

การวิเคราะห์กฎหมายน้ำฉบับใหม่เพื่อการปรับปรุงการบริหารจัดการน้ำของไทย
Analysis of the New National Water Law
for Improving Water Management Problem in Thailand

อารยา ยศมงคล¹
Araya Yotmongkol
araya17233@gmail.com

บทคัดย่อ

การบริหารจัดการน้ำที่ไม่มีประสิทธิภาพถือเป็นปัญหาสำคัญที่ประชาชนคนไทยไม่สามารถเพิกเฉยได้ ในปี 2561 ที่ผ่านมา รัฐบาลได้จัดตั้งพระราชบัญญัติทรัพยากรน้ำ พ.ศ. 2561 ขึ้น โดยหวังว่ากฎหมายฉบับนี้จะช่วยปรับปรุงการบริหารจัดการน้ำของประเทศได้อย่างยั่งยืน งานวิจัยนี้จัดทำขึ้นเพื่อค้นหาคำตอบว่ากฎหมายดังกล่าวจะสามารถปรับปรุงการบริหารจัดการน้ำของไทยได้อย่างไร ซึ่งผู้วิจัยดำเนินการหาข้อมูล ครอบคลุมตั้งแต่การรวบรวมปัญหาของการบริหารจัดการน้ำของไทย จากนั้นแบ่งปัญหาออกเป็น 4 ด้าน ประกอบด้วย 1) การจัดสรรน้ำที่เท่าเทียม 2) การจัดการน้ำในภาวะวิกฤติ 3) การจัดการคุณภาพน้ำและการอนุรักษ์ทรัพยากรน้ำ และ 4) การบริหารจัดการน้ำแบบบูรณาการ ต่อมาวิเคราะห์และจำแนกบทบัญญัติภายใต้กฎหมายฉบับนี้เพื่อให้สอดคล้องกับประเด็นการแก้ไขปัญหานี้ในแต่ละกลุ่ม ทั้งนี้การวิเคราะห์ดังกล่าวจะรวมถึงประเด็นอ่อนไหวหรือข้อที่รัฐควรคำนึงถึงหากนำบทบัญญัติเหล่านั้นมาใช้แก้ปัญหาในทางปฏิบัติ ทั้งนี้เพื่อให้การนำกฎหมายมาปรับใช้กับการบริหารจัดการน้ำมีประสิทธิภาพและลดผลกระทบจากประเด็นอ่อนไหวต่างๆ ผู้วิจัยได้ศึกษาและนำเครื่องมือทางเศรษฐศาสตร์ที่ได้ถูกอ้างอิงไว้ในกฎระเบียบและแผนงานของการบริหารจัดการน้ำในสหภาพยุโรปมาใช้ พร้อมจัดทำเป็นข้อเสนอเพื่อให้รัฐบาลหรือหน่วยงานที่เกี่ยวข้องกับการบริหารจัดการน้ำของประเทศนำไปปรับใช้ได้ต่อไปในอนาคต

คำสำคัญ ปัญหาการบริหารจัดการน้ำของไทย กฎหมายน้ำ เครื่องมือทางเศรษฐศาสตร์

Abstract

Thailand requires water around 147,747 million m³, whereas freshwater is available in only 102 million m³. Furthermore, water conflict still expands widely. Thus, ineffective water management is the crucial issue which Thai citizen cannot ignore. In 2019, Thai government established the Act on Water Resources B.E. 2561 (2018) and they expected this law to improve Thailand water management problems sustainable. The research provides the answer that how this new water law can improve the problems. Researcher starts the research by gathering water management problems in Thailand and separating them into four groups include 1) the equal water allocation 2) the management of water crisis 3) the management of water's quality and water resources conservation, and 4) the integrated water resources management. After that, provision of the new water law is analysed to present the concept and sensitive aspects that correspond to the improvement of the problems in each group. Finally, economic instrument, mentioned in the Water Directive Framework and water management plan of European countries, is presented for improving the problems and sensitive areas. Researcher examines the first group of the problem named the equal water allocation and diagnoses demand-side and supply-side of economic instrument to be the guideline of improvement. The result of this research can encourage Thai government for using the new water law to improve water management. They also consider the sensitive aspects in the practical processes. Moreover, the concept of economic instrument can be applied to other groups of water management problem.

