Action Plan on RBWEM for Cau and Dong Nai River Basin

March 2019

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1. Introduction

1.1 Background

The Action Plans are planned to be prepared as one of outcomes under Output-3 of the Project. The main purpose of the process of preparation of Action Plans are to provide experiences on TPLs control in river basin level, based on the proposed procedure by Circular-2 on loading capacity assessment and coordination mechanism suggested by the guidelines prepared instead of Circular-1. In future, the experiences of the Action Plans preparation in the Project would be adopted to applying the TPLs examination results to the Socio-Economic Plan, as regulated by Decree 38.

The Project was implemented for improve the river basin management based on LEP and Decree 38/2015/ND-CP. The Project is contributed to develop regulations and guidelines for river basin water environment management (RBWEM). The current legalizing system and activities concerning the loading capacity on RBWEM is shown in Figure 1-1. And also, the project is supported to implement the activities or this legal system by provide some Technical guideline/ Manuals. Currently, legal systems and necessary technical documents are prepared, but in actual operation, improvement of existing activities and a more effective legal system may be required. This document is proposed a recommending activities/ effective system on the activity in Figure 1-1 such as pollution load analysis and planning of environmental management plan.

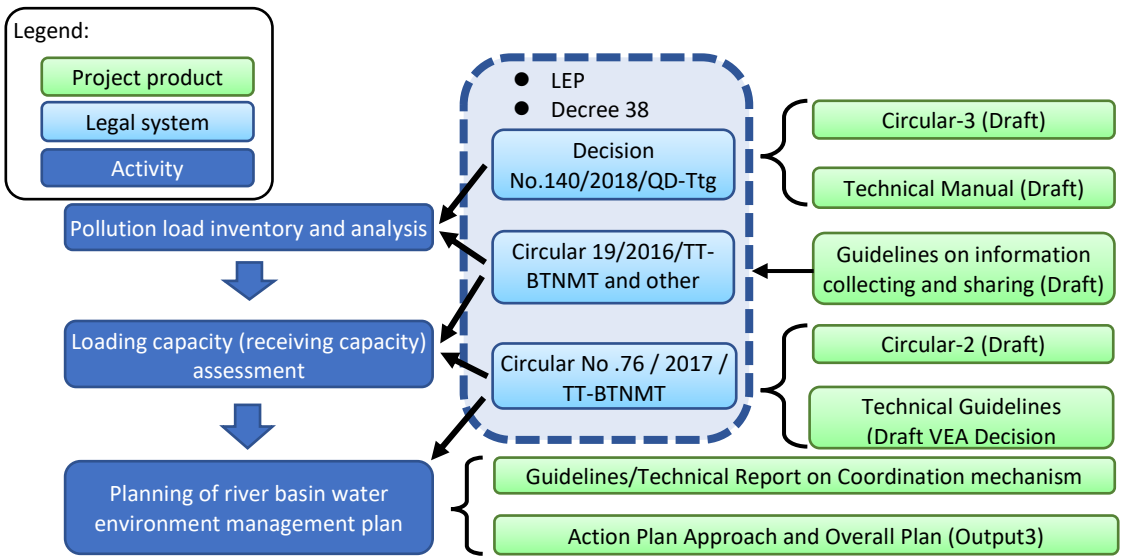


Figure 1-1 Legalizing Status related to RBWEM in Vietnam and Contribution of the Project

1.2 Basic Activity of Pollution Load Analysis and Action Plan

The Circular 76 is regulating to implement assessing loading capacity of each river section and responsibility for the activities regarding approval of the assessed loading capacity on inner-, inter-provincial river. The methodology on assessing of loading capacity is suggested 3 ways of direction

method, in-direction method and using a Water Quality model in Circular 76. Action Plan suggest establishing pollution load reduction scenario based on the assessed loading capacity on basin wide. The key activities of Pollution load analysis under Circular 76 and establishing pollution load reduction scenario under Action plan is shown in Figure 1-2. As show Figure 1-2, activities on Circular 76 and Action plan is desirable continues implement with integrating the target such as parameters, target year and data sources, for effective management. On the other hand, it was suggested that necessary to improve the quality of existing systems and data in order to implement a series of activities through the pilot activities on the Project.

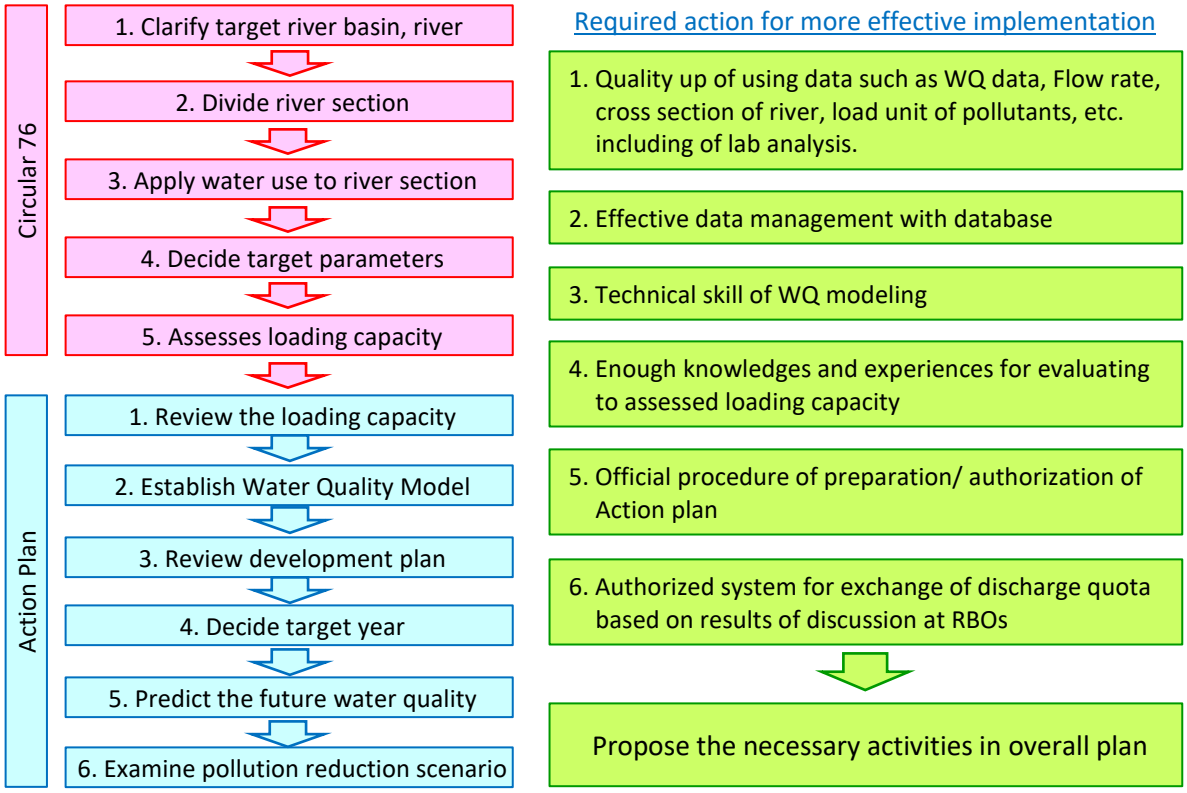


Figure 1-2 Key Activities on Pollution Load Analysis and Recommendations

1.3 What's Action Plan

As shown above, the Circular 76 provide the calculation method, Assessment methodology and responsibility of concerning organization only, but it is not suggested "how use" assessment results for river management. The assessed loading capacity will be estimate easily to using for obtaining permission to establishment of new business in the river section if considering of responsibility of DWRM. However, even if new business will be properly approved and permitted and each business entity apply to emission standards, the future pollution load in basin will be only increased. In addition, the pollution source control method based on such licensing and approval may disadvantageous for new business companies because starting of business will be influenced by the loading capacity is enough or not in the river section.

Therefore, administrative organization is desirable generate additional loading capacity in river section by manage existing companies properly and efforts to reduce pollutant load under existing technologies for seeking fairness among existing companies and new companies. Reducing of Pollution load from river section shall be considered to generated-pollution load in the river section and contributing-pollution load from up-stream. Also, the reduction cost of pollution load and reduction limit of pollution load will be differenced by pollutant source. In considering the pollutant load reduction plan, it is important to examine which sector or which area actually should reduce pollution. In Action plan, specific target area and sectoral pollutant load reduction targets and the results are presented based on the gap between the assessed loading capacity and the environmental standards. In preparing action plans, it is necessary to consider not only information on pollution load analysis but also socioeconomic development plan, population dynamics, etc. Basic policy and methodology of action plan are shown in Action Plan provided on our project, but in this document also suggest recommendation to more effective implement on action plan.

The other hand, on Decree 38/2015/ND-CP is required to implement allocation discharge quota of wastewater for interprovincial river management. Administrative organization is required to propose discharge quota of each section/ area that can be maintain water use/ water quality through the examination of action plan.

2. Expected Contents of the Action Plans

The Action Plans shows a series of process for river basin management by TPLs control approach. The Action Plans will have the following contents.

2.1 Grasping Current Status of Target River Basins

The Action Plans show current status of target river basins, such as water quality, water use, land use, population, socio economic condition, distribution of pollution sources and environmental management activities. Through the Action Plans, current status information can be shared among the provinces in the target river basin.

One of the most important things to grasp current status of the target river basin is to estimate discharged / reached pollution load from pollution sources. Location and characteristic of main pollution sources should be identified for estimation of pollution load. To estimate pollution load at river-basin level, it is necessary to compile pollution sources information by sub-basin units. Pollution Load Analysis and Future Prediction

By the PP of the Project, the existing pollution load in the target river basins were estimated. The estimation is summarized in the Action Plans, and based on the estimated result, future pollution load will be predicted in 2030, based on the expected population increasing and socio-economic development with the planned pollution load reduction scenarios.

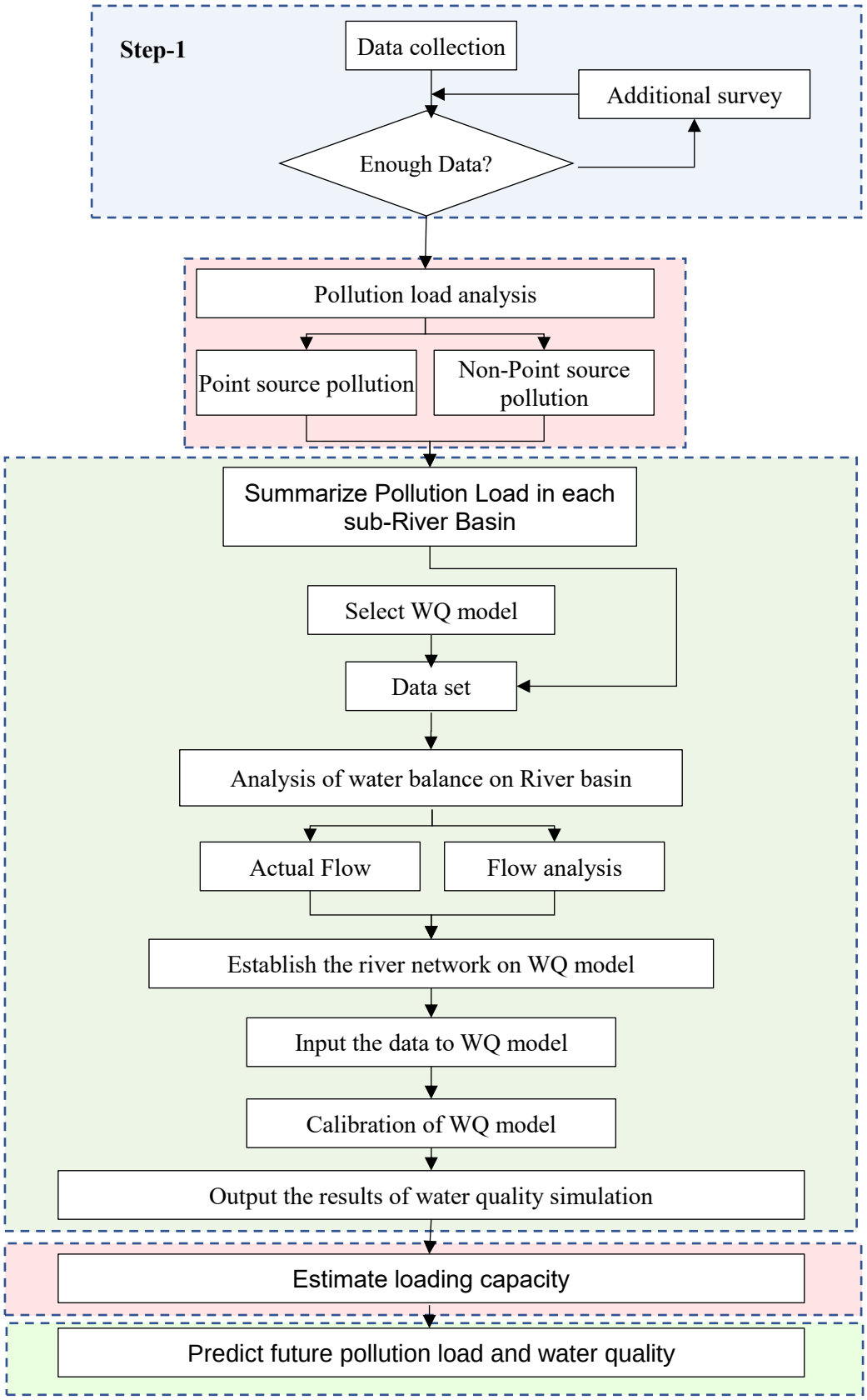


Figure 2-1 Technical Process Flow on Pollution Load Analysis and Loading Capacity Calculation

Calculation of Pollution Load at Each Pollution Source

(a) Pollution Load by Domestic Wastewater

The following equation is used to calculate pollution load by domestic wastewater.

PL = population number x PLU

where,

PL: pollution load [g/day]
PLU: pollution load unit [g/day/person]

Examples of pollution load units of domestic wastewater are shown in Appendix-3.

(b) Pollution Load by Facility Wastewater

Two types of equations are used to calculate pollution load by facility wastewater depending on availability of wastewater monitoring data.

(i) Using of Wastewater Monitoring Data

PL =WQ [g/m^3] x WV [m^3/day]

where,

PL: pollution load [g/day]
WQ: wastewater quality [g/m^3]
PL: wastewater volume [m^3/day]

(ii) Using Pollution Load Units

In case that wastewater monitoring data is not available, pollution load is estimated using the following equation with appropriate pollution load units.

PL = A × PLU × (1- R)

where:

PL: pollution load [g/day]
A = activity level of pollution source
PLU = pollution load unit assuming no control
R = Removal efficiency of control device

2.2 Pollution Load Reduction Planning

Scientific calculations by means of a water quality model are carried out to find the most preferable approach which reduces required amount of pollution load to achieve the target water qualities over the

whole river basin. To this end, several alternatives of pollution load reduction plans are examined, taking account of the following factors:

- Basic approaches for preparing pollution load reduction plan
  - Identify prior target area and pollution sources,
  - Consider cost-performance of alternative measures, and
  - Adopt sector approach for pollution load reduction.
- Conditions to be examined for preparing pollution load reduction plan
  - Current regulations and standards on water environment management
  - Regional development plan
  - Applicable techniques to reduce pollution load

(1) How to Set Pollution Load Reduction Plan?

