Progress of Water Environment Governance in Thailand

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1. Facts and statistics of water quality

STATE OF QUALITY OF SURFACE WATER, COASTAL WATER

• The trend of surface water quality countrywide, the overall surface water quality has been improved.
  • Some water sources has become slightly decreased quality and some water sources remains continuously in poor quality.
• Since 2007, among the 59 main rivers and 6 reservoirs no water sources have been found in very poor quality.
  • The number of water sources in poor quality has become less meanwhile the number of water sources in good quality has become less also.
Figure 1 State of surface water quality countrywide (2008-2017)
• The overall water quality in the past decade showed that the majority was fair quality (Figure 1).

• (28%) The water sources which had consistently good quality were Upper Tapi River, Khwae Noi River and Chi River.

• (55%) Water sources of which the water quality has a tendency to become worse are Lower Rayong River, Upper Rayong River, Upper Phangrad River, Welu River, Ping River, Bueng Boraphet Swamp, Phong River and Upper Langsuan River.

• (17%) Water sources of which the water quality had been poor continuously and needed urgent improvement were Lower Chao Phraya River, Lower Tha Chin River, Lopburi River, Lower Rayong River and Lower Lam Takong.
• For the water sources in each region, the water sources in the Northeastern region have better quality than other regions whereas the water quality of the Central region continued to be deteriorated quality as same as in the previous year.

• Figure 2, In 2017, the top 5 water sources which had good water quality were
  • Songkhram River
  • Chi River
  • Nong Han Lake
  • Upper Tapi River
  • Saiburi River

• The top 5 water sources which had poor water quality were
  • Lower Chao Phraya River
  • Lower Tha Chin River
  • Upper Phangrad River
  • Lower Rayong River
  • Kuang River
Figure 2 Thailand surface water quality in 2017
Main Water Pollution Index

- Ammonia (NH₃): 14%
- Total Coliform Bacteria (TCB): 14%
- Free Coliform Bacteria (FCB): 14%
- Dissolved Oxygen (DO): 12%
- Biochemical Oxygen Demand (BOD): 46%
Water Pollution Sources
(Point Sources)

- Domestic (67%)
- Agriculture (0.5%)
- Industrial (32.5%)
Sources of Water Pollution (Daily)

Domestic Wastewater
9.6 million cu.m.

Industrial Wastewater
9.9 million cu.m.

Agricultural Wastewater
178 million cu.m. (*Water use)

- 66 million persons
  - Building effluent standard
  - Real estate effluent standard
  - Central wastewater treatment plant
  - Effluent standard

- 83,278 factories
  - Industrial effluent standard

- 4.9 million cu.m.
  (For pig farm and aquaculture)
  - Pig farm effluent standard
  - Aquaculture effluent standard

Acts and Responsible Organizations

- Enhancement and Conservation of National Environmental Quality Act (NEQA) → PCD, Ministry of Natural Resources and Environment (MONRE)
- Building control Act → Ministry of Interior (Department of Interior, Municipalities)
- Public Health Act → Ministry of Health (Department of Health, Municipalities)
- ACT on the Maintenance of the Cleanliness and Orderliness of the Country → Ministry of Interior (Department of Local Administration, Municipalities)
- The Factory Act → Department of Industrial Works, Ministry of Industry
- Industrial Estate Authority of Thailand Act → Industrial Estate Authority, Ministry of Industry
Poor quality water was found downstream of the main rivers which were densely populated area, industrial area, agricultural area and livestock farming area

- The cause of the poor quality of water sources is the discharge of untreated wastewater and the treated wastewater which does not comply with the standard to the water sources.

- Presently, the wastewater from 21 million households or from 66 million population has polluted water of 9.9 million cu.m. per day, 3.3 million cu.m. or only 33 % has been treated by 97 central wastewater treatment system which have been constructed and operated.

- From the inspection and law enforcement with pollution sources, the average of 48 % of the establishment has complied with the law on wastewater treatment.
Coastal water quality has become continuously improved. However, in some areas particularly the estuary of the major rivers, sea water quality remains in poor quality.

