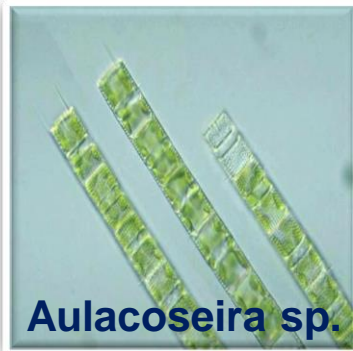
- Salinity contamination
- Algae bloom
- High turbidity
- Organic matters contamination, causing THMs





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# Filter clogging algae



**Aulacoseira sp.**



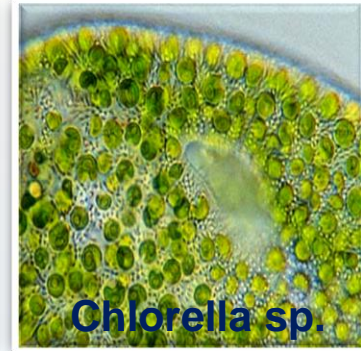
**Melosira sp.**



**Oscillatoria sp.**



**Nitzschia sp.**



**Chlorella sp.**



**Synedra**

sn



**Cyclotella sp.**

20 μm

© 2003 Temer Zohary

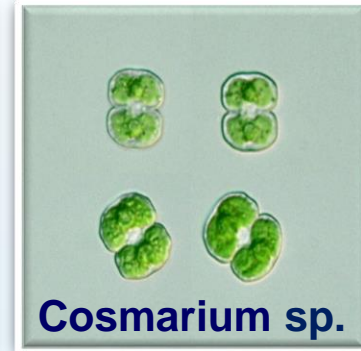


**Anabaena sp.**

© Clouds Hill Imaging/www.lastrefuge.co.uk



**Achnanthes sp.**



**Cosmarium sp.**



**Cylindro-  
spermopsis sp.**



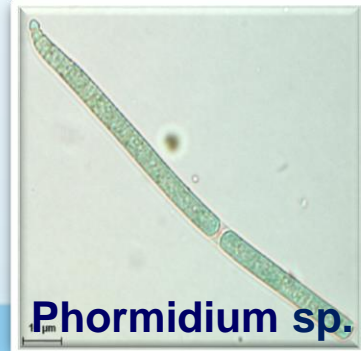
**Pediastrum sp.**



**Scenedesmus sp.**

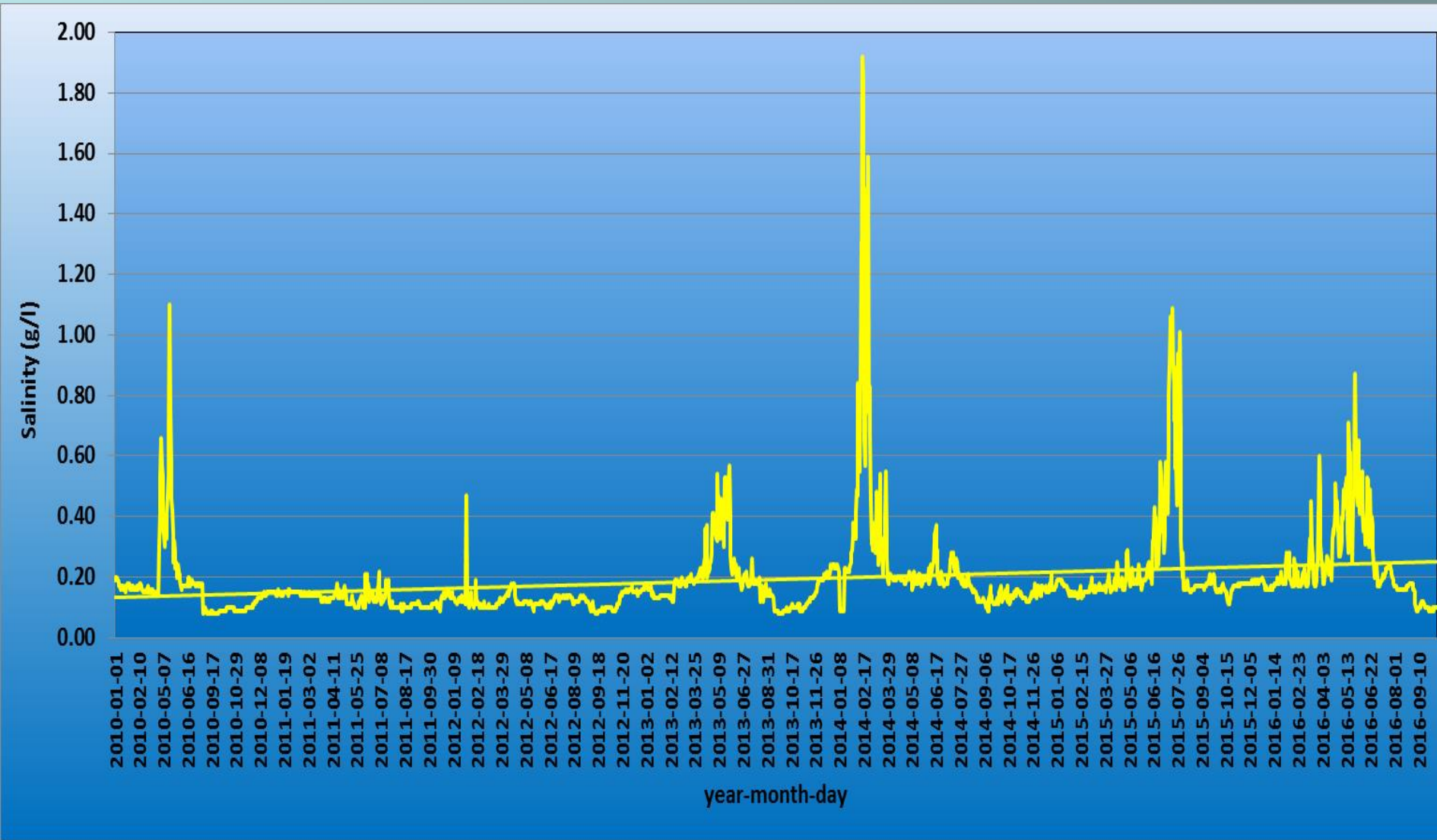