1) Identification of Prior Target Area and Pollution Sources

To consider pollution load reduction plans effectively and efficiently, priority area and target pollution sources should be clarified. In accordance with difference of priority levels, target pollution sources are grouped, and pollution load reduction plans are developed.

2) Cost Performance on Pollution Load Reduction

If same amount of pollution load can be reduced by several ways, such as installation of wastewater treatment plant on industries or development of public sewerage system, cost to reduce unit pollution load should be compared among several possible ways to reduce pollution load to select appropriate pollution reduction load reduction plan.

3) Adoption of Sector Approach for Pollution Load Reduction

Basically, it is recommended that amount of pollution load to be reduced to achieve a goal of WEMP is allocated in accordance with sub-total amount of generated pollution load by each sector. For example, if amount of pollution load in industrial sector from current year to a target year of WEMP is increased and should be reduced to achieve a goal of WEMP, the amount of pollution load to be reduced should be handled in industrial sector. In case that more preferable way can be found from cost performance viewpoints, the amount to be reduced can be allocated to other sectors.

4) Introduction of New Approach for Pollution Load Reduction

If required pollution load can not be reduced even though existing legislation for pollution control is adopted, new approaches for pollution load reduction are recommended to be introduced as a pollution load reduction plan.

(2) Pollution Control Approaches

To clarify present situation on water environment management, relating information should be collected taking into consideration on the pollution control approaches, and classified into each type of the approaches.

In general, pollution control approaches are classified into different ways, depending on countries and projects. In this Study, the following categorization of five (5) approaches is recommended taking into consideration Vietnamese water pollution control system.

Regulatory Approach:	This approach called "command and control" aims to promote the pollution mitigation measures at pollution sources by forcing pollution generators to comply with regulations and requirements by means of legal powers. The regulations and requirements with which pollution generators must comply are set as "command" in legislations. Management agencies supervise and inspect the compliance status of pollution generators and take different sanctions against violators, when incompliance is found. This is called "control".
Economic Approach:	This approach aims to promote the environment protection measure by economic or financial incentives and/or disincentives. There are different measures to give incentives (or disincentive) like: collection of fees, compensation for environment damages, provision of soft loans, preferential taxation, preferential land uses, etc.
Technical Renovation Approach:	This approach aims to encourage the voluntary behaviours of pollution generators to introduce and apply the pollution mitigation measures through different ways. Supporting the promotion of CP and EMS and awarding of good practices are examples to give incentives to promote voluntary measures of pollution generators.
Awareness Raising Approach:	This approach aims to promote the environmental protection measures by enhancing the environment awareness of pollution generators and general citizens. This approach includes the rating of environmental performance of pollution generators, public disclosure of environmental management information and instruction to farmers on the usage of fertilizers and pesticides.
Infrastructure Development Approach:	This approach aims the development of sewerage systems attached by sewage treatment plant so as to reduce the pollution load derived from urban domestic wastewater to the environment.

Box Total Pollution Load Control in Japan

Regarding certain public water bodies where large quantities of domestic and industrial wastewater are discharged as a result of population and industry concentration and it is recognized to be difficult to attain the standards only by means of the effluent standards, the Prime Minister of Japan will prepare Fundamental Policy for Reduction of Total Pollution Load.

The policy stipulates the reduction target volume, the target year and other fundamental matters relating to the reduction of the pollutant load will be set forth. The target pollution reduction amount will be set with the aim of attaining the water quality standard.

<Total pollution load control>

Pollution load = Pollutant concentration x Wastewater volume

Reference: http://www.env.go.jp/en/laws/water/wlaw/ch2-1.html

Table 2-1 Example of Pollution Control Measures

Pollution Control measure	Pertaining Systems	Objectives and Functions
Regulatory approach	Environmental authorization & compliance system	All pollution generators are authorized by the environment management authorities and their environmental protection measures to comply with environmental protection requirements are defined.
	Environmental inspection & check system	Environmental inspection and check are carried out by the environment management authorities to examine the compliance status, when necessary.
	Administrative sanction system	Strict administrative sanctions against pollution generators violating the requirements for environmental protection are imposed to deter repeated violations.
	Environmental Permission	Licenses for mineral exploitation, wastewater discharge to water sources and others are granted by the authorities, inspections are conducted and penalties are imposed to violators.
Infrastructure development	Sewerage system development	Sewerage facilities for urban domestic wastewater are developed in compliance with Decree No.80/2014/ND-CP on drainage, swage and wastewater treatment.
	Installation of Community based wastewater treatment system	Community based treatment system such as septic tank for treating and collecting urban and rural domestic wastewater are developed.
	Improvement of existing wastewater treatment system	Existing wastewater treatment system such as collection system of wastewater from septic tank and maintenance of septic tank are improved
Economic approach	Wastewater fee system	Wastewater fees according to pollution loads are collected from all pollution generators of domestic wastewater or industrial wastewater, and the economic incentive for reducing pollution load is given to pollution generators of industrial wastewater. Further, penalties are imposed to pollution generators unwilling to pay or not meeting the effluent standards.
	Preferential land use system	Preferential treatments on land use for environmental protection measures are given by the authority.
Technical renovation approach	CP application system	The application of cleaner production to reduce pollution load in production lines is promoted. (Mainly the production sector leads this system)
	Good practice awarding system	Good practices are diffused by periodical recognition for less-pollution technologies and practices.

Pollution Control measure	Pertaining Systems	Objectives and Functions
Awareness raising approach	Environment-related service promotion system	The information on specialized institutions of measurement & analysis of water quality, consulting, design, construction, etc. are diffused.
	Environmental performance rating system	Environmental performance of enterprises are assessed and rated based on self-supporting monitoring, and its result is opened to the public.
	Environmental information disclosure system	Environment management information like water quality monitoring, good practices, incompliance and violations are opened to the public through various media.

Source: JET

(2) Conditions to be examined for Preparing Pollution Load Reduction Alternative

1) Current regulations and standards on water environment management

For preparation of pollution load reduction plan, existing wastewater discharge standards and surface water quality standards are basically applied. If modification of existing standards or setting of new standards has been already planned by the final target year of WEMP, it could be applied. In case that observation of wastewater quality standard is not enough to achieve a goal of WEMP, setting of more stringent provincial or basin-wide standards could be examined.

2) Regional development plan

The Action Plan should harmonize regional development and environment protection. Achievement of regional development plan would be a basic condition for considering pollution load reduction scenarios. If it is difficult to achieve a goal of Action Plan with achievement of targets of regional development plan, it is recommended to examine whether existing target of regional development plan could be modified or not with the concerned organizations.

3) Applicable techniques to reduce pollution load

Considering uncertainty of technology development, it is difficult to adopt advanced technology for pollution load reduction for considering pollution load reduction plan. In case that concrete plan to adopt new technology for pollution load reduction and production process improvement, advanced technology could be considered, and pollution load units used for estimating pollution load in the final target year would be changed from existing units.

Attachiment-1 Idea on Action Plan

1. Preparation process of Action Plan

The Action Plans are planned to be prepared as one of outcomes under Output-3 of the Project. In Action Plan, two things, (a) Future Prediction, and (b) Scenario Setting, must be considered.

(a) Future prediction of pollution load

1) Purpose

Purposes of future prediction are (i) to understand increase amount of pollution load with population and GDP growth from current status, (ii) to take into consideration of scenarios and countermeasure to reduce pollution load which exceeded environmental standard. Using a future prediction result, action plan will be prepared.

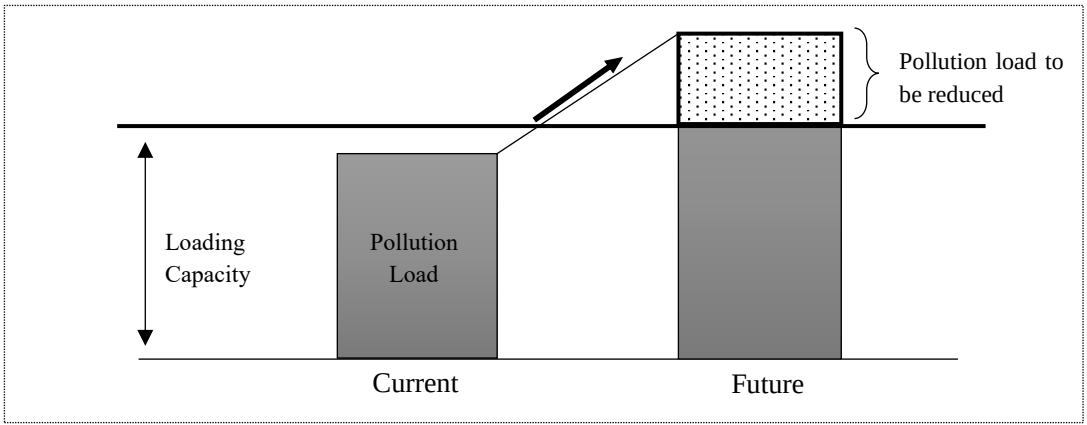


Figure 2 Image of future prediction

2) Precondition

Precondition to estimate future prediction is listed in Table 2.

Table 2 Precondition of prediction

Item	Precondition of prediction
Target Year	2030
Population	Estimated by Socio-economic Development plan (refer to Table 3)
Land use	Same as current status (2014)
Industrial, Service	GDP growth ratio (refer to Table 4)
Wastewater Discharge Unit	Estimated by Socio-economic Development plan or Sewerage development plan (refer to Table 5)
Pollution Load Unit	Same as current status (Binh Duong Decision No. 88/QD UBND)

3) Projection of population in 2014 and 2030

Precondition to estimate future prediction is listed in Table 3, referring from socio-economic plan and related information.

Table 3 Projection of population in 2014 and 2030

Unit: person

Province	Total population		Urban population		Rural population	
	2014	2030	2014	2030	2014	2030
Bac Ninh	1,132,231	1,440,000	318,516	858,240	813,715	581,760
Bac Giang	1,624,456	2,771,000	183,918	300,000	1,440,538	2,471,000
Thai Nguyen	1,173,238	1,449,530	355,120	477,000	818,118	972,530
Binh Duong	1,873,558	3,500,000	1,438,841	3,000,000	434,717	500,000
Dong Nai	2,838,644	3,600,000	978,197	2,600,000	1,860,447	1,000,000
HCMC	8,087,748	10,800,000	6,524,266	8,712,000	1,563,482	2,088,000

4) GDP Growth Prediction

Precondition to estimate future prediction of GDP is listed in Table 4, referring from socio-economic plan and related information.

Table 4 Projection of GDP in 2014 and 2030

Province	Item	2015	2016-2020	2021-2030
Bac Ninh	Ave. Growth rate		12%	9%
	GDP (USD)	5,500	6,133 - 9,478	10,568 - 28,150
Bac Giang	Ave. Growth rate		10%	10%
	GDP (USD)	1,540	1,694 - 2,480	2,728 - 6,433
Thai Nguyen	Ave. Growth rate		12%	14%
	GDP (USD)	3,300	3,680 - 5,687	6,341 - 16,890
Binh Duong	Ave. Growth rate		10.81%	10.81%
	GDP (USD)	3,408	3,776 - 5,694	6,309 15,892
Dong Nai	Ave. Growth rate		9%	9%
	GDP (USD)	3,089	3,352 - 4,645	5,040 - 10,502
HCMC	Ave. Growth rate		9%	8.50%
	GDP (USD)	5,538	6,020 - 8,404	9,135 - 19,355

5) Wastewater generation and pollution load unit

Wastewater generation in 2030 is estimated by Decision No.88/QD-UBND (People's Committee of Binh Duong) and Decision on wastewater treatment in Cau river basin and Dong Nai river basin prepared by MOC (Table 5). On the other hand, Pollution Load Unit is same amount as current condition (Table 6).

Table 5 Wastewater Generation

Unit: L/person/day

Province	Wastewater generation (2014)[1)]		Wastewater generation (2030)[2),3)]	
	Urban	Rural	Urban	Rural
BAC Ninh	96 (80% of 120 l/person/day on water demand)	64 (80% of 800 l/person/day on water demand)	150	80
Bac Giang			150	80
Thai Nguyen			137	80
Binh Duong			120	80
Dong Nai			130	80
HCMC			152	80

1) Source: Decision No.88/QD-UBND dated 13/01/2014 by People's Committee of Binh Duong

2) Decision No. 228/QD-TTg, planning drainage and wastewater treatment for residential and industrial zones in Cau river basin for the period up to year 2030

3) Decision No. 1942/QD-TTg, planning drainage and wastewater treatment for residential and industrial zones in Dong Nai river basin for the period up to year 2030

Table 6 Pollution Load Unit for Domestic Wastewater

Domestic	BOD (g/person/day)	COD (g/person/day)	T-N (kg/person/year)	T-P (kg/person/year)
Urban	49.5	93.5	3.3	0.93
Rural	39.6	74.8	2.64	0.744

6) Current status of Countermeasure

Current status of countermeasures is set, referring to and documents such as provincial environmental protection plan, related report and actual status as follow.

- *Industry : Average ratio result from PSI in this project*
- *Livestock : Provincial environmental protection plan*
- *Domestic (Sewerage) : Actual operation status in target area reported by WB*
- *Domestic (Septic tank) : Provincial environmental protection plan*
- *Hospital : Provincial environmental protection plan*

Table 7 Ratio of Countermeasures by Discharge Source

Discharge Source	Sector	HCMC	Dong Nai	Binh Duong	Bac Giang	Bac Ninh	Thai Nguyen
Industry	IZs. ICs in operation have wastewater treatment system that meet QCVN	80%	80%	80%	80%	80%	80%
Agriculture (Livestock)	Livestock wastewater that is treated to meet QCVN	40%	40%	40%	40%	40%	40%
Domestic	Sewage system	19%	0%	4%	0%	4%	0%
	Septic Tank	65%	96%	95%	60%	60%	60%
Hospital	Hospital wastewater that is treated to meet QCVN	80%	80%	80%	100%	100%	80%

(b) Pollution load adjustment scenarios

Pollution load adjustment scenarios is to set for sector with specific discharge source such as household, industry and livestock, and to estimate the reduction amount of pollution load.

Target environmental standard is set two with consideration of different situation among the province as shown in **Figure 3**. Reduction amount of pollution load to achieve environmental standard is estimated by selecting one or combining several scenarios.