- The good quality of coastal water has been increased continuously by 61% whereas the coastal water of the poor and very poor quality has decreased 3% and 1% respectively. (Figure 4)

- The areas where the coastal water is continuously poor quality are the estuaries of the following major rivers:
  - Bang Pakong Estuary
  - Chao Phraya Estuary
  - Tha Chin Estuary
  - Mae Klong Estuary
Figure 4 State of coastal water quality countrywide (2008-2017)
• The coastal water quality in the Eastern Gulf of Thailand, Western Gulf of Thailand and Andaman Sea is good except the Inner Gulf of Thailand which the quality is fair

• The top 5 coastal water areas of good quality are
  • Ao Saphli bay, Ao Thungwualaen bay (Chumphon Province)
  • Thale Waek sea, Had Tonsai beach (Phee Phee Island in Krabi Province)
  • Chong Samae San sea (Chon Buri Province)

• The top 5 coastal water areas of very poor quality are
  • Pak Klong 12 Thanwa and in front of the dye factory KM 35 (Samut Prakan Province)
  • Pak Klong Tha Koey (Surat Thani Province)
  • Chao Phraya Estuary (Samut Prakan Province)
  • Tha Chin Estuary (Samut Sakhon Province) (Figure 5)
Figure 5 Thailand of coastal water quality in 2017.
The top 5 areas good quality and the top 5 areas poor quality.
Pollution prevention and reduction from the pollution sources onshore and management of seaside activities has improved the quality of coastal water.

- The factors which have contributed to the improvement of the coastal water quality were:
  - Continuous *law enforcement* controlling the discharge of wastewater at the pollution sources.
  - *Public awareness* of the pollution impact on the coastal water quality.
  - *Promotion of pollution reduction* at the pollution sources by utilizing the clean technology, green industry promoting organic agriculture.
  - Additional construction wastewater treatment system in the critical areas and the warning system of the incidents which may affect the coastal water quality.

- However, the problem of frequent oil spills from the leakage accident in the oil transfer and tar balls found on the beach has impact on the quality of the marine environment.
Groundwater in all regions of the country is in good quality and comply with consumer

• The quality of groundwater in the total 27 basins complied with the standard of potable groundwater as stated in the Groundwater Act, B.E. 2520 (1977)

• However, the amount of minerals found in the groundwater in some areas was higher than the requirements in the standard and varied according to the geological, hydrological and environmental condition

• In general, iron and manganese were found in large amount, so the groundwater quality in the problem areas needed to be improved
Monitoring areas of the groundwater quality problem of contamination of heavy metal and volatile organic compounds (VOCs) was found in some risky areas.

- Monitoring was conducted on the area risk of contamination from the *inappropriate landfilling or industrial waste disposal and the illegal waste dumping area* where it was found to have a problem of contamination of heavy metal and volatile organic compounds (VOCs) and *surveillance was carried out on mineral potential areas and industrial areas*.

- The monitoring areas and surveillance were in the following provinces namely, Phetchabun, Phichit, Saraburi, Loei, Khon Kaen, Chacheongsao, Chon Buri, Rayong, Tak, Ratchaburi and Kanchanaburi. (Figure 6)
Figure 6 Situation and monitoring areas of groundwater quality in Thailand (2017)
Source: Department of Groundwater Resource, 2017
Wastewater Treatment and Disposal

- The Government of Thailand has made significant progress in collection and treatment of urban wastewater over the past decade.
- However, only small portion of total urban wastewater generated in Thailand is treated.
**Households or small building**

- Black water
- Grey water

Onsite treatment system

- In present
- Manhole
- Environment

44th and 51st Ministerial regulation under Building control Act
(Adapted from building effluent standard Size C and D)

**> 100 Households (Real estate)**

- Option 1
  - Black water
  - Grey water
  - Onsite treatment system
  - In present
  - Manhole
  - Environment

Option 2

- Real estate effluent standard

- Building effluent standard (Size A and B)