**Staurostrum sp.**



**Phormidium sp.**

# Salinity in raw water at Samlae pumping station







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# High turbidity raw water





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# Impacts of raw water crisis



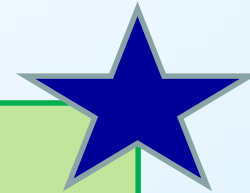
**Raw water crisis ,  
Raw Water quality issues**



- ✓ **Disrupting on water treatment process**
- ✓ **Disrupting on quality and quantity of tap water produced**
- ✓ **Disrupting on cost**
- ✓ **Disrupting on confidence, image and customer satisfaction**



**Need of Appropriate Policies**







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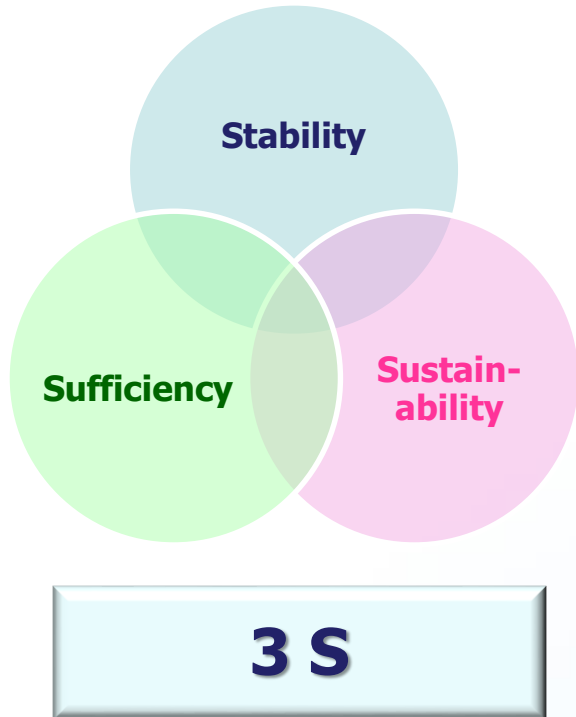
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# Policies