Table 8 Scenarios (Draft)

Scenarios	Contents of countermeasure (Draft)
Scenario 0: Nothing new countermeasure	Nothing to consider any new countermeasure from current status
Scenario 1: Strengthening countermeasure for Domestic Wastewater by Development of planned sewerage facilities	Take into account not only operating sewerage facilities but also planned facilities. Connection ratio in 2030 of planned facilities shall be set reflecting to the current status (approx. 15%)
Scenario 2: Strengthening countermeasure for Industrial Wastewater	Achieve 100% of Environmental standard by enhancing administrative guidance
Scenario 3: Strengthening countermeasure for Livestock	Enhance a pollution control such as introduction of intensive agriculture.
Scenario 4: Developing new sewerage facilities	Estimate additional countermeasure required to achieve higher environmental standard by new sewerage system

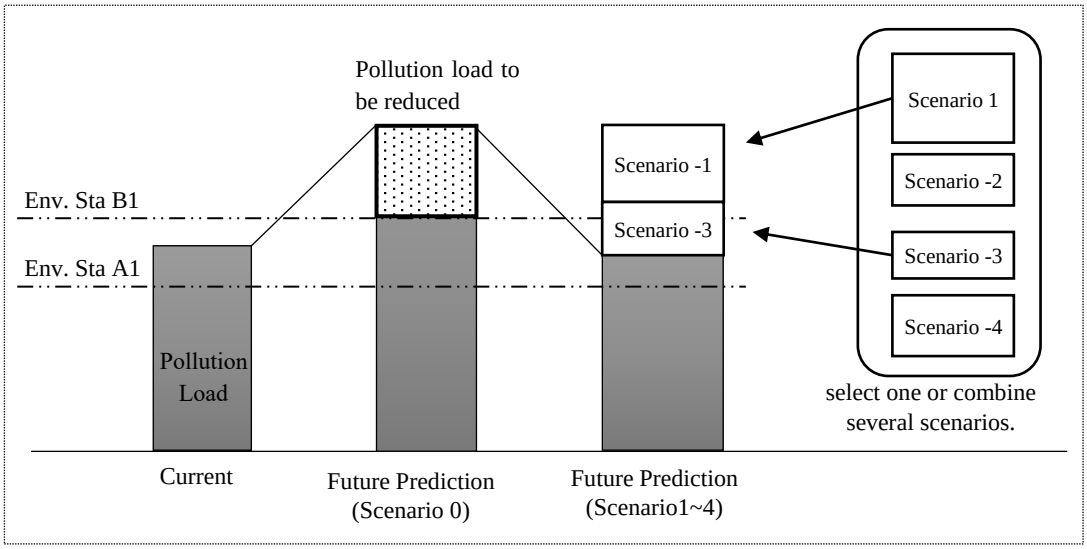
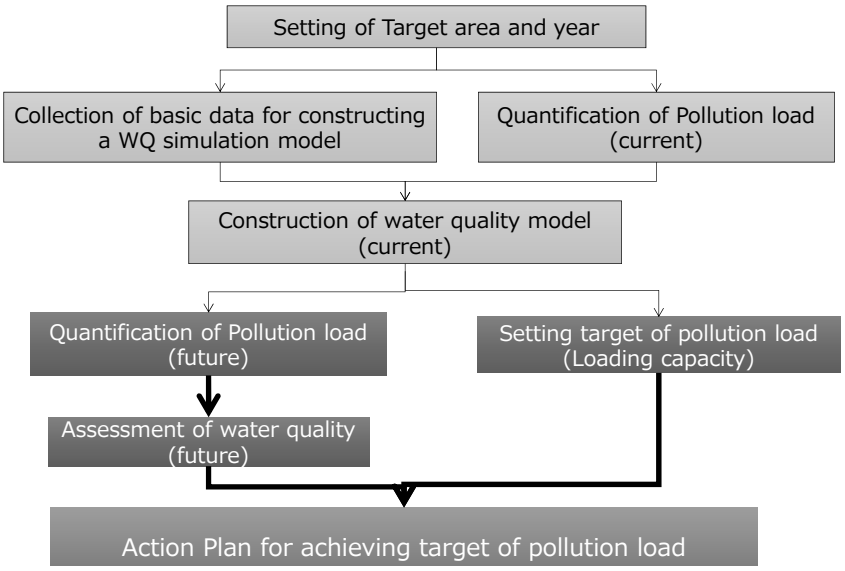


Figure 3 Image of Adjustment Scenarios

Result of Future Prediction and Way of Pollution Load control based on Scenario Setting for Preparation of Action Plan

1

Process of Future Prediction and Action Plan Preparation



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Future Prediction

Precondition

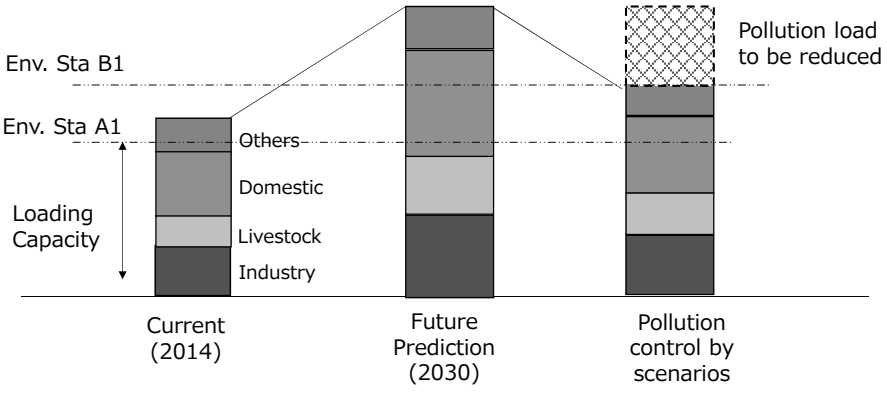
Item	Precondition of prediction
Target Year	2030
Population	Estimated by Socio-economic Development plan
Industrial, Service	GDP growth ratio
Wastewater Discharge Unit	Estimated by Socio-economic Development plan or Sewerage development plan
Land use	Same as current status (2014)
Pollution Load Unit	Same as current status

3

Outline of Today's Meeting

Process of Pollution load Prediction

- Nothing to do any new countermeasure (percentage of wastewater treatment suppose to keep the status quo).
  * Coverage ratio of sewerage : 20% in 2014 -→ 20% in 2030
- Understand the reduction volume of pollution load



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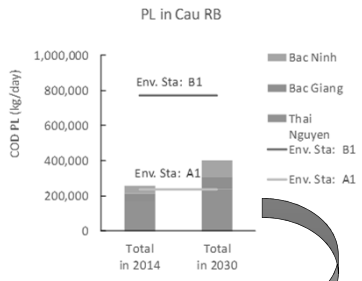
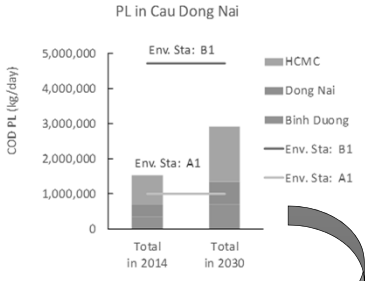
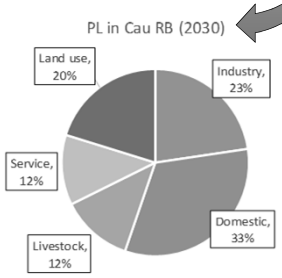
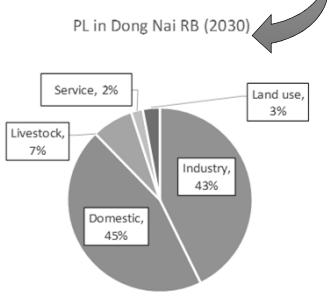
Result of PL Prediction









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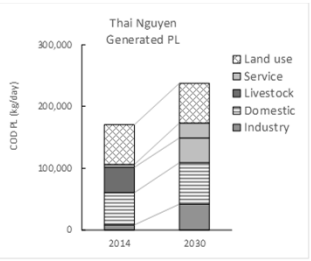
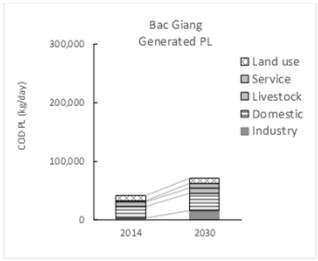
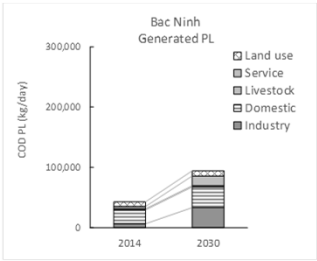
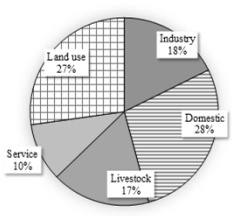
Result of PL Prediction in Cau RB

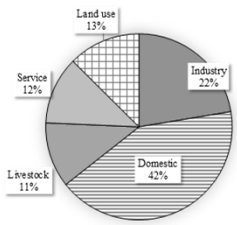




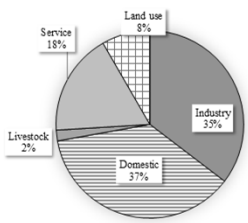




Thai Nguyen
Generated PL (COD, 2030)



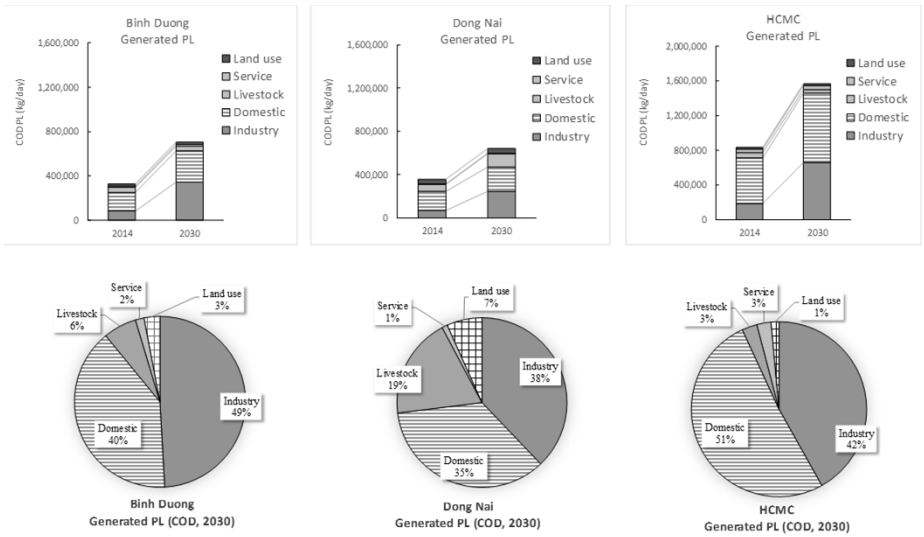
Bac Giang
Generated PL (COD, 2030)



Bac Ninh
Generated PL (COD, 2030)

6

Result of PL Prediction in Dong Nai RB



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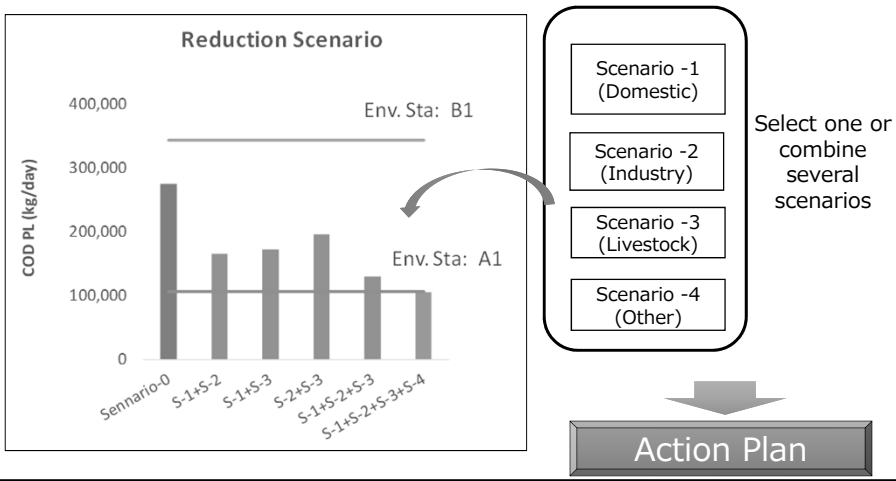
Outline of Scenario Setting

◘ Pollution Load Control by Scenarios

- To provide approaches showing some scenarios on pollution load control
- Select priority actions for water environmental management



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Scenario Setting(Example)

Scenario(Example)	Contents
Scenario 0: Nothing new countermeasure	Nothing to consider any new countermeasure from current status
Scenario 1: Strengthening countermeasure for Domestic Wastewater by Development of planned sewerage facilities	Take into account not only operating sewerage facilities but also planned facilities. Connection ratio in 2030 of planned facilities shall be set reflecting to the current status (approx. 15%)
Scenario 2: Strengthening countermeasure for Industrial Wastewater	Achieve 100% of Environmental standard by enhancing administrative guidance
Scenario 3: Strengthening countermeasure for Livestock	Enhance a pollution control such as introduction of intensive agriculture.
Scenario 4: Developing new sewerage facilities	Estimate additional countermeasure required to achieve higher environmental standard by new sewerage system

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Scenario Setting(Example)

Scenario	Sector	Term	HCMC	Dong Nai	Binh Duong	Bac Giang	Bac Ninh	Thai Nguyen
S-1	Domestic in Urban (Sewerage)	2014	19%	0%	4%	0%	4%	0%
		2030	35%	15%	20%	10%	20%	15%
	Domestic in Rural (Septic Tank)	2014	65%	96%	95%	60%	60%	60%
		2030	100%	100%	100%	100%	100%	100%
S-2	Industry	2014	74%	88%	89%	88%	70%	88%
		2030	100%	100%	100%	100%	100%	100%
S-3	Livestock	2014	40%	40%	40%	40%	40%	40%
		2030	50%	50%	50%	50%	50%	50%
S-4	Domestic in Urban (Sewerage)	2030	50%	30%	35%	25%	35%	30%

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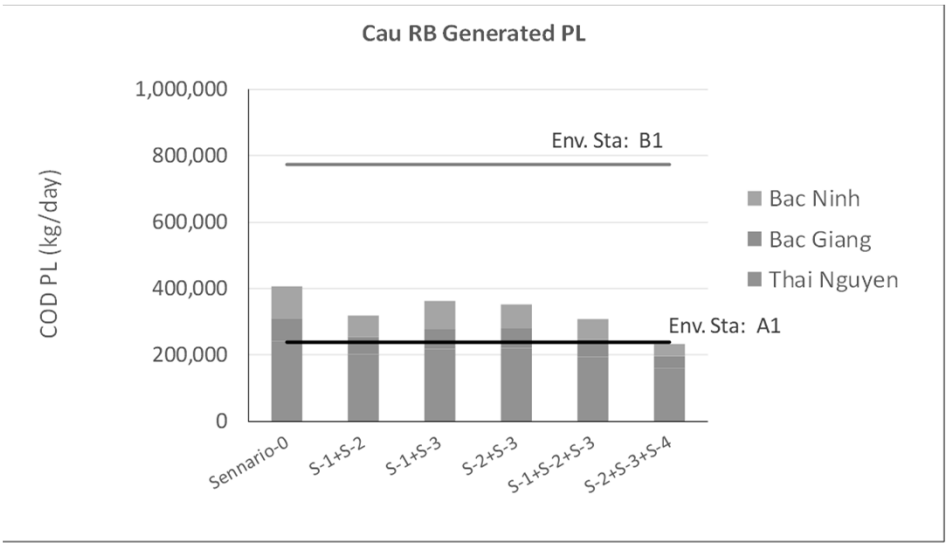
Draft Idea of Reduction Scenario (Cau RB)