**Big Building**

- Black water
- Grey water

Central wastewater treatment plant

Environment
Domestic wastewater management

- Household or Small building
- >100 households
- 10 types of Building
- Building effluent standard BOD < 30 mg/L
- Real estate effluent standard BOD < 30 mg/L
- Ministerial regulation under Building control Act BOD < 30 mg/L
- Environment
- Faecal Sludge
- FS treatment plant 80% Anaerobic Digester
- Emptying truck
- 105 plants Central wastewater treatment system
- Operated 97 plants (2.6 million cu.m./day)
- Effluent standard BOD < 20 mg/L
- Combined sewerage system
- Andaman Sea
- Gulf of Thailand
- Domestic wastewater management
- Central wastewater treatment system
- 9.9 million cu.m
- 1.4 million cu.m
- 8.5 million cu.m
- BOD < 30 mg/L
- BOD < 20 mg/L
- 97 plants (2.6 million cu.m./day)
Total 105 WWTP in Thailand
capacity: 3.2 million cu.m./day
- Completed 97 plants
capacity: 2.6 million cu.m./day
- Rehabbing and updating 5 plants
- Suspended 3 plants

Total construction cost 83 billion Baht (฿)
(Or 2.5 billion US$)

Types of WWTP
- Stabilization Pond: 46 plants
- Aerated Lagoons: 16 plants
- Activated sludge (Oxidation ditch): 36 plants
- RBC: 1 plant
- Constructed wetland: 2 plants
Domestic Wastewater Management

- Operated 97 plants (2.6 million cu.m./day)
- 105 plants
- 7,852 Local Administrative Organizations
- 1.8 billion USD Investment cost

Faecal Sludge Management (FSM)

- Buildings
- Combined Sewer
- Water bodies
- Land application
- Faecal Sludge Management (FSM)

- 66 million persons
- 9.9 million cu.m./day
- 7,852 Local Administrative Organizations
- 2 plants
- In 1985
- In 2018

- 46% Stabilization pond
- 16% Aerated lagoons
- 38% Activated sludge

- ~74% are partially treated by the onsite sanitation units
- ~26% of wastewater generated
- X 150 lpcd
- 23
Laws and Regulations for domestic wastewater and faecal sludge management in Thailand

- Real estate effluent standard (> 100 houses) under Enhancement and Conservation of National Environmental Quality Act (NEQA)
  - BOD < 30 mg/L, SS < 40 mg/L

- Building effluent standard (10 Types) under NEQA
  - BOD < 30 mg/L, SS < 40 mg/L

- Central wastewater treatment plant effluent standard under NEQA
  - Wastewater tariff under NEQA

- Onsite installation by 44th and 51st Ministerial regulation under Building control Act

- FS collection and disposal under Public Health Act and ACT on the Maintenance of the Cleanliness and Orderliness of the Country
  - Approved for installation by LAO
  - PCD, REO

- Onsite package system

- Commercial package system

- Cesspool

- Onsite treatment system

- (Draft) TISI standards For <10 cu.m./day

- Building effluent standard under NEQA

- (Draft) Solid fraction standard Under Public Health Act and proposed by Public Health Department

- Discharge
  - BOD < 20 mg/L, SS < 30 mg/L

- FS treatment plant

- Soil conditioner

- Land application

- Transportation

- Emptying

- Enforced by PCD, REO

- Proposed by LAO

- Approved by Pollution Control Committee

- Enforced by PCD, REO

- Enforced by PCD, REO

- Approved by LAO

- Approved by LAO

- LAO

- LAO

- LAO

- LAO

- LAO

- LAO

- LAO
3. Industrial effluent standards in Thailand

General Standard

- Ministry of Natural Resource and Environment Announcement on Designation of Factory, Industrial Estate and Industrial Zone Effluent Control Standard

Specific Standard

- Ministry of Natural Resource and Environment Announcement on Designation of Effluent Control Standard for Establishment Relating to Desalination
### Industrial Wastewater (Daily)

**Domestic Wastewater**
- 9.6 million cu.m.

**Industrial Wastewater**
- 9.9 million cu.m.
- 83,278 factories

**Agricultural Wastewater**
- 178 million cu.m. (*Water use*
- 4.9 million cu.m. (For pig farm and aquaculture)

### Acts and Responsible Organizations

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- Building effluent standard
- Real estate effluent standard
- Central wastewater treatment plant
- Effluent standard
- Pig farm effluent standard
- Aquaculture effluent standard
Industrial Wastewater Management