Key words: Thailand water management problems, water law, economic instrument

¹ข้าราชการตำแหน่ง นักประชาสัมพันธ์ชำนาญการ ในสังกัดกรมทรัพยากรน้ำ กระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม ได้รับทุนพัฒนาบุคลากรภาครัฐ ปี 2561 ศึกษาต่อด้านความยั่งยืนและความปลอดภัยทางด้านน้ำ ณ ประเทศสก็อตแลนด์

Research Problem

Thailand is a country that encounters water problems annually. The primary source of water is rain. Thailand located in the Southeast Asia continent, which is a tropical zone near the equator. The influence of stormy winds brings the rain in Thailand moreover El Nino and La Nina phenomenon can be the critical factor for the variable rainfall. (Francesca Franzetti, Alessandro Pezzoli, and Macro Bagliani, 2017: 171) The consequences are water shortage and flooding in various areas. Currently, Thailand faces water imbalance. The freshwater that can be accessed is approximately 102 billion m³, whereas water demand is 147,747 billion m³. (Somkiat Apipattanavis, Sitha Ketpratoom, and Pradab Kladkempetch, 2018: 114) Water use in Thailand still increases continuously for population growth support and covers economic expansion and urbanisation. Water becomes a limited resource. Water conflict between upstream and downstream areas is intense and expands widely. Therefore, **water management efficiently is an essential issue for Thailand.**

Thailand manages water resources which divided into surface water and groundwater. The State Irrigation Act B.E. 2485 (1942) and People Irrigation Act B.E. 2482 (1939) provide the regulation of surface water for irrigation areas. In contrast, the Groundwater Act B.E. 2520 (1977) indicates the protection of groundwater resources, the licensing of groundwater exploitation, and groundwater utilisation control. (Chaiyuth Sukhsri, 1999: 3) For the last decade, surface water outside irrigation areas was not covered by a specific law. Over 48 agencies manage water in a different direction and lack of connectivity. It is the cause of budget loss and disintegrated water problem-solving. (ONWR, 2018: 17)

Thailand attempts to achieve the sustainability of water security by reforming water management. In January 2019, the Thai government adopted the Act on Water Resources B.E. 2561 (2018) to be the leading law for national water management. This new water law was adapted from involved laws and improved by related water organizations, including water specialists, government agencies, business representatives, and communities both upstream and downstream. It is a challenging aspect that this new water law is expected to improve water management problems in Thailand sustainable.

Research objective and Research Questions

The research aims to analyse the Act on Water Resources B.E. 2561 (2018), the new national water law to improve water management problems in Thailand.

The main research question is how does the new water law can improve problems of water management in Thailand? There are three sub-questions include:

- 1) What are the issues of water management in Thailand?
- 2) How can the new water law improve the problems of water management in Thailand?
- 3) How can we adapt the international policies or water management of other countries for proposing Thailand's water management guideline?

Methodology

The methodology of research is a qualitative method by analysing secondary data and interviewing. The research comprises three sub-questions for achieving the main question; therefore, this research's processes are also separated into three parts.

Before answering the research questions, the researcher reviews water management characteristic of Thailand to find the gaps which are possibly the cause of water problems in the country. Keywords,

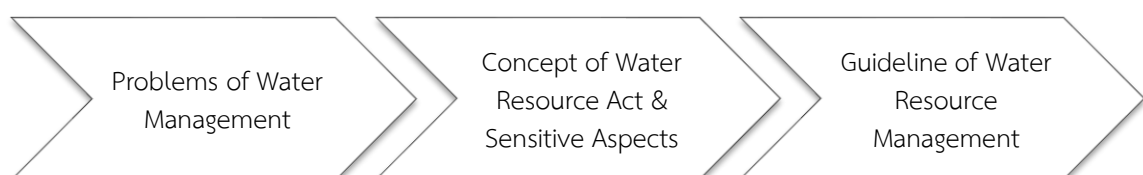
that researcher uses for reviewing, are “Thailand water problem”, “water usage in Thailand”, and “water-based community”. Moreover, the literature review covers the process of the new water law establishment to ensure the quality of the law involved with water users in every part. The keywords are “Thailand’s water law”, “legal framework of Thailand’s water resources”, “water act in Thailand”. Researcher studies the economic instrument mentioned in the Water Framework Directive. The concepts of economic instrument will be analysed to adapt to water management in Thailand. The keywords are “WFD” and “economic instrument in water allocation”.

After understanding water problems and the gaps which are the cause of water management issues in Thailand, three parts of sub-questions will be scrutinised.

In the first part, it starts with addressing the problems of water management in Thailand. The researcher collects the issues of water management from the Thai government reports include the Office of the National Water Resources, the Department of Disaster Prevention and Mitigation, and the Department of Water Resources. Furthermore, the researcher joins with the online conference in the topic “The Project of Water Management which relevant to the Development of Thailand’s Economic and Social”. The discussion is presented by specialists from the University of Thammasat and Thailand Science Research and Innovation. They examine water management criteria by considering balance of water demand and water supply in different river basins of Thailand. (The University of Thammasat and TSRI, 2020) Besides, the researcher searches academics articles and books with keyword “problems of water management in Thailand”.