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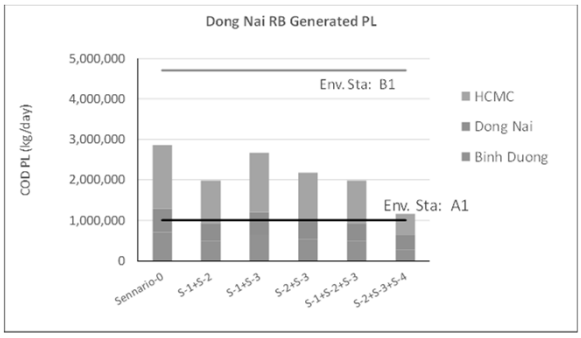
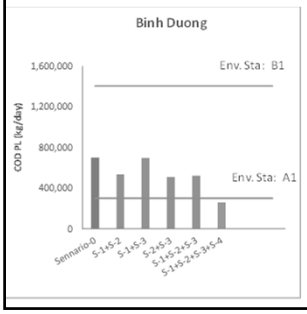
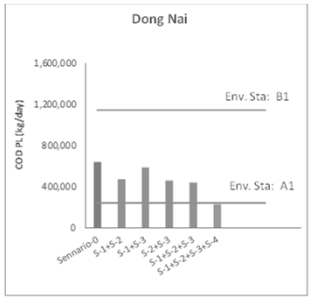
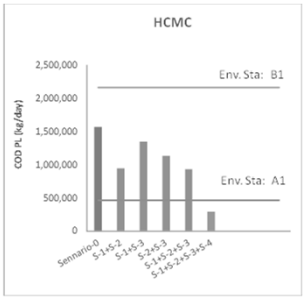
Draft Idea of Reduction Scenario (Dong Nai RB)









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Reference

- Data source
- Population projection in 2030
- Wastewater Generation
- Economic Growth
- Acceptable Loading Capacity

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Precondition (Data source)

☐ Precondition

Information Source	Type of information
1. Province	• Sewerage development plan • Socio-economic development plan • Environmental protection program, etc
2. MOC	• Planning on water drainage systems and wastewater treatment of the residential areas and industrial zones (Decision 228/QD-ttg: Cau River Basin) (Decision 1942/QD-ttg: Dong Nai River Basin)
3. Government	• Orientations for development of water drainage in Vietnamese urban centers and industrial parks up to 2025 and a vision towards 2050

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Precondition (Population projection in 2030)

Province	Total population		Urban population		Rural population	
	2014	2030	2014	2030	2014	2030
Bac Ninh	1,132,231	1,440,000	318,516	858,240	813,715	581,760
Bac Giang	1,624,456	2,771,000	183,918	300,000	1,440,538	2,471,000
Thai Nguyen	1,173,238	1,449,530	355,120	477,000	818,118	972,530
Binh Duong	1,873,558	3,500,000	1,438,841	3,000,000	434,717	500,000
Dong Nai	2,838,644	3,600,000	978,197	2,600,000	1,860,447	1,000,000
HCMC	8,087,748	10,800,000	6,524,266	8,712,000	1,563,482	2,088,000

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Precondition (Wastewater Generation)

Bing Duong

Decision No.88/QD-UBND dated 13/01/2014 by People's Committee of Binh Duong

Unit (liter / person / day)

Administrative units	Wastewater Discharge Unit (l/person/day)
Urban	96 (city, town), 64 (district)
Rural	80 (city, town), 48 (district)

MOC

1) Decision No.228/QD-ttg Planning the drainage system and waste water treatment for residential areas, industrial zones in river Cau river basin by 2030. MOC, 2013
2) Decision No.1942/QD-ttg Planning the drainage system and waste water treatment for residential areas, industrial zones in river Dong Nai river basin by 2030. MOC, 2013

Unit (liter / person / day)

River Basin	Drainage area	Wastewater Discharge Unit	
		2020	2030
Cau[1)]	Urban	80 - 165	100 - 200
	Rural	60	80
	Industrial Zone	20-40 m^3 / ha / day	
Dong Nai[2)]	Urban	90-145	100-160
	Rural	65	80
	Industrial Zone	20-40 m^3 / ha / day	

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Precondition (Wastewater Generation)

Unit (liter / person / day)

Province	Wastewater generation (2014)[1)]		Wastewater generation (2030)[2),3)]	
	Urban	Rural	Urban	Rural
BAC Ninh	96 (80% of 120 l/person/day on water demand)	64 (80% of 800 l/person/day on water demand)	150	80
Bac Giang			150	80
Thai Nguyen			137	80
Binh Duong			120	80
Dong Nai			130	80
HCMC			152	80

1) Source: Decision No.88/QD-UBND dated 13/01/2014 by People's Committee of Binh Duong

2) Decision No. 228/QD-TTg, planning drainage and wastewater treatment for residential and industrial zones in Cau river basin for the period up to year 2030

3) Decision No. 1942/QD-TTg, planning drainage and wastewater treatment for residential and industrial zones in Dong Nai river basin for the period up to year 2030

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Precondition (Economic Growth)

Province	Item	2014	2016-2020	2021-2030
Bac Ninh	Ave. Growth rate		12%	9%
	GDP (USD)	4,523	6,133 - 9,478	10,568 - 28,150
Bac Giang	Ave. Growth rate		10%	10%
	GDP (USD)	1,250	1,694 - 2,480	2,728 - 6,433
Thai Nguyen	Ave. Growth rate		12%	14%
	GDP (USD)	2,696	3,680 - 5,687	6,341 - 16,890
Binh Duong	Ave. Growth rate		10.81%	10.81%
	GDP (USD)	2,853	3,776 - 5,694	6,309 15,892
Dong Nai	Ave. Growth rate		9%	9%
	GDP (USD)	2,984	3,352 - 4,645	5,040 - 10,502
HCMC	Ave. Growth rate		9%	8.50%
	GDP (USD)	5,131	6,020 - 8,404	9,135 - 19,355

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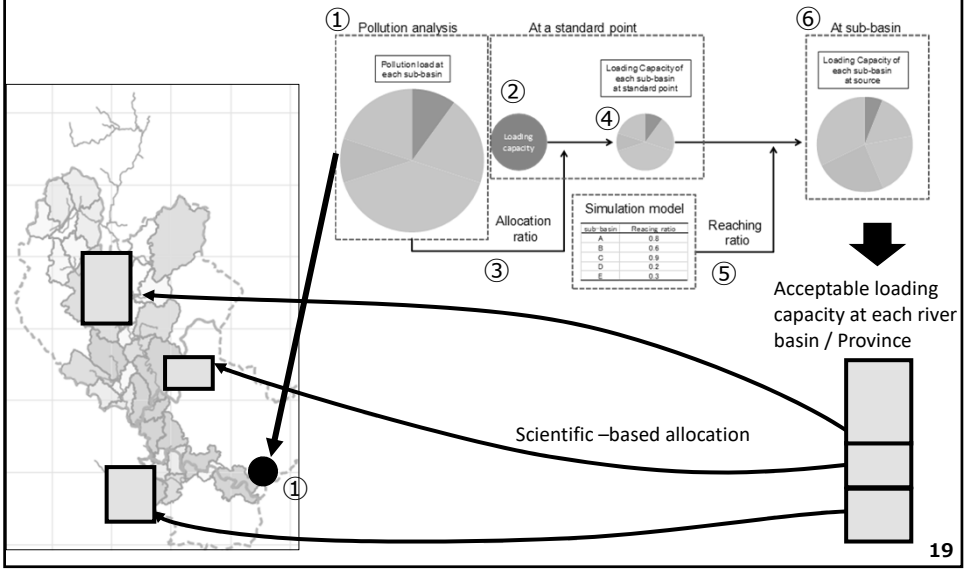
Acceptable Loading Capacity

- Acceptable Loading capacity in each provinces is allocated by scientific-based calculation



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Acceptable Loading Capacity

- Process of quantification of loading capacity at each river basin / province

① To quantify pollution load of each sub river basin in the current situation according to the result of pollution load analysis

② To calculate loading capacity of whole river basin at a control point

③ To define allocation ratio of whole river basin.
[Loading capacity at a control point] / [Pollution load reaching the control point coming from the current river basin area]

④ To allocate loading capacity of whole river basin to each sub river basin with allocation ratio defined in ③.

⑤ To obtain reaching ratio of each sub river basin using the result of a simulation model.

⑥ To quantify loading capacity of generated at each sub river basin (not at a control point) by dividing loading capacity of each sub river basin at a control point by reaching ratio.

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Acceptable loading capacity by Scientific Allocation

- Contribution ratio of pollution load to be affect at control point

Province		Thai Nguyen	Bac Giang	Bac Ninh	sum	From upstream
Contribution Ratio(%)		40.0%	13.0%	37.0%	90.0%	10.0%
Scientific Allocation (kg/day)	Env.Std is A1	105,728	34,361	97,798	237,887	-
	Env.Std is B1	343,615	111,675	317,844	773,133	-

Province		Binh Duong	Dong Nai	Ho Chi Minh	sum	From upstream or sea
Contribution Ratio(%)		16.7%	13.6%	25.7%	55.9%	44.1%
Scientific Allocation (kg/day)	Env.Std is A1	299,782	243,910	461,104	1,004,796	-
	Env.Std is B1	1,405,520	1,143,565	2,161,871	4,710,957	-

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Overall Plan for Strengthening and Promoting River Basin Water Environmental Management (RMWEM) for Cau and Dong Nai river basin

March 2019

JICA Expert Team

WENID

ESI

Table of Contents

Chapter 1 Introduction

1.1 Legal Background on River Basin Water Environmental Management (RBWEM)

There are two major environmental laws: the Law on Environmental Protection (LEP) and the Law on Water Resources (LWR) on Water Environmental management. The LEP focuses on Environmental Protection Strategy such as Master Plan, EIA/IEE, and in the context, the Monitoring activities also implemented. The other hand, LWR focuses on effective usage of Water Resources, and in the context, developing the WR master plan, implementing basic survey, etc. The two laws may seem to do the same things such as conducting monitoring activity, developing master plans, but these activities have different objectives. The relationship and overlap of these two laws is shown in Figure 1-1.

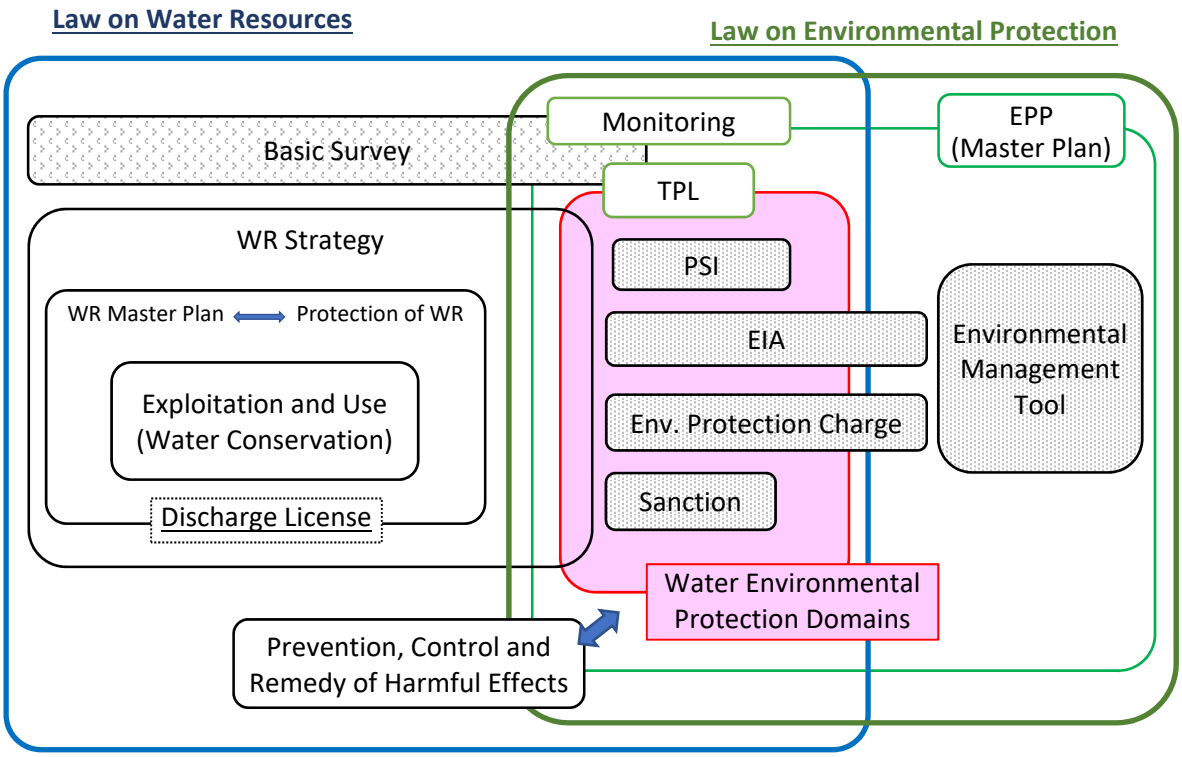


Figure 1-1 Legal Framework for LWR and LEP

MONRE has the responsibility under Decree 38/2015/ND-CP under LEP for assessing the loading capacity and allocating the discharge quota on the wastewater management for inter-provincial river basin. MONRE is required to realize the items described below.

Decree 38, Chapter V, Article 43. Responsibility of Ministers in waste water management,
Item b) on 1. Minister of MONRE has responsibility for:

"Development and provision of guidelines for assessing load capacity of the receiving water, zoning water use area, and determining wastewater discharge quota into the receiving water; Development, issuing, and allocating discharge quota of wastewater for interprovincial river basins; management of exchanging discharge quota of wastewater"

1.2 New Movement for RBWEM

In 2017-2018, MONRE accelerated River Basin Management with restructure of its own organization. Especially, a new management methodology of water resources introduced the integrated management of inter-provincial river and Pollution load analysis. It's a paradigm-sift for river management from conventional management methodology by determining water quality in each province for river basin management based on cooperation of concerned provinces. In this context, each province has to have a management body to handle a target river basin in cooperation with other provinces, and the River Basin Organizations (RBOs) that was newly established by prime minister decision is very important. Circular 76 established by Department of Water Resources Management (DWRM) will support the management of pollution load analysis on inter-provincial rivers. The outcomes and tools on the Project for Strengthening Capacity of Water Environmental Management in River Basin (hereinafter the Project) implemented in 2015-2018 in cooperation with Japan International Cooperation Agency (JICA) will useful in RBWEM too. The Action plan, one of outcomes of the Project, is useful for consideration of pollution load control basin-wide.

Table 1.1 New movement regarding RBWEM

#	Registration	Title	Note
1	PRIME MINISTER No.: 15/2018/QD-TTg	Defining functions, tasks, powers and organizational structure of General Department of Environment Administration under the Ministry of Natural Resources and Environment	12 March 2018
2	Circular No.76/2017/TT-BTNMT	Regulating assessment of wastewater receiving capacity and loading capacity of rivers and lakes	29 December 2017
3	Guideline	Action Plan on the Project for Strengthening Capacity of Water Environmental Management in River Basin	2015-2018

River Basin Water Environmental Management (RBWEM) is necessary to implement according to the Law on Environmental Protection (LEP) and the Law on Water Resources (LWR). The Water Environmental Protection Domain is duplicated in both laws. Circular 76 as a new regulation links Discharge license and Water Environmental Protection Domain under LWR. On the other hand, the Action Plan under the Project focuses on the Water Environmental Protection and Environmental Protection Plan. Both activities of Circular 76 and Action Plan should interlock through the pollution load analysis at Water Environmental Protection Domain. For example, when the relationship of Circular 76 and Action Plan are as shown in Figure 1-2.