1. Effluent Control Standard

2. Monitoring of Discharge from Industry

3. Data Report

4. Inspection

5. Pollution Control Manager* (*The person who has been registered for inspection, control, supervision, operation and maintenance of the system of water pollution, air, industrial waste or equipment)
Industrial Wastewater Management

1. All factory is required to treat their water to meet with effluent standard

2. Last survey by Pollution Control Department found that number of industries that actually comply with effluent standard is around 50%
4. Legislative framework for water environmental governance

The Enhancement and Conservation of National Environmental Quality Act 1992

- In the year 1992 Thailand has its environmental law called "The Enhancement and Conservation of National Environmental Quality Act". Wastewater management before the time of the 1992 Act was mainly under responsibility of two departments: the Industrial Works Department, Ministry of Industry and the Public Works Department, Ministry of Interior. After 1992, the Pollution Control Department (PCD) * and the Office of Environmental Policy and Planning (OEPP) under the Ministry of Science Technology and Environment (MOSTE) have started to be involved in wastewater management by undertaking national and regional water quality management planning and facilitating local authorities for their responsibilities of their own wastewater management.

- Thailand has adopted a "command and control approach", based on European and American pollution control model with the establishment of effluent standards and their subsequently enforcement.

* After 2004, the Pollution Control Department (PCD) under the Ministry of Natural Resources and Environment (MONRE)
In order to control and manage water quality problem in Thailand, the regulations can be grouped into three categories as follows:

(1) The application on environmental impact assessment (EIA) for determination the impact and mitigation plan for development projects with various types and sizes such as dam with storage volume of 100 million cubic meters or more, irrigation project of 12,800 hectares or more, hotel or resort with 80 rooms or more, thermal power plant with capacity of 10 MW or more, all size of mining, etc.

(2) The ambient water quality standard and classification based on water quality situation, socio-economic aspects, and availability of treatment technologies

(3) The establishment and application of effluent standards such as industrial effluent standards, domestic effluent standards, effluent standards for pig farms and fish/shrimp farms etc.
Wastewater Management Measures

- Law Regulation and Enforcement Measures
  - Water Quality Standards: Ambient Water Quality Standards
  - Effluent Standards
  - Other Laws

- Management Measures:
  - Monitor and Evaluate Water Quality in Water sources
  - Pollution Control Zone:

- Investment Measures:
  - Establish Wastewater Treatment Facilities

Main Principle:
- Polluter Pays Principle (PPP)
- Penalty/Damaged environment compensation
- Pollution Control Area (8 areas)
- Monitoring
- Water Quality standards
- Effluent Standards
Ambient Water quality standards:
- Surface Water Quality Standards B.E. 2537 (1994)
- Coastal Water Quality Standards B.E. 2537 (1994)

Effluent standard
- Industrial Effluent Standards B.E. 2539 (1996)
- Pig Farm Effluent Standards B.E. 2544 (1991)
- Gas Station Effluent Standard and Oil Terminal Effluent Standards B.E. 2545 (2002)
Other laws related to water pollution control

- The Factories Act B.E. 2535 (1992)
- The Public Health Act B.E. 2535 (1992)
- The Public Cleansing Act B.E. 2535 (1992)
- Industrial Estate Authority of Thailand Act B.E. 2522 (1979)
Ministry of Natural Resources and Environment (MONRE)

There are 3 agencies which concern environmental issues.