The second part will diagnose the concept of new water law to analyse the water rights mentioned and the sensitive aspect of the law in practical process. The researcher studies the new water law from the Act of Water Resources B.E. 2561 (2018) and collects the recommendation of sensitive aspects in the law for the practical process from the online conference and academic articles.

In the third part, the international policies and water management of other countries will be adapted for proposing a water management guideline. The researcher chooses “the equal water allocation”, one of the four aspects from the second part and advances it with a water management guideline. “Economic Instrument” mentioned in Water Framework Directive of EU becomes the keyword of this part. Moreover, the researcher uses interview methodology in this part. The data from interviews is primary data from an experienced person to the answers research question. The interviewee is Mr Nirut Koonpol, the Bureau of International Cooperation director in the Department of Water Resources. The topic of interviewing is Thailand’s water management following to current world trend and international policies under the Water Resources Act. The process of the interview will be an online interview and takes time approximately 45 minutes.



Picture 1 Process of Research Methodology

Results

1. Problems of Water Resources Management

The researcher examines water resources management problems in Thailand for addressing the cause of water problems. Eight issues mentioned as follow;

1. Water demand increases whereas water use prioritisation is still lack of control. (OECD, 2021)
2. Wastewater from the leakage of the agricultural chemical and household activities is ignored in the upstream areas. (Guangwei Huang and others, 2019: 671)
3. Illegal deforestation increases in the watershed areas. It is the cause of severe landslides and floods in the monsoon season. (Yongyut Trisurat, Hiroaki Shirakawa, and John M. Johnston, 2019: 650)
4. Most of the building structure obstructs water flow in urban areas. (Nipon Poaponsakorn, 2013: 6)
5. Insufficient control of water use is the cause of water shortage in the dry season. (Francois Molle, 2002: 215)
6. Water users do not concern about water value because it is free. (Francois Molle, 2002: 218)
7. There is a conflict between water users in the upstream and downstream areas in the biophysical and social dynamic. (N.Becu et.al., 2003: 331)
8. Institution and infrastructure complexity of water administrators bring the overlapping implementation. (Richard Friend and Pakamas Thinphanga, 2018: 3935)

Eight issues are combined into four groups for diagnosis in the next part of the research. They include 1) water allocation issue 2) water crisis management issue 3) water quality and watershed conservation issue and 4) integrated water resources management issue.

2. Concept of Water Resources Management in the Act of Water Resources

The Act of Water Resources B.E. 2561 (2018) was adopted to be the primary water management law. The researcher diagnoses the law for presenting sensitive aspects in a practical process. Four elements of Water Resources Act conceptual include;

1. Equal Water Allocation
2. Management of Water Crisis
3. Management of Water's Quality and Water Resources Conservation
4. Integrated Water Resources Management

2.1 Equal Water Allocation

The problems of water management, which lack prioritisation control and lack of awareness to save water, can improve by promoting equally water allocation and advocating value of water. People can reach water and pay for it in a reasonable case. The concept in the Water Resources Act will support the actions and recover these issues.

Section 7 of the law formulates the basic rights of people to access public water resources. People have the right to use or keep public water resources in necessary volumes without causing damage to other people. Water allocation is identified in chapter 4, which classified the use of shared water resources into three types.

The law is established to be the primary water management law in public water resources. It is an important feature that the practical process will be diagnosed for achieving equally water allocation under this law. The researcher presents the sensitive aspects of the practical approach in this part as follow;

1. The conflict between water users in a different economic sector can occur. There is a diversity of water quantity, water quality, and geography related to the level of gravity. People who live in upstream areas have more occasions to reach water sources than downstream people. Suppose downstream areas require a majority of freshwater. In that case, they must approach the negotiation with people in upper areas for saving water, treating water sources, and launching more water to down areas.
2. The explicit criteria of water payment must be expressed. If water users in type two and type three are required for licence permission and water charge, the government must show the definition and differentiation between type one, type two, and type three. Moreover, the government must explain the method to manage fee from water charge for transparency of payers.
3. Some businesses invest by paying more money for using more water. It is not a target of the law. The law determines water payment to increase awareness of water users and stimulate them to save water.
4. Charging water can be the cause of product price raise. The producer must pay more for water because it is an essential material. If the cost of product increases, the burden of indirect water payment owned by general people will increase. The government should concern in this issue.

2.2 Management of Water Crisis

Water management issues in insufficient water usage control and obstruction of water flow are improved by focusing on water crisis management. Concept of the Water Resources Act can prevent water crisis in both cases of water drought and flood. The law determines a special centre to control water supply by providing enough water to water shortage areas and draining flooding. The barriers of waterway are also controlled with this law.