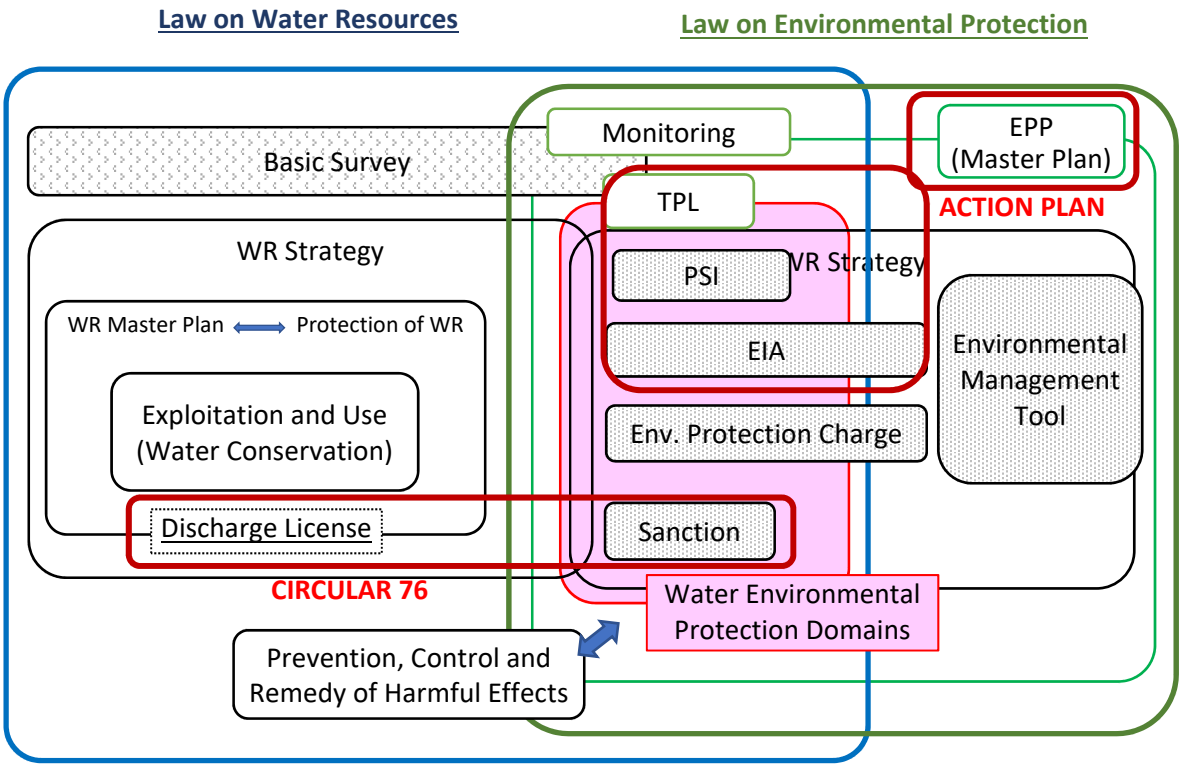


Figure 1-2 Relationship of Circular 76 and Action Plan for LWR and LEP

As shown in Figure 1-2, Circular 76 and Action Plan should work together through Water Environmental Protection Domains, although Circular 76 is regulated under LWR and Action Plan is focusing to LEP. Individual pollution load management such as discharge license can be effective to environmental protection plan under LEP through these related actions.

1.3 Contribution of Project Outcomes on RBWEM

The Project was implemented to improve the river basin management based on LEP and Decree 38/2015/ND-CP. The Project contributes to develop regulations and guidelines for river basin water environment management (RBWEM). The current legalizing system and activities concerning the loading capacity on RBWEM is shown in Figure 1-3. Also, the project supports implementing activities for this legal system by providing some Technical guideline and Manuals. Currently, legal systems and necessary technical documents are prepared, but in actual operation, improvement of existing activities and a more effective legal system are required. This document is proposed to recommend activities and effective system for the activity in Figure 1-3 such as pollution load analysis and planning of environmental management plan.

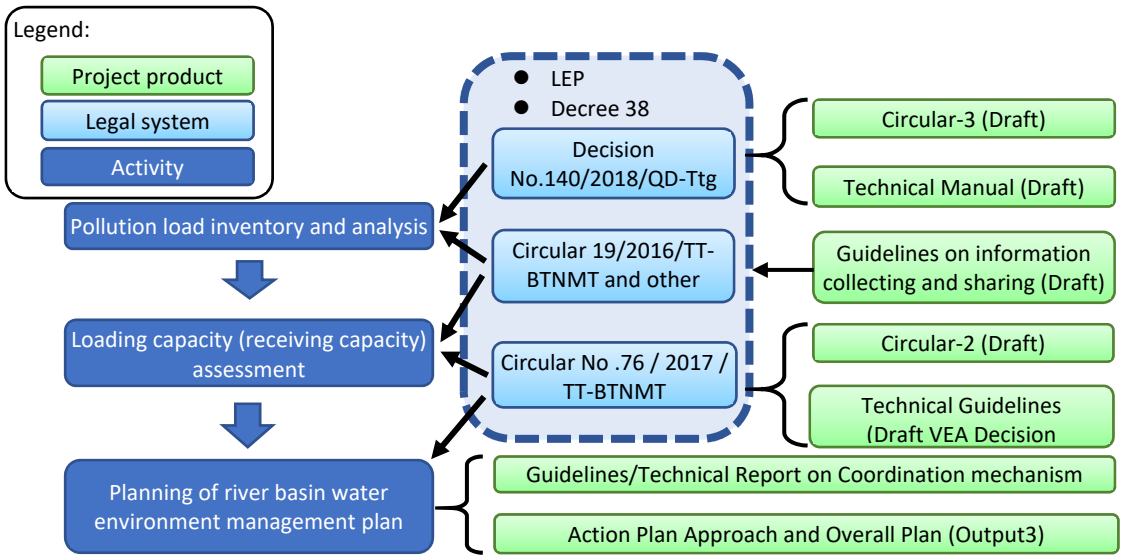


Figure 1-3 Legalizing Status related to RBWEM in Vietnam and Contribution of the Project

Chapter 2 Objectives

2.1 Objectives of Overall Plan

Overall plan recommends action to more effectively implement Total Pollution Load (TPL) analysis and Action plan on RBWEM under Decree 38.

2.2 Subject of Application

Overall plan is applied to river management bodies and river basin management bodies regarding water quality and pollution load.

2.3 Outcomes

Based on this document, it is expected that all relevant authorities promote necessary activities, and strengthen implementation capacity regarding “pollution load analysis”, “allocation of discharge quota” and “development of pollution load scenario”.

Chapter 3 Current Situation under Circular 76 and Action Plan

3.1 Basic Activity of Pollution Load analysis and Action Plan

Circular 76 is regulating assessing loading capacity of each river section and responsibility for the activities regarding approval of the assessed loading capacity on inner- and intra-provincial rivers. There are three methods for assessing loading capacity: direct method, indirect method and using the Water Quality model in Circular 76. Action Plan suggests establishing pollution load reduction scenario based on the assessed loading capacity basin-wide. The key activities of Pollution load analysis under Circular 76 and

establishing pollution load reduction scenario under Action plan are shown in Figure 3-1. In it, activities in Circular 76 and Action plan should continue to implement by integrating the targets such as parameters, target year and data sources, for effective management. On the other hand, it was suggested that it is necessary to improve the quality of existing systems and data in order to implement a series of activities through the pilot activities of the Project.

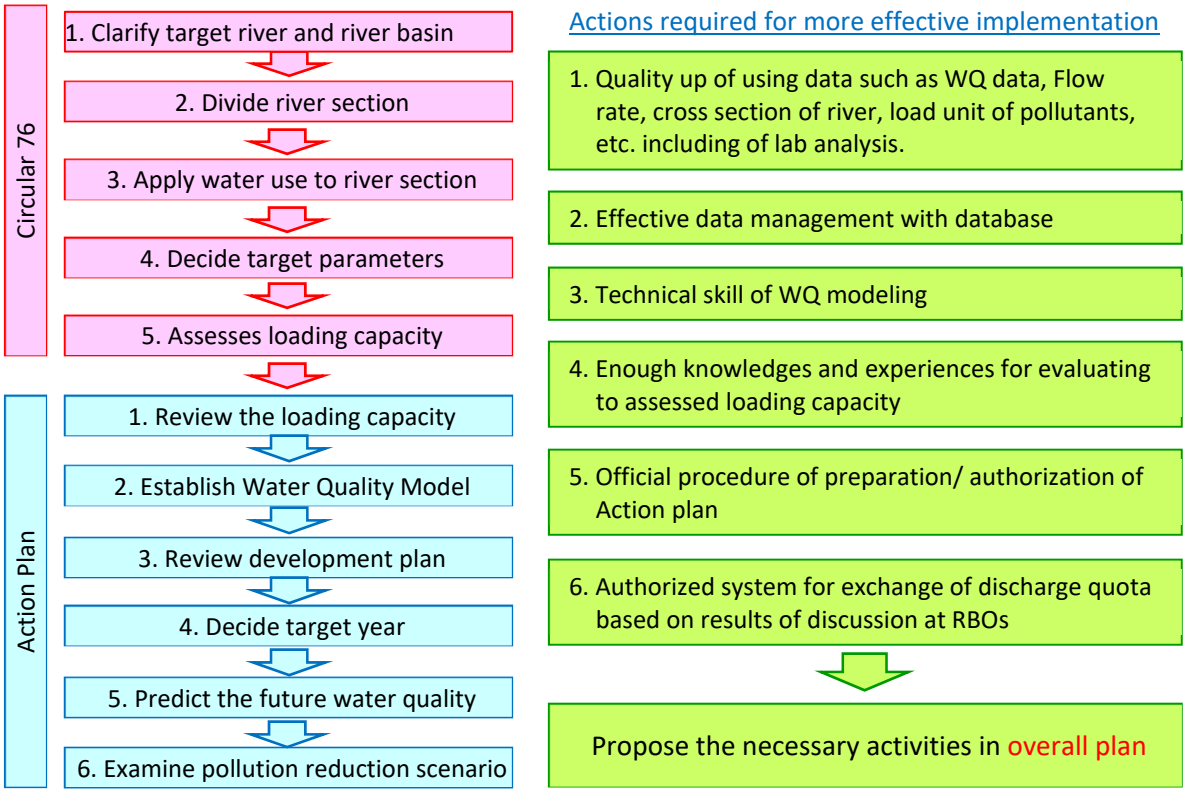


Figure 3-1 Key Activities on Pollution Load Analysis and Recommendations

3.2 Summary of tasks in Circular 76

Circular 76 provides definitions, basic calculation method, methodology, selection and responsibilities of related to organization on assessment of loading capacity and receiving capacity. Basic operation is conducted on the provincial level, and finally, MONRE will approve the loading capacity for international-, interprovincial-river based on the submitted document regarding assessed loading capacity by PPC, DWRM.

Table 3.1 Responsibility of each organization in Circular 76

Article	Responsibility	Support	Implement to	Period	Consider to
15	MONRE		● Approve loading capacity, receiving capacity of international-, inter provincial river and lake		
	PPC		● Approve wastewater receiving capacity of intra provincial level		
	DWRM	Cooperate with VEA, MONRE, MOIT, MARD, MOT, MOC, MOCST, PPC	● Summarizing opinions ● Finalizing dossiers (including draft approval decision, list of loading capacity, assessment report etc.) ● Submitting results of loading capacity to MONRE		
	DONRE	support to PPC	● for organize survey and evaluation of assessment of loading capacity for intra-river ● for collecting opinion from concerning authorizes		
16	DWRM	cooperate with VEA DONRE PPC	● **Clause 3 of Article 4**; define water source except international-, interprovincial river. and implement assessment loading capacity ● **Clause 2 of Article 6**: determine the water use except the place of defining by water resource planning, etc. ● **Clause 2 of Article 7**: decide parameters to be assessed except regulated parameters like QCVN ● **Clause 3 of Article 8**: providing necessary data for assessment of loading capacity ● **Point d of Clause 1, Clause 3 of Article 9**: providing the safety factor and implement of modeling method ● **Clause 2 of Article 10**: provide flow rate ● **Clause 4 of Article 13**: calibrate model	Every 5 years	socio-economic development planning
	VEA	coordinate with DWRM	● Conduct survey, statistics ● Build a database for international-, interprovincial river		

On comparing the requirement in Decree 38 and contents of Circular 76, Circular 76 includes the two activities of “assessing load capacity of the receiving water” and “zoning water use area” as dividing a river section, but activities for “determining wastewater discharge quota” and “allocating discharge quota” are not mentioned. Therefore, the activities regarding discharge quota have to be considered in RBOs and Action plan.

3.3 Role of Action Plan

As shown above, the Circular 76 only specifies the calculation method, Assessment methodology and responsibility of concerning organization, but it does not suggest “how to use” assessment results for river management. The assessed loading capacity can be estimated easily for obtaining permission to establish a new business in the river section when considering responsibility of DWRM. However, even if the new business will be properly approved and permitted and each business entity applies the emission standards, the future pollution load in basin will be increased. In addition, the pollution source control method based on such licensing and approval may be disadvantageous for new business companies because starting of business will be influenced by whether the loading capacity is enough or not in the river section.

Therefore, administrative organization needs to generate additional loading capacity in river section to manage existing companies properly and to make efforts to reduce pollutant load under existing technologies for seeking fairness among existing companies and new companies. Reducing of the pollution load from river section should consider the generated-pollution load in the river section and contributing-pollution load from up-stream. Also, the reduction cost of pollution load and reduction limit of pollution load will be differenced by pollutant source. In considering the pollutant load reduction plan, it is important to examine which sector or which area should reduce pollution.

In Action plan, specific target area and sectoral pollutant load reduction targets and the results are presented based on the gap between the assessed loading capacity and the environmental standards. In preparing action plans, it is necessary to consider not only information on pollution load analysis but also socioeconomic development plan, population dynamics, etc. Basic policy and methodology of action plan are shown in Action Plan provided on our project, but in this document also suggest recommendation to more effective implement on action plan.

The other hand, Decree 38/2015/ND-CP requires to implement allocation discharge quota of wastewater for interprovincial river management. Administrative organization is required to propose discharge quota of each section and area that can maintain water use/ water quality through the examination of action plan. These activities will be managed on RBOs

Chapter 4 Necessary Activities for Implementation of RBM based on Assessment of Loading Capacity

In this chapter will propose matters to be carried out in three categories: 1) establishment of new system, 2) capacity strengthening of existing organization, and 3) efficiency of existing system for 3 categories, regarding a series of examinations from pollution load analysis to countermeasures.

4.1 Establishment of New Institutional System

Currently, the necessary regulations for pollution load analysis are established in Vietnam, and additional regulations to be required are limited. At these situations, the reporting system of discharge amount from industry is recommended.