Sufficient and continuous water supply  
with drinking water quality standard

## 2 applications

- Raw water sources
- Water treatment process

## 2 stages of countermeasures

- Short term plan
- Long term plan

## 1 Strategic measure

- Strategic partners with other authorities and agencies

## Ways of Policies Deployment

- Implementation of Water Safety Plan
- MWA's 4<sup>th</sup> Strategic Plan (2017-2021)



# Policies Implementation

		Applications	
		Raw water sources	Water treatment process
Preparation		<input type="checkbox"/> gathering information <input type="checkbox"/> C.M.C. establishment	<input type="checkbox"/> resources preparation
Stage	Short term	<input type="checkbox"/> survey and monitoring <input type="checkbox"/> thorough water quality analysis <input type="checkbox"/> contamination prevention <input type="checkbox"/> improvement of water quality <input type="checkbox"/> pumping management	<input type="checkbox"/> increasing system efficiency ; chemical, clarification, filtration and disinfection process
	Long term	<input type="checkbox"/> studying potential alternative sources <input type="checkbox"/> transmission west → east bank <input type="checkbox"/> claim the situation as national issues	<input type="checkbox"/> improving treatment system conventional → advanced such as membrane technology, ozonation, GAC and desalination
Strategic measure		Strategic partners with <input type="checkbox"/> Royal Irrigation Department <input type="checkbox"/> Department of Royal Rain and Agricultural Aviation <input type="checkbox"/> Department of water resources <input type="checkbox"/> other waterworks authorities and agencies ; both domestic and foreign	