Section 24 of the law formulates the government to establish an ad hoc command centre for managing the water crisis. The ad hoc command centre will cooperate with relevant organizations such as state agencies, local government organizations, and citizens to prevent, control, resolve, and mitigate effects from ensuing damage.

Chapter 5 of the law identifies water management for drought and flood. Section 56 mentions the infrastructures will not exploit or obstruct a flow of water in the waterways system. Moreover, section 58 of the law refers to the water drought zone. The Prime Minister can declare severe water drought zone in such area and prescribe water use methods for controlling the quantity of water usage. Section 60 supports the right for a person who must ration their retained water to mitigate the consumption grievances in case of drought. The person who rations water will get the recompense. Besides, section 61 and section 64 indicate that basin committees have a role in managing water in the river basin and presenting the plan for drought and flood. The law in section 78 prescribes the rules of handling structure or activities that affect public water resources must be required to remove. If the removal attacks benefit of water users, they can get compensation in the sensible rate.

Researcher analyses the sensitive aspects under the law in water crisis management. There are 3 aspects include;

1. Climate change scenario can be the main cause of water crisis; thus, water crisis plan should be reviewed continuously by considering climate change aspect. If the plan is in accordance with the current situation, efficient water crisis management will be approached.
2. The water crisis is a long-term issue, so integrated water management and sustainable implementation should be promoted. Previous situations can be analysed in the causes of problems, monitored the impact, and made a water crisis statistic for forecasting impacts of the water crisis. It also can be mitigating the damage in the future. (Francesca Franzetti, Alessandro Pezzoli, and Macro Bagliani, 2017: 193)
3. Water crisis management with the top-down pattern can lack receiving the realistic data in each area. In a crisis, the prime minister has a role in controlling the situation by top down process for working fast and solving problems immediately. However, the leading organisation can miss some critical data which is specific for each area. If water crisis cooperation of representative in the risk areas can be encouraged to join with the implementation, the efficiency of water management in crisis will occur. Local organizations will support geographical characteristics, the nature of the crisis in the area, and local wisdom for decreasing and mitigating the damage. Furthermore, the data can be adapted to be the effective prevention and resolution of drought and flood plan for the future. (Wengky Ariando, 2017: 3)

2.3 Management of Water's Quality and Water Resources Conservation

Water's quality and water resources conservation management problems are wastewater from agricultural and household activities runoff and illegal deforestation in the watershed area. The Water Resources Act determines the provision to control and improve these issues.

Chapter 6 of the law is the conservation and development of public water resources. It focuses on prescribing and regulation for conserving and developing public water resources. The actions, which are the causes of pollution, danger, or damage to shared water resources, will be prohibited. Section 73 of the law concerns the environmentally protected area. The exploitation of the land, which affects public water resources, will be controlled. Section 78 advocates water users to preserve the ecology in their area. Any action causing water resources deterioration will be prohibited, such as release toxic substances in the river and discharge untreated water to public water resources. Water users are prerequisite for installing equipment or measures to examine water quality harm, prevent water resources damaged, and resolve destroyed water sources in their area. The structure affecting public water resources will be required to be removed.

A sensitive aspect of managing water's quality and water conservation is the conflict between government officer who uses the law and people who take advantage in the area for their livelihood. The law provides the right for a government organization to determine the environmentally protected area. It can affect original people who use that area for their agriculture and habitat. For instance, there is the conflict of local people in Ka Ching Swamp Forest, Chumporn Province, Thailand who disagree with the enforced legislation for managing and conserving this swamp forest. They think the ruling will obstruct the locals in term of habitat and generating income. They ignore the law and still continuous destroy swamp forest for their demand. (Poomchai Suwande and Akkara Thammathikul, 2020: 103)

2.4 Integrated Water Resources Management

The issues integrated water resources management are the conflict between upstream and downstream people and the overlapped operation because of a complex institution. The stipulation in the Water Resources Act can improve these problems.

Chapter 3 of the law is water resources management bodies. It indicates the duties of the National Water Resources Commission to prepare and consider the policies and master plans of water resources administration to integrate the management, maintenance and conservation of water resources. Part three of this chapter explains the role of drainage basins and drainage basin committees. Water management in Thailand will be divided into river basin management to increase efficient water resources management. In the practical organization term, section 38 mentions a water-user. It is the group of people who use water in neighbourhood areas or the same drainage basin. They have the right to assemble and register for establishing a water-user body. It provides the rights to use, develop, manage, maintain, and conserve water resources among the water-use body members. People in the water resources areas can operate their water use by them self and achieve more sustainable water management. The objectives, duties, and powers of water-user bodies will be prescribed in the Ministerial Regulation which can be different regulations depend on the hydrological conditions, the geographical constraints, the ecosystem, cultures, customs, and lifestyle of the people in each area. The law will be used in the experimental process to achieve integrated water resources management. There are some sensitive aspects that the government has to concern. They are political interference and ancient riparian right.