Table 4.1 Recommended New Institutional System

#	Items	Summary	Priority
1	The system of authorization of Action plan	Action plan will suggest many countermeasures for maintain water use, water quality standard according to socioeconomic development plan. Therefore, the system for authorization of action plan and reflection to development policy is required.	High
2	Regulation on report the discharge amount from industry	Newly regulate a reporting system of discharge amount depends on the industry scales	Middle
3	Rule or regulation regarding public hearing	It is desirable to set criteria, methods and periods for public hearing.	Low
4	Introduction of economic incentive management	Establishment of fund for management of river basin is required.	Middle

4.1.1 The system for Authorization of Action plan

(1) The system for authorization of Action Plan

Action plan is an important tool for river basin management, forecasting water quality in the future based on approved loading capacity and socioeconomic development plan, recommending necessary countermeasures. Implementation of action plan should be coordinated among provinces in the river basin, because the recommendation in action plan is proposed based on river basin management, not river section. It is assumed that examination and discussion on finalization of it will be conducted by the RBOs, but it is necessary to clarify the position as an administrative document of the action plan and clearly indicate the approval process.

For example, if the activity of preparation of action plan is following Decree 38, the preparation and authorization of action plan needs to regulate by MONRE decision, etc. Also, if the development of action plan is following the socioeconomic development plan, it needs to revise the regulation of socioeconomic development plan or establish equivalent regulation with socioeconomic development plan to develop/authorize action plan.

(2) The system to reflect practical development policy of countermeasure in action plan

Recommendation by action plan involves some scenarios based on socioeconomic plan. Therefore, the development of action plan comes after the socioeconomic plan. Basically, since socioeconomic development plan is prepared every 5 years, it is should control the schedule and responsible organization for approving of loading capacity, development of action plan, allocate discharge quota and reflect to practical development policy.

Especially, to reflect practical development policy in the results of action plan, each province has the responsibility to reduce pollution load. A system is necessary to reflect to provincial development policy, and to implement each countermeasure in authorized action plan.

4.1.2 Regulation to report the discharge amount from industry

In pollution load analysis based on river basin management, it is important to accurately grasp pollution load from pollutant sources. However, ordinarily management of industry is done by regulating concentration by QCVN, as almost all industries don't monitor pollution load.

In order to improve quality of pollution load analysis, improvement of measuring methodology of each discharge source is important. Especially, industry discharging a high amount of pollution load should be obligated "to report discharge amount", not only "maintaining concentration of discharge" by QCVN. Of course, domestic wastewater and livestock wastewater can be thought of as a major pollutant source, but these generated pollutant amounts can be estimated as "per person" or "per head". When regulating domestic wastewater or livestock wastewater, considering the method, cost, and the accuracy that can be obtained, the priority is not high. Also, factory wastewater varies depending on the sector and scale of business, it is efficient to institutionally manage against to large-emission companies. Currently, the regulated reporting system of discharge volumes are performed by "Circular 31" for target the industries more than 1,000 m^3/day.

Using this circular effectively, it is desirable to expand the target industries step by step. But for small-scale industry it is difficult to install automatic monitoring system; therefore, when the target industry expands to small-scale industry, it is desirable to regulate depending on industry scale as shown in Table 4.2.

Table 4.2 Examples of report frequencies

Level	Industry scale (discharge volume)	Measurement frequency of discharge volume	Note
1	More than 200m3/day	Daily or more	these industry levels will be recommended to install automatic monitoring system
2	More than 50m3/day	Weekly or more	
3	More than 20m3/day	Monthly or more	
4	Less than 20m3/day	Depended on instruction	

4.1.3 Rules or regulations regarding public hearings and public comments

For river basin management, administrative government will need to decide specific areas to protect environment or protect aquatic life, etc. for consideration as priority area and reduction of pollution

load. In these cases, it will be required to confirm the public opinions for the specific areas to control various activities. In particular, environmental conservation has various values depending on users, surrounding residents, business operators. Thus, the evaluation is not uniform, and it is extremely difficult to price. In cases where scientific and technological evaluation is difficult, public hearing is one of the ways to establish relative values for accumulated opinions. Also, public hearing has the function to increase fairness and transparency of administrative activities. Of course, there are cases where the results of the public hearings are not sufficient, and it will be face difficulty to implement without any guidelines on public hearings in advance. It will be better to establish basic method of public hearings.

The methodology of public hearing should consider the following items:

Table 4.3 Example methodology for public hearing

Items	Reason (and proposal)
What case should be considered	In the implementation of public hearing, in order not to be arbitrary, set up rules in advance
How to decide/ select target participants for public hearing	For selecting public hearing participants, it is desirable to make rules. In addition to prevent arbitrary selection, it is expected to eliminate comments from outside the area.
How to announce the implementation of public hearing	Determine the rules for implementing public hearing, such as whether to announce on the web or contact the targets directly.
How long to implement	When the period is short for public hearing, the opinion is given that it is insufficient for the objective, and when the period is long, it takes time to make decisions, so the appropriate period for each case is determined in advance.
How to collect opinions from the public	For opinion gathering, how to implement such as letters, faxes, web, etc. Also, decide rules such as a signature or anonymous.
Conditions for applying the results	It should be decided on how to handle comments since it is not necessary to follow up on all public comments.
Rules for considering detailed method	It is not required to set uniform method; it's enough to show that on each case can set its own detailed method.

4.1.4 Introduction of economic incentive management

For river basin management, socioeconomic development plan or Action plan will suggest activity/ countermeasure beyond administrative boundaries. For example, in the cases of basin-wide area where sewerage system is required for protection of river basin environment, the construction cost or maintenance cost could not be shouldered by one province; also, one province should not shoulder the cost considering the purpose of environmental protection of river basin. Thus, in watershed management, it will be expected to hold joint activities that should be implemented beyond regional boundaries. Necessity of jointed management fund will have river basin management options as described below.

(1) Fund management based on allocation of loading capacity (Type I)

In introducing this method, first establish baselines of allowable pollution load, and if the province emit pollution loads beyond the baseline, it will contribute to a common fund for river basin management. Also, municipalities that emit fewer pollutant loads than baselines will receive refunds through the fund and use them as resources for reducing pollutant load.

For this method, there are difficulties: 1) to set appropriate baseline of allowable pollution load, 2) to set appropriate contribution when exceeding pollution load. In addition, this method is based on economic incentives corresponding to individual provincial efforts rather than cooperative measures across catchments.

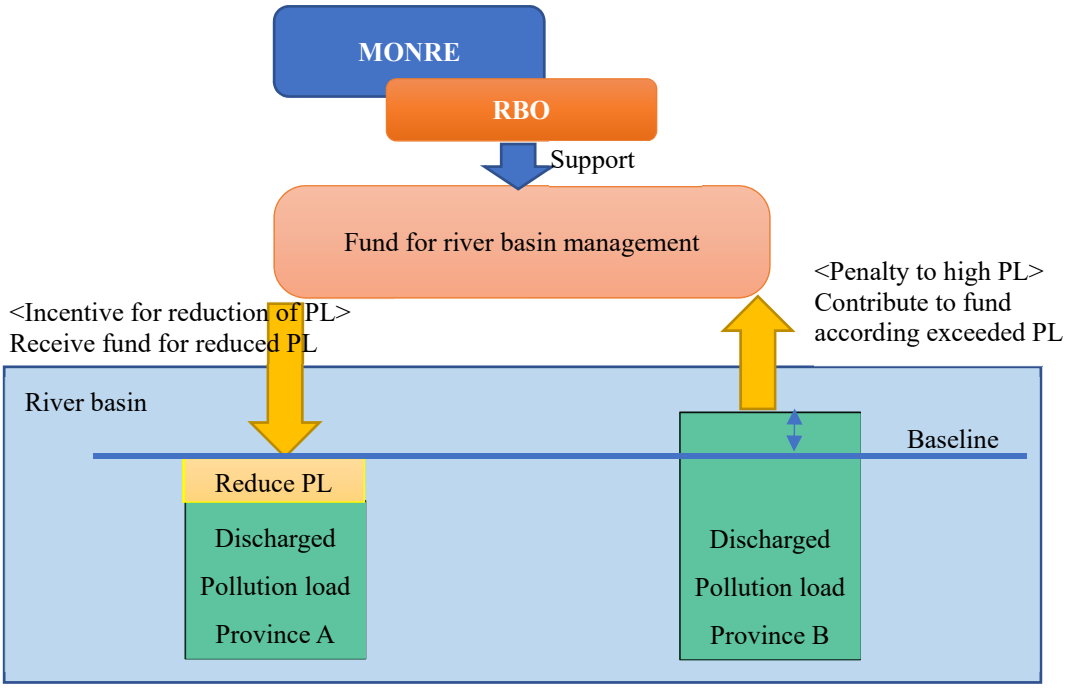


Figure 4-1 Image of fund management of Type I

(2) Fund management based of allocation of loading capacity (Type II)

When the related provinces contribute to the fund according to the pollutant discharge load and implement comprehensive measures for the river basin, they use the funds and support implementing of countermeasures of the target local government.

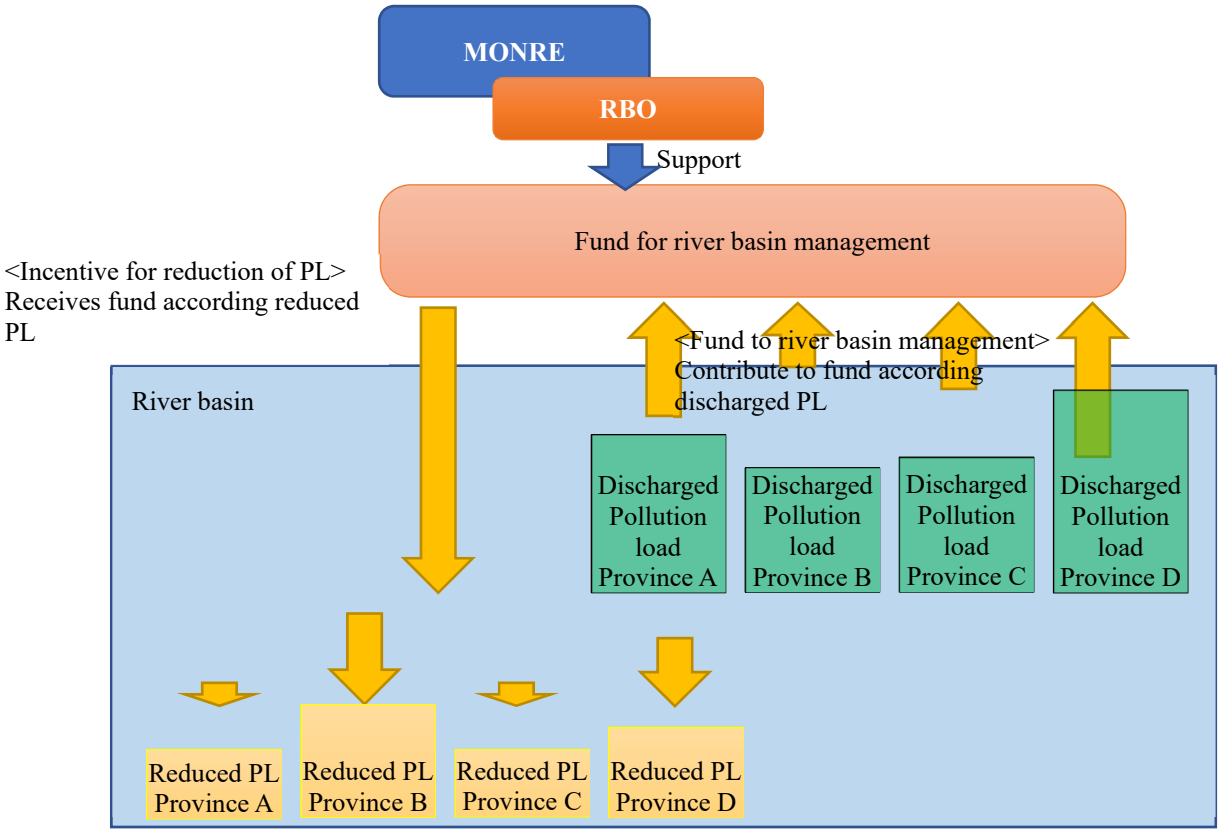


Figure 4-2 Image of fund management of Type II

(3) Resource and Allocation of fund

River basin management by economic incentive needs an operating budget such as introduced above. The sources of budget can consider several types including source according to their discharge pollution of each province.

The following section will consider issues on fund resources and methodology of fund allocation.

a) Sources of fund

For the management of water environment, type of necessary fund is considered below.

① Principle of payment for polluter: The pollution source company will be charged according to the pollutant load emission or violation amount, but in this method it is necessary to consider the penalty in existing regulations or the relationship with those regulations.

② Principle of user payment: This method is based on the principle that the user should bear the necessary cost to secure the water to be used. However, ordinary water users have already paid the necessary cost as water fee, etc., and additional cost burden will not be

tolerated. It is necessary to examine the allocation to watershed management, etc. from the existing collected fee.

③ Contribution from General budget: Regardless of the specific financial resources, allocate from conventional budget for environmental conservation or pollution control.

As the basis of financial resources, the above-mentioned case can be assumed, but the influence of the incentive mechanism also changes depending on whether the financial management is carried out on province basis or mainly the central level. In any case, it is related to the existing legal system or budget of each province, and securing of financial resources should be carried out carefully.

Also, based on these resources, it need to consider how much allocate to each RBO.

b) Allocation of funds

In order to make the incentive mechanism function, it is important to allocate funds based on ① what criteria are to be allocated, and ② how much is allocated.

① As shown in Figure 4-1 and Figure 4-2, there are several types of allocation of funds. The effectiveness of incentives will change depending on whether funds are allocated according to the pollution amount below the reference value or allocated according to the reduced pollution amount.

② In the allocation of funds, applying the same system strongly influences the raising of the unit price against reduction of pollution load. On the other hand, the funds needed to manage incentives are enormous, making it difficult to prepare sources for funds. Conversely, if the price for pollution is too small, it will not function as an incentive.

4.2 Strengthening of Existing Organization Capacity for RBWEM

This chapter focuses on new required techniques and capacity for implementation in Circular 76, preparation of action plan on river basin management. For example, Circular 76 regulates responsibility on approving the loading capacity to PPC or MONRE, although DWRM has responsibility for many actual activities of assessment of loading capacity. For the approving of loading capacity, MONRE, PPC have to understand and evaluate the results on assessment of loading capacity from DWRM. Also, MONRE, PPC will be required coordination with related organizations for adjustment of socio-economic plan and Action plan. Here, some responsibility/tasks of MONRE are considered based on establishment of RBOs.

Among the series of processes from pollution load analysis to action plan creation, it is necessary to strengthen capacity in existing organizations; these are proposed based on next 3 key factors: a) information collection on pollution load analysis, b) consistency in pollution load analysis between provinces, and c) consistency in water use and socioeconomic development plan.