Department of Environmental Quality Promotion (DEQP)
Office of Natural Resources and Environmental Policy and Planning (ONEP)

16 Regional Environmental Offices (REO)

Pollution Control Department (PCD)

Authorities and Duties of PCD

1. Submit opinions for the formulation of national policy and plans for the promotion and conservation of environmental quality with respect to pollution control.
2. Make recommendations for the establishment of environmental quality standards and emission effluent standards.
3. Develop environmental quality management plans and measures to control, prevent and mitigate pollution.
5. Prepare an annual report on the state of pollution.
6. Develop appropriate systems, methodologies, and technologies for the application in the management of solid waste, hazardous substance, water quality, air quality, noise level and vibration.
7. Coordinate and implement measures to rehabilitate and remedy damages caused by pollution in the contaminated area and environmental appraisals.
8. Provide assistance and advice on environmental management.
9. Cooperate with other countries and international organizations on environmental management.
10. Investigate public complaints on pollution.
12. Perform other functions as may be designed by law to be the responsibilities of the Department or by Ministry of Natural Resources and Environment or by the Cabinet.
Responsibilities: Water Quality Management Division

- Establish water pollution control policy
- Formulate water quality standards and strategies
- Monitor water quality & water pollution
- Provide water pollution advice
Institutional and financial arrangement

Environmental fund was established by collecting from various sources: Fuel Oil Fund, Revolving Fund for Environmental Development and Quality of Life, service fees and penalties collected by virtue of the Enhancement and Environmental Quality Promotion Act, 1992, grants from the government, donation, and others. The Fund can be used to control water quality problem under the following strategies:

- Grants to government agency or local administration for investment in and operation on the central treatment plant
- Loans to local government or state enterprise for making available of wastewater treatment facilities
- Aids or grants to support any activity concerning the promotion and conservation of environmental quality
Cooperation with related agencies and local communities

• Cooperation is an important and practicable approach for water quality management because pollution problems are usually related to a number of agencies and local communities.

• The Pollution Control Department has cooperated with related agencies to solve specific problems such as the establishment of working group to monitor wastewater discharges from pollution sources.
River Basin Management Approach

• New directions for urban water quality management are being considered based upon assimilative capacity of receiving waters, budget availability, and prioritized projects within basin-wide approach.

• The most flexible means of water quality management are being practiced such as simulation models, geographic information systems, and database management systems.

• Waste loads allocation is being considered depending on assimilative capacity of water body and guidelines to attain receiving water quality standards.

• Thus, river basin management approach is being practices such as in the Thachin River Basin. The details can be found at the Web Site http://welcome.to/thachin.
Monitoring and Enforcement

- **Water quality monitoring program** plays an important role in water resource management.
- Water quality monitoring consists of data and sample analysis performed by using acceptable protocols.
- Monitoring includes analysis of data to support decision makers.
- Under new environmental regulation (*The Enhancement and Conservation of National Environmental Quality Act, 1992*), there are two types of monitoring programs: effluent and receiving water quality monitoring.
- The owner or possessor of point sources of pollution is required for the collection of statistics and data, the making notes and reports of the effluent monitoring program.
- The monitoring of receiving water quality is done by the government agencies to maintain the quality of waters and to produce the state of annual water quality report for the country.

**Responsibilities**: Water Quality Management Division
- Monitor water quality & water pollution
Total area: 513,115 km²
Land boundaries: 4,863 km
Coastline: 3,219 km

Thailand is a tropical country – Rainwater is one of the most important sources of water.

Water system in Thailand

25 river basins (254 sub-basin) and 2 Coasts

66 million persons
Surface water quality standard

Class 1: Natural water resources
Class 2: For aquatic conservation, fishing, swimming and water sports (20 areas)
Class 3: For agricultural use (35 areas)
Class 4: For industrial use (4 areas)
Class 5: For transportation

- Physical Properties
  - Temperature, color, odour, turbidity, conductivity, salinity, suspended solids, floatables

- Chemical Properties
  - DO, pH, BOD, Nutrients (NO2-N, NO3-N, NH3-N, PO4-P, TP), heavy metals (Cd, Cr, Cu, Fe, Mn, Pb, Zn, Hg), pesticides, TPH

- Biological Properties
  - Bacteria (Total Coliform, Fecal Coliform, Enterococci)

26 main rivers (from 48 main river and 4 reservoirs)
Coastal marine water quality standard

Class 1: To conserve natural resources (85 areas)
Class 2: For coral conservation (40 areas)
Class 3: For aquaculture (5 areas)
Class 4: For recreation (5 areas)
Class 5: For industry and harbor (7 areas)
Class 6: For community area (27 areas)