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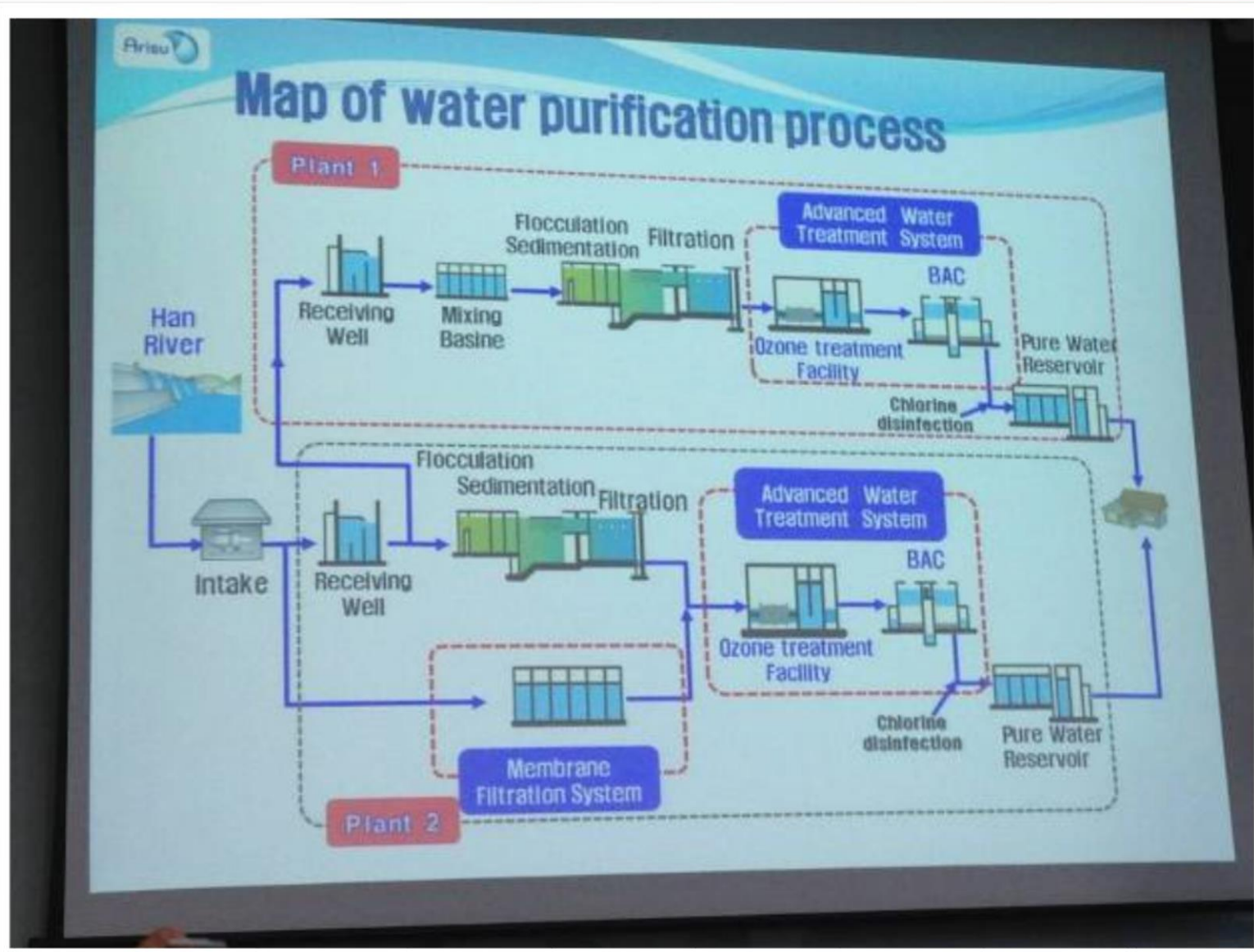
# Sustainable countermeasure

- **Management of raw water sources**
- **Management of water treatment process**
  - **Modification of existing water treatment process**
    - The use of Membrane Filtration Systems : RO after the sedimentation process (before filtration process)
  - **Consideration of advanced water treatment**
    - applying either Membrane filtration system or RO together with conventional system in the construction of new water treatment facilities



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# Yeongdeungpo Arisu Water Purification Center







# Yeongdeungpo Arisu Water Purification Center

**Advanced water treatment effect & Water quality status**

**Complete removal of Taste and Odor causing substances**

- Geosmin, 2-MIB (Methylisoborneol)
- Earthy and fishy smell removal

**Decrease of disinfectant smell**

- Chlorine dose decrease by Ozone disinfection performance
- Substantial decrease of chlorine smell

① Water quality status

Test items	Sort	Standard	2014
Geosmin (ng/L)		Below 20	Non Detection
2-MIB (ng/L)		Below 20	Non Detection
Residual chlorine (mg/L)		Below 4.0	0.47
Turbidity (NTU)		Below 0.5	0.04