1. Political interference can obstruct water management. It related to water policies, planning, and budget decisions in each area. (ASEAN Development Bank, 2015: 14) Moreover, water management will lack continuous implementation because of political change. Each political era has specific policies. It is possible to be a different detail from the last generation.
2. The ancient riparian right will probably be ignored from current policies. Most of the water use protected from the law is water usage in consumption, economy, and ecological conservation. Local activities such as water use for custom and regional cooperation such as Weir mine group are unnoticed. Local stakeholder loss of opportunities to participate with the integrated water resources management due to the law does not cover their right.

3. Guideline of Thailand's Water Management

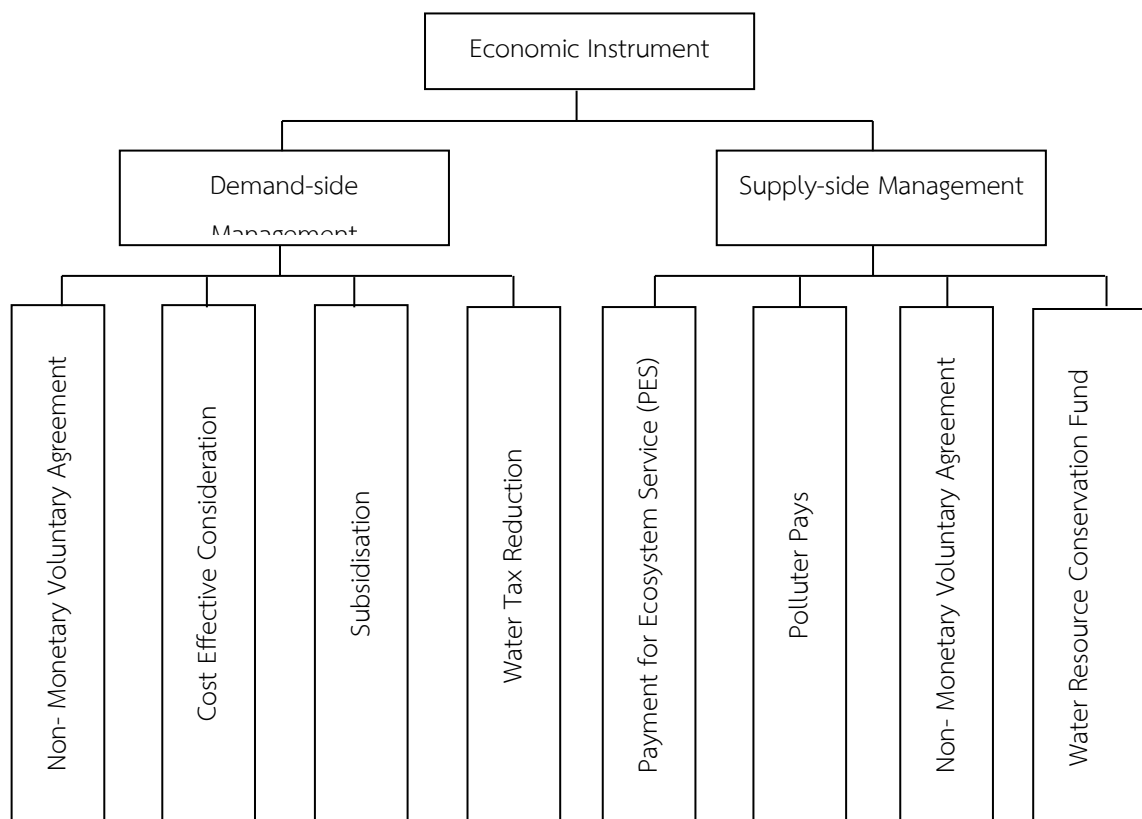
According to the Water Framework Directive (WFD), a common framework for water management in Europe, promotes the sustainable water use by adapting **Economic Instrument** to achieve the environmental objective. Article 5 of WFD prescribes the financial analysis of water use and environment of human activities. Furthermore, article 9 of the directive determines the cost of water service. Water price will ensure efficient water use and contribute environment objectively. Annex III identifies that water cost has to cover long-term forecast of water supply and water demand.

The researcher improves water management problems in the group of "equal water allocation" by adapting the economic instrument mentioned in the Article 5 and Article 9 of WFD. The guideline of water allocation improvement will be clarified in this part of the research.

As the first and second part of the research, water allocation is one of the essential water management problems in Thailand. Water will have more value by promoting equally water rights and efficiently water allocation in the Water Resources Act. The law reveals water users, who use more water, have to pay more money and present their water management plan. However, there

are sensitive aspects of the law that governments have to consider when using the law in a practical process. The economic instrument concept is adapted to improve water management and complete the sensitive areas of the law.