- **Physical Properties**
  - Floatable Solids, color, Odour, Temp., Transparency, salinity, suspended solids

- **Chemical Properties**
  - DO, pH, BOD, Nutrients (NO2-N, NO3-N, NH3-N, PO4-P, TP), Petroleum hydrocarbon, heavy metals (Cd, Cr, Cu, Fe, Mn, Pb, Zn, Hg), Fluoride, Residual Chlorine, Phenols, Sulfide, Cyanide, Total Organochlorine Pesticides, As, Radioactivity, Tributyltin:TBT

- **Biological Properties**
  - Bacteria (Total Coliform, Fecal Coliform, Enterococci)
Surface water monitoring
(635 Sampling points – 4 times/year)

48 Main rivers
4 Lakes

Parameters: DO, BOD, Total and Fecal Coliform Bacteria, NH₃-N, HM, Pesticide

Surface Water quality situation in the 10 year period

5 main parameters:
• Temperature
• pH
• Dissolve Oxygen (DO)
• Conductivity
• Salinity
Coastal water monitoring
(211 Sampling points along coastal areas – 2 times/year)

Coastal Marine Water quality situation in the 10 year period

- Parameters: NH\textsubscript{3}-N, NO\textsubscript{3}-N, PO\textsubscript{4}-P and Total Coliform Bacteria
- Total 169 areas

- 69% of areas do not meet the standard
7. Future targets/plans, issues and challenges of water environment governance

Strategies for Water Quality Management

1. Master plan under the 20 year national strategy (2017 - 2036)
2. Country reform plan for Natural Resources and Environment
3. Master Plan for Water resources management 20 years (2018 - 2037)
5. Annual budget allocation strategy 2020
The 20-year national strategy consists of 23 master plans, such as security, agriculture, foreign industries, etc.

Under issue 18, sustainable growth, sub-plan 3.4 to manage pollution that affects the environment and chemicals in the entire agricultural system with international standards and pollution management system. Development guidelines 1 have been set.

"Focus on water quality management in surface water and coastal water to be suitable for the type of utilization. By reducing and controlling pollution released from the source which is the principle of pollution management at the source and consider carrying capacity, including the application of the permitting system and Polluter Pays Principle: PPP"
Environmental goals "To create pollution management system at the source that effectively improve quality of the environment and good quality of life for people"
Accelerate solve the problem of domestic wastewater and industrial wastewater by:

- Develop and increase the efficiency of wastewater collecting system and municipal wastewater treatment
- Manage wastewater treatment system by reuse treated wastewater
- Encourage local government to operate municipal wastewater treatment
- Collect wastewater treatment fees, maintainance, monitor and evaluate performance of wastewater treatment
3. National economic and social development Plan No. 12
4th Strategy on Environment - friendly growth for sustainable development (continue)

- Promote the role of the private sector to manage wastewater treatment systems
- Improve regulations under building control act related to wastewater sources
- Establish guideline and procedures for permitting the emission of pollutants that take into account the amount of accumulated pollutants in environment.

- 6th section of the Plan on Water Resources Management Plan and Developing the database system,

“to set the plan for legal and economic measures to control wastewater discharge.”
Under 5th article, the strategy of creating growth on the quality of life that is environmentally friendly on item 5.1.8

"Promoting water quality management in surface water and seawater to be suitable for the type of utilization in accordance with the Sustainable Development Goals (SDGs) and maintain suitable condition for aquatic organisms and utilization for people"
Master plan for Water Quality Management in Thailand (2018-2037)

Within 10 years (2027)

- Improve surface water quality in 59 areas (48 main rivers) and maintain them
- Improve Coastal marine quality in 166 areas and maintain them

**Mitigation 1:** Prevent and Reduce wastewater at source

**Mitigation 2:** Control wastewater discharge

**Mitigation 3:** Increasing efficiency in wastewater management
Within 10 years (2027)

- Improve surface water quality in 59 areas (48 main rivers) and maintain them
- Improve Coastal marine quality in 166 areas and maintain them