Table 4.4 Strengthen of Existing Organization Capacity

#	Items	Summary	Priority
1	Information collection of domestic wastewater and agricultural wastewater	Although generated PL can be estimated as constant load, the contribution to river changes depends on the discharge method.	Middle
2	Capacity development of MONRE, RBOs	The approving of loading capacity of international, inter provincial river is the task of MONRE. This new task will be managed under RBOs. MONRE and RBO have to strengthen capacity of evaluation of results on loading capacity.	High
3	Capacity development of PPC	PPC have to strengthen capacity of evaluation of results on loading capacity.	High
4	Socioeconomic development plan and Action Plan	MONRE, PPC should understand the relationship during socioeconomic development plan and action plan.	Middle
5	Designing of coordination mechanism with competent authorities under Article 15	VEA reach common consensus on RBWEM with competent authorities	Middle

4.2.1 Information collection of domestic wastewater and agricultural wastewater

Generated Pollution load from domestic wastewater, agricultural fields, and livestock can estimate constant load statistically. However, the contribution of the pollution load to rivers vary greatly depending on whether the discharge method such as directly into the main river through channel, discharging into the environment through pits or using of sewerage or not. In addition, the condition of the discharging fields affects the PL ratio reaching the river, depending on whether the discharge site is covered naturally or artificially. Although such information is not managed by QCVN, etc., it is useful for improving the accuracy of pollution load analysis. The responsible departments need to collect and organize such information properly.

Although this information will contribute to improving the accuracy of PL analysis, collection activities are complicated and assume that various information will be handled. For this reason, it is desirable to start with activities after considering how to use the collected information and what accuracy of information is required.

4.2.2 Capacity development of MONRE, RBOs

For assessment of loading capacity for international-, interprovincial river, MONRE has responsibility of approving loading capacity. For this task, MONRE has to evaluate loading capacity submitted from each DWRM. When approving loading capacity, MONRE should consider the following issues:

(1) Supervise assessment of loading capacity among provinces in river basin

MONRE should understand whether the loading capacity is consistent among provincial level, or not. Also, MONRE should confirm the quality of data used such as calculation methodology

(Direct method, Indirect method, water quality model), quality of collected/ used data for calculation, setting of water use (QCVN) on each river section, etc.

(2) Approving procedure of loading capacity

MONRE have responsibility for approval of assessed loading capacity, but the detailed procedure is not regulated. As to the thinking with the functioning of RBOs, MONRE should decide the approval procedure, time schedule, members, reporting method and information management, etc. in advance.

The technical issue of approval of assessed loading capacity was provided in the "Guideline for Coordination Mechanism in Pollutant Load Discharge Management" prepared by the Project.

(3) Quality of loading capacity and Safety factor

Each DWRM should submit loading capacity to MONRE to obtain approval. Assessed loading capacity is calculated by DWRM according Circular 76 and using Technical Guideline.

Loading capacity submitted by DONRE may set minimum safety factor to maximize the lading capacity in each DONRE. When a province in up-stream sets small safety factor, large amount of pollution load will be sent into downstream province in the future according to development. MONRE should have required capacity: i) to check the quality of loading capacity submitted from DWRM, and ii) to suggest to re-calculate and adjust the loading capacity.

(4) Consider the impact of approved loading capacity

Since loading capacity is the acceptable pollutant load capacity in the river section, there is a possibility that a factory will be attracted in the river section where the additional loading capacity is still available. When such sections continue, the pollution load amount of the entire basin increases as a result. Even at the present time, the pollution load from the upstream is increasing, and there is a possibility that it may exceed beyond QCVN. Especially, river sections that were calculated by the direct method and the indirect method, it does not consider the relationship of each loading capacity in river basin. Of course, since the safety factor is set, it is considered that such a situation will not occur immediately. Also, approved loading capacity will be reflected to socio-economic plan.

For this reason, MONRE will need to accumulate knowledge concerning the loading capacity of each river section and the total pollution load of the river basin.

(5) Clarifying of responsibility for RBO

MONRE's responsibility described above, will be handle by RBO. MONRE should instruct RBO to equip necessary techniques and knowledge for assessed loading capacity. For these activities, the "Guideline for Coordination Mechanism in Pollutant Load Discharge Management" prepared by the Project will be useful.

(6) Recommendation to DWRM

For approving the process of loading capacity, MONRE, RBO are required to suggest improvement of the quality of calculation results by DWRM, not only judgment to approve or not. For example,

what data is improved comparing with other provincial data, etc. MONRE will be required to make effort to upgrade quality and obtain unified quality in river basin through recommendation to DWRM, etc.

4.2.3 Capacity development of PPC

As required in Circular 76, PPC have responsibility for approval of Loading capacity of intra provincial river submitted by DWRM. PPC also have to understand the same issues mentioned above.

4.2.4 Socioeconomic development plan and Action Plan

In Article-4, -12 in Circular 76, it is suggested that loading capacity is assessed in consideration of the socioeconomic development plan. Since this Circular cannot affect socioeconomic development plans, what it can do is to maintain that water use in the future can only be done by setting the smallest safety factor in the assessment of Loading capacity. When pollution load is expected to increase due to the socio-economic development plan, it may happen that protect water use due to actual loading capacity may increase to exceed assessed loading capacity.

Therefore, MONRE, PPC and related organizations should examine the pollution load reduction plan proposed as Action Plan in this project. This is including the authorization of action plan and reflection system of pollution load reduction to socioeconomic development plan as described in section 4.1.1 in this document.

4.2.5 Designing of coordination mechanism with competent authorities under Article 15

In Article 15 of Circular 76, the responsibility regarding assessment of receiving capacity and loading capacity on MONRE, DWRM and DONRE, etc. are regulated. In this context, each authority has to collaborate with concerned authorities.

4.3 Enhancing Systems for Increasing Efficiency and Improving Quality of Concerning Data

Related organizations hope to use data or model as possible highly accurate regarding calculation of pollution load or allocation of loading capacity. Although it is important that the highly accurate model for performing more accurate evaluation, the environmental measurement value that is the basic data for evaluating is not limited to the representative of the monitoring site. Hence, for the accuracy of analysis, number of monitoring there are limitations. Therefore, in order to improve accuracy, it is necessary not only to select models but also to improve the accuracy of the monitoring data to be acquired. In addition, in Allocation of loading capacity, it is necessary to handle a lot of data, so it is important to promote efficient data collection too.

Table 4.5 Enhancing System

#	Items	Summary	Priority
1	Re-check the environmental monitoring activity	・ Add new monitoring points to follow the divided river section for assessment of loading capacity. ・ Avoid duplicate monitoring among related agencies ・ Implement flowrate monitoring	High
2	Efficient data collection and sharing	・ Establish data base ・ Data-upload from DONRE	High
3	QA/QC for analysis in laboratory	・ Obtain ISO/IEC 17025 or equivalent assurance system in Vietnam ・ Participate in proficiency test	Middle
4	Improvement of Load unit for WQ model	・ Conduct the survey of load unit	Low
5	Clarify river section and water use purpose	・ Each province and VEA should review existing monitoring condition and clarify the target river section and the water uses based on criteria by setting environmental standard under unification of river basin.	High

4.3.1 Re-check the monitoring activity

For River basin management, DONRE and MONRE should increase their requirement of monitoring data sharing. For the process, we recommend to re-check or re-set the monitoring points among CEM and each DONRE implemented, because DONRE and CEM are independently set monitoring points. Also, for considering the WQ model, the river flow measurement is important. River flow information is necessary with more frequency than water quality monitoring, but the measurement takes a long time. Therefore, the measurement of river flow is recommend to measure by automatic monitoring of water level after preparing the H-Q curve at the monitoring points. The following section will recommend actions.

(1) Set more effective monitoring points for water quality and river flow as river basin

It's recommended to avoid duplicate monitoring among CEM and DONREs. Also the monitoring points should be re-set to more effective points through the discussion in RBO or equivalent committees, and then assign the monitoring activities among DONREs and CEM. In addition, the monitoring stations are regulated by *Decision No. 90/QD-TTg dated January 12, 2016 of the Prime Minister on approval for a master plan for natural resources and environment monitoring networks for 2016-2026 with a vision to 2030*. Based on this Decision, MONRE and DONRE should set up effective monitoring points and stations considering the river sections required by Circular 76 and water use. Also the monitoring network should avoid duplicate monitoring places.

(2) Establish H-Q curve and Automatic water level measurement station for river flow monitoring

Measurement of river flow is important from the viewpoint of water resource management or Establishment of WQ model. Generally, the measurement of river flow is conducted to measure river cross section. The measurement work is required 30 min or more even for a small river; if a

large river such as Dong Nai, river measure will be required for more than half day. Furthermore, the measurement frequency is better to implement daily, if the area is a tidal area, and it will be required to measure hourly. River flow measurement requires a lot of information as aforementioned. Therefore, river flow measurement is recommended to establish H-Q curve and use automatic water level measurement.

For the Circular 76, calculate pollution load on each river section for assessment of loading capacity. According these requirement, measuring station of river flow with water quality monitoring are required on each river section. However, as aforementioned, the river flow measuring activity is very hard, and on preparation of H-Q curve, it is required to conduct actual measure of flow rate on several flow amounts from low water to high water.

MONRE, DONRE have to coordinate/ decide the river flow monitoring stations based on dividing river sections to conduct the monitoring or simulate the river flow. Also, MONRE/ DONRE should prepare the river flow monitoring plan and obtain the H-Q curves according to proposed monitoring network to meet each river section.

4.3.2 Efficient data collection and sharing

In order to implement river basin management based on loading capacity of Circular 76, DONRE, DWRM have to collect a lot of data/ information and share it with PPC, MONRE. For example, industrial discharge information is one of most important kinds of information to estimate discharge pollution load to river. However, discharge information is not only the industry name or amount of discharge, but also to collect necessary information such as the discharging parameters, whether the discharge in only day time or discharge in night time too, etc. When this information is not managed in unified format, the data collectors have to re-order the data set to unified format. In addition, non-unified format will cause mistakes in data handling. Therefore, for data management it is better to set up a database.

(1) Establish database

Establishment of database is regulated as the responsibility of VEA in Circular 76, and necessity of database also is clarified in *Decree No. 140*. *Circular 24/2017/BTNMT* regulate basic data transferring method among MONRE and DONRE, DONRE and industry, automatic monitoring stations. For river basin management, unified management of environmental information is very important, and the information that should be managed in the database is not only water quality monitoring data, but it should include industry information, several bits of river information such as cross section, flow rate, etc. MONRE should decide the what information to include tin the database, and it should decide what statics will be required and how to upload/ update all information properly by database management.

(2) Institutionalize Guideline on pollution source inventory (PSI) development

Effective usage of database is required, not only just to establish the database and input the required data. The administrative organization has to clarify what information is needed; for example, the distribution of each pollution source, or total pollution load in target area, list of violations of wastewater, etc. In order to obtain such a result, it is necessary to add map information in addition to database information, and statistical processing as necessary.

The Project, "Manual on Wastewater Discharge Source Inventory (WDSI) Development for River Basin Water Environment Management" provided for support of effective usage of a database. MONROE need to institute the manual as VEA decision, and the manual should be shared to related organizations for introducing a unified database management, and effective usage of the database.

4.3.3 QA/QC for laboratory analysis

Quality Control and Quality Assurance are important to assure monitoring data. Worldwide, it's popular in the ISO/IEC 17025 system. Vietnam also has similar system to assure laboratory analysis. These QA/QC systems are required to establish the quality assurance system in laboratory, and additionally it is required to control the quality of each laboratory work. In addition, QA/QC is necessary to apply to each parameter and to update the system continually. "Quality Control" includes the quality of equipment/ glassware, quality of used reagent, technical skill of analysts, etc. On the other hand, "Quality assurance" establishes and complies with each procedure, such as to determine standard operational procedure on each parameter, ensuring traceability, approval procedure of analysis results, record of corrective actions, etc.

Additionally, in order to guarantee the quality of monitoring data, the laboratory needs to prove the accuracy of analysis by participating in inter-laboratory tests (proficiency test) to manage specific agencies to check analytical techniques.

4.3.4 Improvement of Pollution Load Unit

Currently, only one set of Pollution Load Units (PLUs) are available which can be taken from the guidelines of Decision 88/QD-UBND dated 01/13/2014 of People's Committee of Binh Duong province on promulgating Guidelines about collecting and calculating environmental indicators in Binh Duong province for 2013-2020. On the other hand, PLUs may not recommend to apply to another area even with the same landuse because the characteristics of the land use may differ in the geological features or practical usage methods. It's necessary to check several reports, since the range of PLUs take very wide range values depending on the study or survey. For example. PLUs of COD are i shown in Figure 4-3 in one Guideline[1] in Japan. As shown in Figure 4-3, the range of PLUs are a very wide range from 40 to 400 (kg/hr/year) for COD (urban area).

[1] "Guideline for facilitating Unspecified Pollution Source Control (2nd version)" (December 2014) Ministry of Environment in Japan

Unit: kg/hr/year

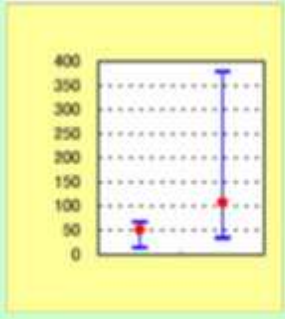
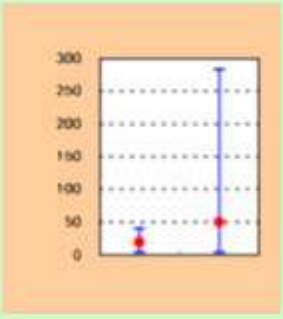
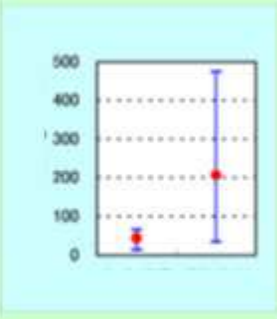
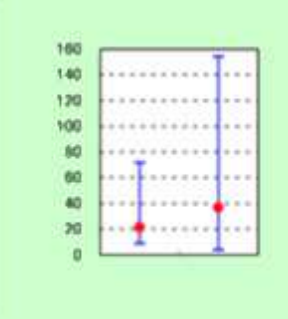
COD (Urban area)	COD (Farm land)	COD (Paddy field)	COD (Forest)
			
Left: Specific lake Right: River basin	Left: Specific lake Right: River basin	Left: Specific lake Right: River basin	Left: Specific lake Right: River basin

Figure 4-3 Range of PLUs on COD

Methodology of PLUs survey is also not established in Vietnam. As shown above, it is desirable to establish technical guideline for surveys of PLUs which show wide-range of values in reports, and to promote the survey of certain quality. First, the technical guideline for PLUs survey should be prepared, and MONRE should promote to each province to implement PLUs survey.

4.3.5 Clarify river section and the water use purpose

The competent authority should decide river section according to Article 5 in Circular 76. The river section needs to be uniquely decided in the river basin without the difference among the administrative authorities because, dividing of river section is conducted based on the geological viewpoint such as confluence point. In Circular 76, the length of river section is recommended around 10 km. On the other hand, according to experiences of establishing the WQ model in the Project, the length of river section used in calculation were about 2 km in Cau and Dong Nai river basin. These points used for calculation may use some simulated information, but if actual data is input into all calculation points, it will contribute to improve quality. These facts too should be considered for dividing river sections.

Based on dividing river section, MONRE/ DONRE and PPC will be required to apply water use purpose according to criteria by Surface water standard such as A1, A2, B1 and B2.

As the results of these activities, MONRE/ DONRE should prepare a Map of river sections and water categorization for each river basin, and then share it to related authorities to confirm the target of major water use.

Chapter 5 Recommended Schedule for Strengthen of Capacity Development on River Basin Management

The recommended action in Overall plan shown below includes designing period of the system.