The economic instrument is divided into demand-side management and supply-side management. The demand-side management presents the measures that support water demand in the limited water resources. They compose non-monetary voluntary agreement, cost-effective consideration, subsidisation, and water tax reduction. On the other hand, the supply side management increases water resources for balance with water demand. The measures are the payment for ecosystem service (PES), polluter pay, non-monetary voluntary agreement, and water resource conservation fund. (Picture 2) This part of the research has presented the advantage and the limitation of Thailand when deploying the economic instrument to improve water allocation problems.



Picture 2 Framework of Economic Instrument to Improve the Efficiently Water Allocation

Economic Instrument in Demand Side Management

1) Non- Monetary Voluntary Agreement

It is the process that water users support the management with willingness without enforcement. Water users in different areas set the voluntary agreement to allocate water from upstream to downstream. This process can reduce the conflict between different sectors because all stakeholders promote the agreement. (Maria Carmona and others, 2017)

2) Cost-Effective Consideration

The cost-effective consideration is the instrument to check and control the balance between water use and the goods value. According to the conference of the University of Thammasat and Thailand Science Research and Innovation, the local government has to be concerned about water footprint and water use efficiency in each region because each crop requires different quantity of fresh water. The water footprint is introduced as a method to indicate water use and production impact. The more water footprint means the more quantity of water use and water pollution released. Some areas use water for their plants that have less value in that area and they can cause water stress. Cassava and rubber; for example, cause high water stress in Mun, Chi, and East Coast Gulf watershed. The second rice and cassava cultivation is the source of water stress in Chao Phraya river basin. Biofuel crop, such as sugarcane, provides water stress in Thachin river basin. (Shabbir H. Gheewala and others, 2014) Thus, cultivation different crops in the specific areas, which products can have more value, are the effective process for managing water allocation in the agricultural sector.

3) Subsidisation

Government supports subsidisation to industries, farmers, or entrepreneurs who suffer from water scenarios. When the country faces a water crisis, subsidises are adapted to reduce the production cost, shift downward supply trend, reduce price, and increase the quantity of goods in the market. It can be price support, subsidised loan, direct payment, and tax or charges relief. (Dolores Rey and others, 2019: 220) The process of subsidisation can reduce the side effect of water payment in water allocation which is possible to affect product price raises.

4) Water Tax Reduction

Water tax reduction is one of the economic instruments to reduce production cost. According to interviewee Mr Nirut Koonpol, the government should support industries by reducing the water cost for industry that use innovative processes or improve the procedure for saving water, treating wastewater, and producing products that encourage the awareness of water value. This instrument can motivate the industries to provide efficient water use in the production process and produces more water-saving products. Besides, this measure can improve the problem of product price raise because of the production cost increase.

Economic Instrument in Supply Side Management

1) Payment for Ecosystem Service (PES)

PES is an incentive measure which government use for motivating water users to conserve water resources. This measure can encourage cooperation of water users in the different sectors by supporting the compensation. According to the conference of the University of Thammasat and Thailand Science Research and Innovation, the Northern region is the upstream Thailand area. Most the upper people use water for their household activities such as consumption, small agriculture, and small livestock. They have to preserve water resources which are the watershed areas for downstream people. They should get compensation to inspire and reward them for their sacrifice and responsibility to protect ecology in watershed areas for downstream people. The payment can be a convenient infrastructure or money for supporting community's activities. PES can decrease the conflicts between water users and increase awareness of water value in the long term.

2) Polluter pays

Industries or activities which are the causes of pollution have to pay for polluted treatment. This measure will stimulate the responsibility of contaminated sources. The industries have to get the licences and establish the plan to treat the wastewater before releasing them to the public water sources.

3) Non - Monetary Voluntary Agreement

Water users, especially in the upstream areas, voluntarily limit the use of fertilizer and improve water quality. This measure is similar to demand-side management. Water users take action without enforcement. Before allocating water from watershed areas to downstream, the quality of water has to be controlled. Government motivate farmers to grow organic plant and avoid chemical fertilizer which is the crucial cause for water contaminated with a chemical substance.