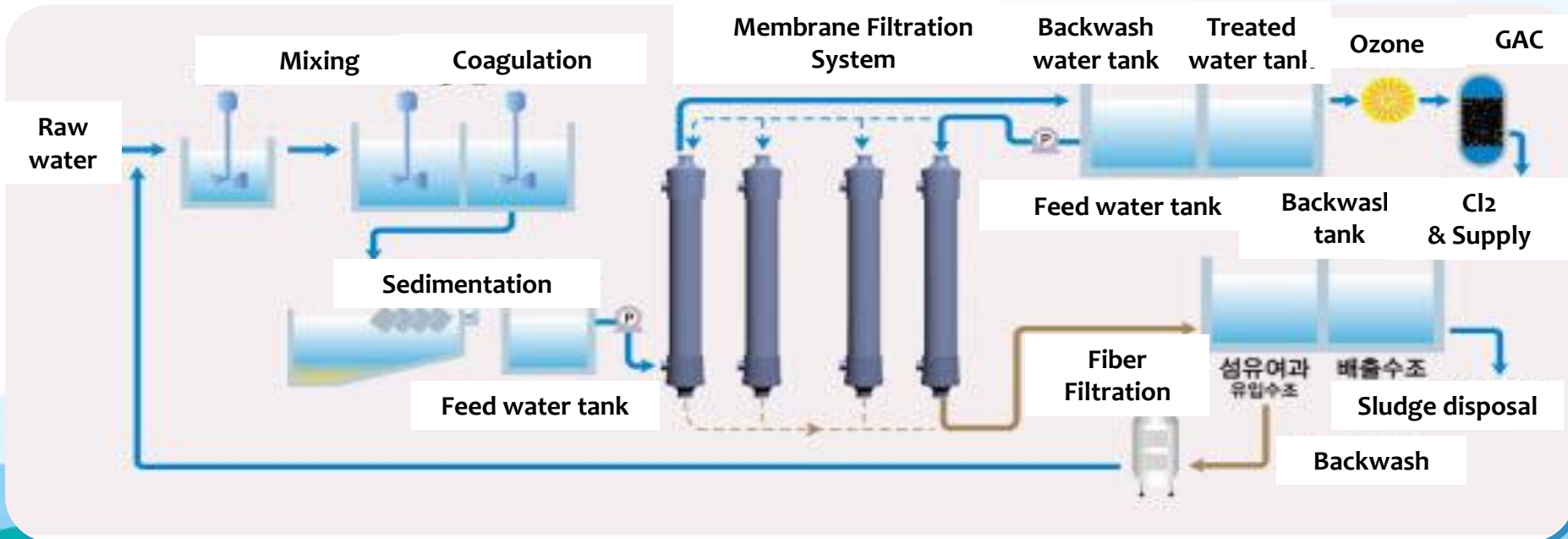
② To cope with the climate change

- Adopted Biological-warning system in Pung-nap intake facility
- Global Top class Purification Water Quality Control
  - Add 8 water quality criteria : 183 => 184(now) [ by law=> 53 , monitoring=> 105 ]
  - new-macro-elements check : 130 => 135(now), check twice a year



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# Membrane Filtration System





# Membrane Filtration Systems : RO

- Offer a more precise purification mechanism than the conventional sand filtering system
- Efficiently separate and eliminate impurities in the source water
- Reduce the use of chemicals
- Reduce the chemical odor in tap water
- Reduce the disinfection byproducts : THMs