Mitigation 1: Prevent and Reduce wastewater at source

Mitigation 2: Control wastewater discharge

Mitigation 3: Increasing efficiency in wastewater management

1. Promote and enhance **Green industry and Eco-industry** such as Zero discharge, Reuse and Recycle
2. Minimize **domestic wastewater** at source such as install high performance onsite system, promote products which design for environment (DfE)
3. Modify or Improve process for minimizing **agricultural wastewater** generation such as SMART farm, promote Good Agriculture Practices (GAP)
4. Prevent pollution from water transportation such as develop safety standard for water transportation (reduce oil leakage from accident), develop oil spill monitoring system in **coastal areas**
Within 10 years (2027)

• Improve surface water quality in 59 areas (48 main rivers) and maintain them
• Improve Coastal marine quality in 166 areas and maintain them

Mitigation 1: Prevent and Reduce wastewater at source

Mitigation 2: Control wastewater discharge

1. Install more central wastewater treatment in prioritized and sensitive areas such as high polluted area, tourist area and special area
2. Rehab for current central wastewater treatment
3. Collect wastewater treatment fee
4. Propose and implement Permit system
5. Enhance law enforcement, integrate among regulation (minimize the gap)

Mitigation 3: Increasing efficiency in wastewater management
Master plan for Water Quality Management in Thailand (2018-2037)

Within 10 years (2027)

- Improve surface water quality in 59 areas (48 main rivers) and maintain them
- Improve Coastal marine quality in 166 areas and maintain them

Mitigation 1: Prevent and Reduce wastewater at source

Mitigation 2: Control wastewater discharge

Mitigation 3: Increasing efficiency in wastewater management

1. Enhance wastewater management by Public Private Partnership (PPP)
2. Big Data – integrate water quantity and quality, point source database, monitoring system, warning system
3. Promote green products and services
4. Capacity Building for local staffs
5. Awareness Raising for all stakeholder
6. Follow the global mitigation for water quality management
Integration of water-related government agencies

Natural Resources

20 Year Master Plan

Act/Law

Institute

Innovation

People

Country

World

National water resources management
The Four Pillars

- Policy
- National Strategy
- Reformation Plan

Act/Law
- Water Resources Act, 2018

Institute
- National Water Resources Committee
- ONWR
- River Basin Committee

20 Year Water Resources Master Plan

Innovation
- Database
- Application
- R&D
1. **20 Year National Strategy**: goals

- Security
- Competitiveness
- Capacity Development
- Equality and Equity
- Environmental friendly
- Management and Government

2. **Master plan (under the National Strategy)**: **Issue 19: Water Resources Management**

   - 19.1 Watershed-based management for water security
   - 19.2 Increase water productivity and value to reach international standard
   - 19.3 Conservation and restoration natural water courses nationwide

3. **20 Year Water Resources Master Plan**: to support the Master Plan Issue 19

- Domestic use
- Water security for production sector
- Flood management
- Water quality and conservation
- Upstream forest restoration
- Management

59
20 Year Water Resources Master Plan
(2018 – 2037)

1. Domestic use management
   - Clean and accessible water for all by 2030
   - Coverage of water supply for main cities/ tourist hotspots and economic zones
   - Water use per head is continuously decreased

2. Water security for production sectors
   - Development of water storage and increase efficiency of distribution system
   - Development of alternative water sources
   - Water provision for rain-fed area to reduce damages and losses in critical areas (50%)
   - Water productivity and restructure of water use

3. Flood and Water disaster management
   - Drainage system and water channel obstruction improvement
   - River Basin planning and enforcement
   - Flood prevention in 764 communities
   - Increase resilience and preparedness

4. Water quality management and conservation
   - Prevention and reduction of wastewater at point source
   - Construction of communal wastewater treatment plant
   - Water recycling
   - Natural river restoration

5. Upstream forest restoration and soil conservation
   - Upstream forest restoration and flash flood interception
   - Soil erosion control in sloping area

6. Management
   - Law
   - Master plan
   - International cooperation
   - Database
   - Monitoring and Evaluation
   - R&D
   - PR