4) Water Resources Conservation Fund

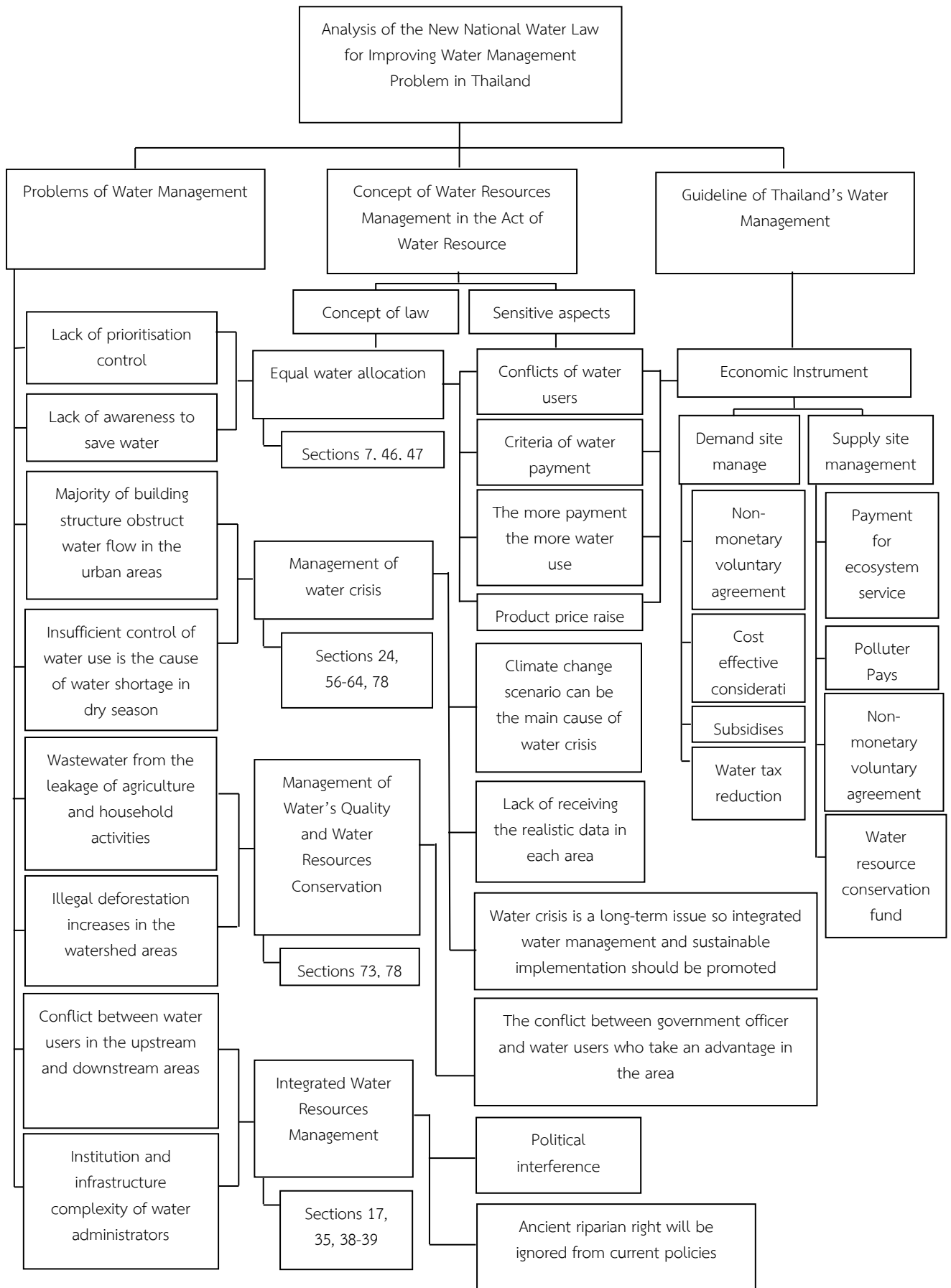
Water Resources should have the right as same as the juristic person to be protected and conserved. According to the interview, the government should establish the Water Resources Conservation Fund to action with the ecological damages. The fund will support organizations and activities that recover, improve, and conserve environmental abundance in the long term. This measure can encourage the nature-based implementation following the UN Decade's declaring on Ecosystem Restoration 2021 – 2030.

Advantages and Limitation of Economic Instrument Deployment in Thailand

Researcher evaluates the benefits and limitation when Thailand deploys the economic instrument to improve water allocation. Both management of demand and supply-side can support the efficiency of water allocation. The problems of water management in the water allocation part will be improved. The conflict of water users in the different sector decreases with voluntary agreement. The reasonable criterion of water payment is established. The product price raise will be controlled because of water tax reduction and subsidisation. Besides, the water resources will be conserved due to the PES measure, polluter pay, and water resources conservation fund.

On the other hand, the limitations of an economic instrument in Thailand have still appeared. There are two aspects include:

1. Economic instrument in the Water Framework Directive is a good concept, but it is not popular and still has barrier in some European countries. Because of the directive determines the expenditure that water users will pay depends on quantity of water use and environmental conservation. Water users have to pay more to protect the environment and control it to achieve a good status. They pay by lacking of willingness. (Dolores Rey and others, 2019: 228) Thus, Thai government should concern with citizens' awareness of environmental conservation responsibility as same as water usage.
2. Government has to manage the budget to support the economic instrument. The revenue from water bill payment is not enough to manage overall water allocation. They should separate general taxation from advocating financial device.