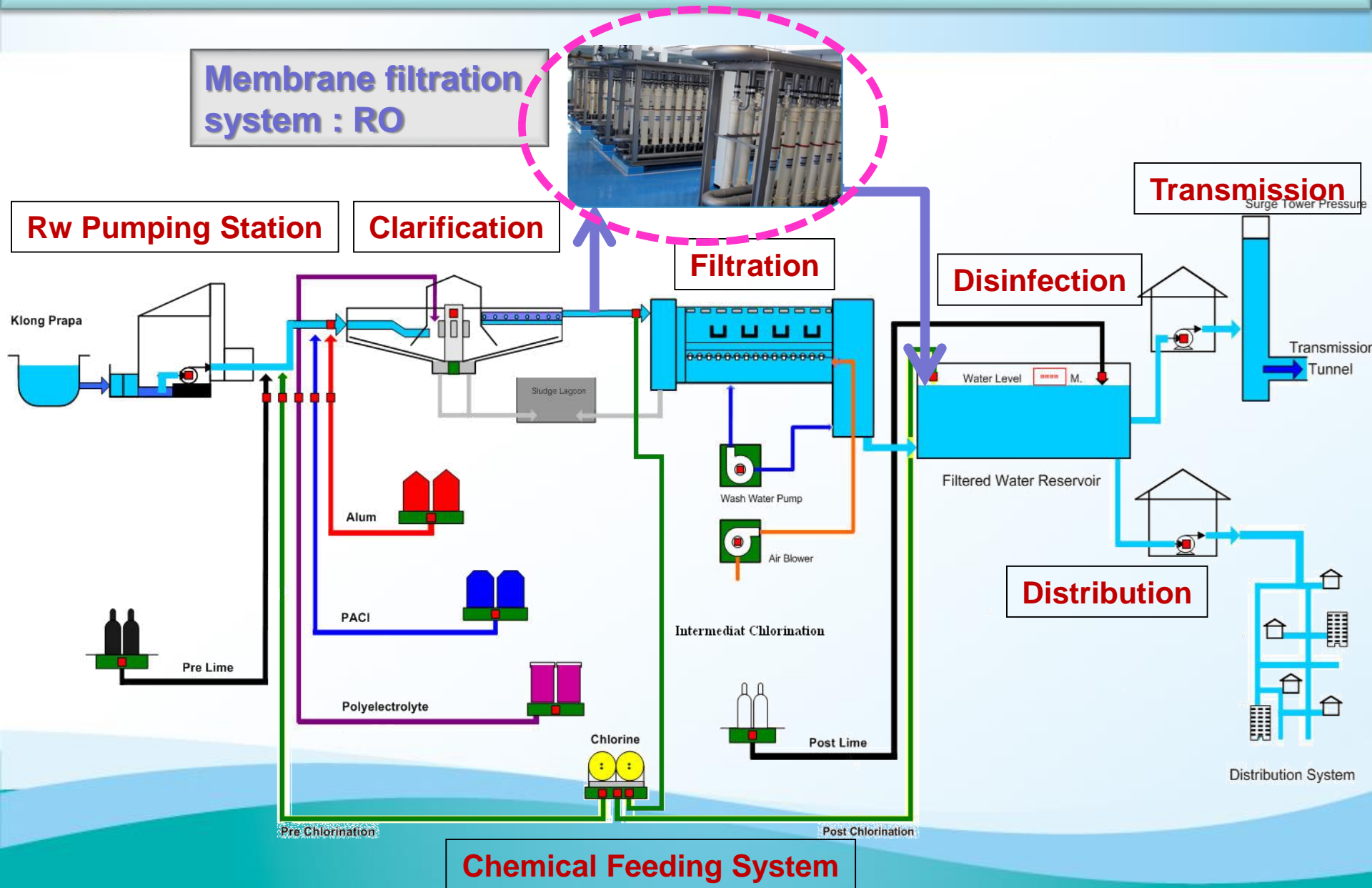


# Membrane Filtration Systems: RO of MWA

- the use of RO Membrane after the sedimentation process (before filtration process)
  - Efficient and sustainable countermeasure
  - Solving a filter clogging algae problems
  - Solving a salinity and organic matters problems
  - Solving high turbidity problem by the parallel use of RO and existing conventional system
  - Response the Water Safety Plan and the 4<sup>th</sup> MWA's strategic plan (tap water turbidity shall be reduced from 0.9 NTU to 0.5 NTU)



# Modification of existing water treatment process







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# the 9<sup>th</sup> Water Supply Improvement Project

## Expansion of water treatment facilities at Mahasawat WTP

- Asking private agencies to submit the proposal on advanced water treatment solutions
- Considering the appropriate way of project management
- Evaluating water treatment alternatives by
  - investment cost
  - operation and maintenance cost
  - reliability
  - quality of treated water
  - space required
  - construction duration





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# TAP WATER FOR PEOPLE



CLEAN & SAFETY,  
BE UP TO STANDARD  
ADEQUATE & CONTINUITY SERVICE



***Thank You***

***<http://www.mwa.co.th>***