Picture 3 Conclusion of the Research

Conclusion

In conclusion, Thai government can use the new water law to improve problems of water management. Sensitive aspects in the practical processes are the critical factor that the government also consider. The economic instrument mentioned in the Water Directive Framework and water management plan of European countries can be deployed to improve the problems and sensitive areas of water allocation. Moreover, the research's recommendation is encouragement to apply the concept of economic instrument with other groups of water management's problem that mentioned in the research include the management of water crisis, the management of waters quality and water resources conservation, and the integrated water resources management.

Bibliography

- ASEAN Development Bank. (2015) Guidance Note Irrigation Subsector Risk Assessment, Mandaluyong City, Philippines, 14
- Chaiyuth Sukhsri (1999) Water Resources Law in Thailand. Faculty of Engineering, Chulalongkorn University and Department of Energy Development and Promotion (DEDP), Japan International Cooperation Agency (JICA) and The Japanese Institute of Irrigation and Drainage (JIID), 3
- Dolores Rey and others. (2019) Role of economic instruments in water allocation reform: lessons from Europe, 35(2) *International Journal of Water Resources Development* 206, 220, 228
- Francesca Franzetti, Alessandro Pezzoli, and Macro Bagliani. (2017) Rethinking Water Resources Management Under a Climate Change Perspective: From National to Local Level. The Case of Thailand in M. Tiepolo and others (eds), *Renewing Local Planning to Face Climate Change in the Tropics (Green Energy and Technology, 2017)* 171, 193
- Guangwei Huang and others. (2019) Duality Seasonal Effect and River Bend in Relation to Water Quality in the Chao Phraya River, 11(4) *Water* 656, 671
- Interview with Mr. Nirut Koonpol, Director of Bureau of International Cooperation, Department of Water Resources (Online interviewing, 7 August 2020)
- Maria Carmona and others. (2017) Assessing the effectiveness of Multi-Sector Partnerships to manage droughts: The case of the Jucar river. [Online] Available: <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2017EF000545>. 2021, January 11
- Molle F. (2002) Economic Tools for Water Demand Management in Thailand: Conventional Wisdom and the Real World' in Donna Brennan (ed), *Water Policy Reform: Lessons from Asia and Australia (Proceedings of an International workshop held in Bangkok, Thailand 2002)* 215, 218
- N.Becu et.al. (2003) Agent Based Simulation of a Small Catchment Water Management in Northern Thailand: Description of the Catchscape Model. 170/2 *Ecological modelling* 319, 331
- Nipon Poaponsakorn. (2013) Impact of the 2011 Floods, and Flood Management in Thailand, 34 *ERIA Discussion Paper Series*, 6
- OECD. (2021) Chapter 3 Towards better management of water security in Thailand's Northern Region. [Online] Available: www.oecd-ilibrary.org/sites/5c065631-en/index.html?itemId=/content/component/5c065631-en. 2021, January 5
- Office of the National Water Resources. (2018) *The Management of Water Resources in Thailand*, 17

Poomchai Suwandee and Akkara Thammathikul. (2020) The Problems of Law Enforcement for the Wetlands Management and Conservation: The Case Study of Ka-ching Swamp Forest, Patew, Chumpon Province, 14(2) NRRU Community Research Journal 95, 103

Richard Friend and Pakamas Thinphanga. (2018) Urban Water Crisis under Future Uncertainties: The Case of Institutional and Infrastructure Complexity in Khon Kaen, Thailand, 10 Sustainability (Basel, Switzerland) 3921, 2935

Shabbir H. Gheewala and others. (2014) Water Footprint and Impact of Water Consumption for Food, Feed, Fuel Crops Production in Thailand, 6 Water 1698, 1715

Somkiat Apipattanavis, Sitha Ketpratoom, and Pradab Kladkempetch. (2018) Water Management in Thailand. 67 Irrig. and Drain. 113, 114

The University of Thammasat and TSRI. (2020) Project of Water Management which relevant with the development of Thailand's economic and social, Seminar to disseminate study results

Water Framework Directive 2000/60/EC of 23 October 2000

Water Resources Act B.E. 2561 (2018) (TH)

Wengky Ariando. (2017) Environmental Problems and Management of Water Resource Research Gate, 3

Yongyut Trisurat, Hiroaki Shirakawa, and John M. Johnston. (2019) Land-Use/ Land-Cover Change from Socio-Economic rivers and Their Impact on Biodiversity in Nan Province, Thailand, 11(3) Sustainability 649, 650