Table 5.1 Schedule of Capacity Development

	Category	2020	2021	2022	2023	2024	2025
1	Establishment of New Institutional System	The system of authorization of Action				Rule or regulation regarding public	
			Regulation on report the discharge amount from industry				
				Introduction of economic incentive management			
2	Strengthening of Existing Organization Capacity for RBWEM	Information collection of domestic wastewater and agricultural wastewater			Socioeconomic development plan and Action Plan		
		Capacity development of MONRE, RBOs		Capacity development of PPC			
		Designing of coordination mechanism with competent authorities under Article 15					
3	Enhancing Systems for Increasing Efficiency and Improving Quality of Concerning Data	Re-check the environmental monitoring		QA/QC for analysis in laboratory			
		Efficient data collection and sharing		Improvement of Load unit for WQ model			
		Clarify river section and water use purpose					

Project for Strengthening Capacity
of Water Environmental Management in River Basin
(WEMRB)

OVERVIEW ON WATER RESOURCE MANAGEMENT - ROADMAP FOR INTEGRATED WATER RESOURCE MANAGEMENT IN VIETNAM

Hanoi, March 2019

Table of contents

List of abbreviations

BCT / MOIT	Ministry of Industry and Trade
BGTVT/ MOT	Ministry of Transportation
BTC / MOF	Ministry of Finance
BNNPTNT / MARD	Ministry of Agriculture and Rural Development
BTNMT / MONRE	Ministry of Natural Resources and Environment
NĐ-CP	State Decree
QĐ	Decision
QĐ-TTg	Decision by the Prime Minister
QH	National Assembly
TT	Circular
TTLT	Joint Circular
VBHN	Consolidated document
QLTHTNN / IWRM	Integrated water resource management
TNN	Water resource
LVS	River basin
BĐKH	Climate change
BVMT	Environmental protection
CNH	Industrialization
KTTV	Meteorological and hydrology
QLTNN	Water resource management
UBSMC	Mekong river committee

Summary

Research contents of report:

In recent years, the mechanism and policy framework on river basin management and river basin management organizations has been increasingly improved. However, the implementation of mechanisms and policies as well as the formation of river basin management organizations prescribed in legal documents has not been effective, lacking, overlapping, and inadequate so far. Facing this fact, it is necessary to review and evaluate the current mechanisms and policies, based on the actual needs of water resources management in river basin to provide solutions for effectively management of the river basin in consideration of current challenges.

This study has analyzed and comprehensively assessed the development history and mechanisms and policies for managing water resources and river basins over time. In particular, the study has introduced and analyzed policies, legal regulations related to water resources and river basins, assessing the appropriate points, inappropriate and missing points, in which carefully analyze the development history of river basin management organization in Vietnam. The study also summarizes the international principles of water resource management and Japan's experience in integrated water resource management. On that basis, research to develop a roadmap for development of integrated water resources management (IWRM) and river basin in Vietnam in the coming time was conducted.

The study has developed a legal framework in Annex 1, including: (1) State legal documents, including general legal provisions related to water resource management and river basin management, from the constitution to the laws on investment, public investment, environmental protection, land, planning, and development strategies; (2) Legal documents on management of water resource and river basin; (3) Legal documents on environmental protection of rivers and river basins; (4) Legal documents on irrigation management related to river water and river basins; (5) Legal documents on river and river basin flood management; (6) documents on interdisciplinary coordination in river basin.

The report comprised 5 chapters: (1) The concept of IWRM and introduction of Japanese IWRM; (2) Introduction and context of river basin management in Vietnam; (3) Policy and process of implementing IWRM management in Vietnam; (4) Planning of water resources and river basins in Vietnam; (5) Road Map for IWRM in Vietnam.

The concept of IWRM and introduction of Japan's integrated water resource management

IWRM is a process that promotes the coordination of development and management of water, land, and related resources to maximize economic and social welfare in a fair manner without affecting the sustainability of important ecosystems. There are different definitions of IWRM, however, it must be based on the general principles that IWRM is a management method to consider water resources and human activities related to water in the context of the entire ecosystem and IWRM needs a comprehensive approach for managing and recording all the features of the hydrological cycle and its interaction with other natural resources and ecosystems. Today, countries are based on Dublin principles with a set of four basic principles for planning an IWRM strategy, which are four principles: (1) Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment. (2) Water development and management should be based on a participatory approach, involving users, planners and policymakers at all levels. (3) Women play a central part in the provision, management and safeguarding of water. (4) Water has an economic value in all its competing uses and should be recognized as an economic goods. Vietnam has also been applying these principles in the process of application of IWRM.

Like many countries in the world, Japan also has difficulties in effective storage of water, so Japan has to apply many overcome measures. Japan also has a long history of water resources management, with a period (from ancient times to the 17th century) using only water for stable food production; but after the 20th century, water played an important role in the country in socioeconomic development - high - level economic growth; and especially the period after the 21st century is the new age of water resource management in post-modern society. Currently, Japan is implementing IWRM to move towards integrated management of water quantity and quality, utilization and conservation of groundwater and conservation of river basins.

In Japan, the Government is responsible for developing and implementing water resources policies at the national level. The Government developed an overall plan for water resource development and environmental conservation. The Ministry of Land, Infrastructure and Transport is responsible for managing the river basin. The River Law is just a regulation for managing rivers in Japan.

The river administration system has been revised several times since the enactment of the so-called "Old River Law" in 1896. Under the "new River Law" enacted in 1964, the institutional framework for flood control and water use was improved systematically by, for example, introducing an integrated river system management system. The River Law of 1964, therefore, has played an important role in forming river administration today. However, as the economic and social conditions have changed in the subsequent years, the conditions surrounding the river administration system have changed dramatically. Today, Projects are expected not only to perform flood control and water use functions but also to provide an attractive waterside space and habitat for diverse plants and animals. There is also a growing demand for creative efforts to make effective use of rivers as an important component of the regional climate, landscape, and culture. In addition, in keeping pace with the improvement of socioeconomic status and lifestyles, social impact of drought has become much more serious than before, and there is a pressing need for measures to ensure a smooth coordination of water use during periods of drought. In view of these changes, in December 1996 the River Council made "recommendations on the reform of the river administration system for meeting the change of social and economic needs." The River Law was amended on June 5, 1997.

The history of river basin management in Japan has shown changes in each period: 1890: Birth of modern river management system; flood management; 1964: Establishment of systems for systematic flood management and water utilization: Flood management + Water utilization; Introduction of integrated management system for river systems; 1997: Establishment of water utilization rules and regulations, including: Flood management + Water utilization + Environmental conservation; Improvement and conservation of river environment; Introduction of a system for river planning reflecting the opinions of local.

The Comprehensive National Water Resources Plan prepared by the Ministry of Land, Transport and Infrastructure formulated and revised in accordance with the Comprehensive National Development Plan, which is stipulated in the Comprehensive National Land Development Act and approved by the Prime Minister's cabinet. The Water Plan is a multi-year plan and addresses basic medium to long-term planning issues regarding water resources development, conservation and utilization, as well as makes forecasts of long-term water demand. The Ministry of Land, Transport and Infrastructure uses the Water Plan to formulate more detailed annual development plans and their related budgets. The most recent water paln, the Water Plan 21, stresses the efficient utilization of existing water resources facilities rather than the development of new water resources. Nowadays, the contemporary water recycle is replaced to the Basic Plan on Water Cycle in 2015.

- The Cabinet, under the Basic Environment Law, approves the Basic Environment Plan in December 1994. And In 2006, an outline of the revised Basic Environment Plan has been published, in which the government gives priority to 10 priority fields for implementation.

Among the 10 priority fields mentioned in the new Basic Environmental Plan, the government plans to put efforts to secure an environmentally sound water cycle, more concerns on, conservation and sustainable use of the water environment including water quality, water quantity, aquatic life and waterside areas, and creation of a rich community through contact with accessible water environments. In addition, other plans have been developed, including, plan by regions that is consistent with water utilization and flood control; Maintenance and improvement of storage penetration and recharge performance throughout all basins; international dissemination of the efforts and contribution to solving the world's water problems.

Regarding the institutional system of water resource management in Japan, the national government formulates and implements comprehensive policies such as those for water resources development, the administration of waterworks, and the protection of water quality. Five related ministries (Ministry of Land, Transport and Infrastructure, Ministry of the Environment, Ministry of Health, Labor and Welfare, Ministry of Economy, Trade and Industry, Ministry of Agriculture, Forest and Fisheries) take charge of the various administrative areas, and cooperate with each other to formulate water-related policies. The Institutional framework for water resources is divided into five broad areas, comprising: (1) Overall planning of water resources development; (2) Development of water-related facilities including the basis for subsidies; (3) Water rights and water trading; (4) Water Utilities; (5) conservation of the water environment.

For the financial system, the bulk of national expenditures are direct subsidies (transfers) to local governments and publicly owned water utilities for constructing new facilities; flood control facilities and sewage treatment systems. About 40% of the water-related budget is spent on flood control investments such as the construction of dams, waterworks, and related facilities. Around 35% of the water-related budget is spent for sewerage treatment systems. This spending complies with the Local Finance Law. The River Law, Water Supply Law, Sewerage Water Law, Industrial Water Supply Business Law, and the Land Improvement Law stipulate the ratio of subsidy of the state and the local government to total projects budget individually.

The "Basic Water Cycle act" was enacted in July 2014 and the Basic Plan on Water Cycle based on the law was adopted at a Cabinet meeting in July 2015, for the purpose of promoting water cycle measures comprehensively and consistently. The objectives of the Basic Act on Water Cycle are to specify the basic principles for water cycle measures, clarify the obligations of the national and local governments, enterprises, and citizens, design basic plans for water cycle, stipulate the fundamental items of water cycle measures, establish the Headquarters for Water Cycle Policy, promote water cycle measures comprehensively and consistently, and then contribute to the healthy development of economy and society and the sound improvement of human life.

History of river basin management in Vietnam

Through an overview study of the history of river basin management in Vietnam; the development of mechanisms, policies and laws on integrated water resources management; the current situation and propose the establishment of river basin management organization, management mechanism and development of policies on river basin management in Vietnam in periods: from 1867 to before 1998 (before the Law on Water Resources 1998 was issued) and the period from 1998 up to now, shows that:

1. The period before 1998: River basin management was carried out in the task of managing irrigation (with a broad sense), including hydropower, water transport and other activities for socio-economic development. River planning have been developed and the content of integrated interdisciplinary, inter-regional and inter-regional planning is the basis for effective water utilizatio and exploitation of rivers. And it can be said that the river management in this

period has shown the first step to apply the content of integrated management.

Regarding international cooperation, Vietnam has joined the International Mekong River Committee and established the Vietnam Mekong River Committee.

The agency performing the task of state management of irrigation, river water and river basin management has been assigned to different ministries through each stage of this period in accordance with the purpose and management requirements.

2. Period from 1998 to present: Direction, tasks for water resources management, irrigation development, disaster prevention, climate change response and environmental protection are identified in the reports and resolutions of Party. Based on the orientations of the Party, the National Assembly and the Government issued specific policies and laws and achieved the following achievements:

a. Management of river and river basin is increasingly being improved in accordance with the development of the national economy. Up to now, management of river water, river basin, and river water environment protection have been implemented in accordance with 3 specialized laws: Law on Water Resources 2012, Law on Environmental Protection 2015, and Law on Water Resources 2017. Besides, there are a series of sub-law documents, along with other relevant legal regulations, that have formed a full legal framework and a basis for managing rivers and river basins in Vietnam.

b. Policies on IWRM in Vietnam are defined in the strategic directions and relevant legal regulations that can be classified into groups:

1) Policy group on sustainable socio-economic development. The development of water resources is associated with each national goal and strategy from time to time. The success of the policy of sustainable development will make an important contribution to improving people's lives and each socio-economic sector. This is confirmed by the results recorded through active water supply in irrigation and flood control.

2) Preventation and reduction of natural disasters. Vietnam is located in the tropical monsoon region with heavy rainfall and many unusual events of the weather. Flooding and landslides are inevitable. In order to minimize the harmful effects of disasters, it is necessary to firmly grasp the rules, developments, impacts of weather and natural conditions of each region. Understanding of natural disasters needs to be improved, especially with policy makers at the central and local levels. Options to prevent and overcome the effectiveness of storms and flash floods have been mentioned in the current laws. Flood prevention plans in the Red River Delta, Mekong River Delta, and Central Highlands have been gradually completed. Large flood control networks such as the Red - Thai Binh, Ma, and Ca, etc. rivers systems; sea dike system, saline prevention sluice gates in the North and North Central; system of dykes and flood drainage channels in the Mekong Delta; large reservoirs such as Hoa Binh, Thac Ba, Tri An, Dau Tieng, Phu Ninh, Thac Mo, Vinh Son, Binh Dien-Ta Trach lakes, etc. to cut flood, protect people's life, infrastructure, and production in important national plains during the rainy season, floods. The effectiveness of these works is the prevention and mitigation of harm caused by water, while exploiting the benefits of floods, the flooded areas have been recorded.

3) Socialization in water resource management. Socialize the management of water resources according to the approach: the State and people work together, focusing on promoting internal strength and strength of the whole society, while encouraging domestic and foreign investors to joinly participate in the investment process and effectively exploit water resources; managing the huge investment capital of the State, the people and the value of water resources, affirming the management of water resources is the responsibility, duty and benefit of each citizen.

4) Effective use of capacity and potential of surface and groundwater: Water resources in Vietnam are relatively abundant but not infinite. On the other hand, the amount of water is distributed unevenly in space and time of the year, so the policy of effective use and water saving according to the multi-sectoral and inter-provincial coordination structure is necessary.

5) Financial investment policy. The investment to the management and rational use of water resources has attracted the attention of the Party and Government of Vietnam since the 1960s, particularly through the construction of irrigation works (such as Bac - Hung - Hai irrigation work) with domestic capital. The investment in water infrastructure such as dykes, canals and multi-functional lakes are considered to be expanded with all sources in various forms. State-owned investment represents a significant proportion of the state budget. Since 1999, this proportion has decreased due to the fact that investment in the water sector mainly focused on irrigation and drainage. In the period 1996 - 2001, an estimated 64% of the total investment in the water sector came from ODA, while 36% was from direct investment. The total investment for the irrigation sector in the 10 years from 1991 to 2000 is estimated at 2.5 billion USD, of which the contribution of the people is about 1/3, the State budget (both central and local) about USD 1.7 billion, and the investment in period 1996-2000 equals to 2.4 times of that in the period 1991-1995. In addition, river basin management is supported by Asian Bank (ADB) and AusAID funding in planning and identifying priority issues for each basin.
6) Water resource planning by basin. Vietnam is located in the tropical monsoon region, so floods and droughts are frequent, and the management of water resources in the river basin is necessary to address the imbalance of water by space and time. As mentioned above, Vietnam has long been developing river and river basin planning. Then, when the 1998 Water Resources Law was enacted, many programs for water resource management were conducted in the river basin with a water resources planning approach. Many management organizations for water resources have been established: the National Council on Water Resources and the planning management bodies of three major rivers: Red - Thai Binh, Dong Nai and Cuu Long rivers. According to MARD's assessment, the policy of applying integrated water resources management in the basin has been proven to be correct with the following results:
- Previous irrigation planning projects have been carried out by basin and following the direction of integrated use of river water resources and river ecology protection. Works were proposed in multi-sectoral and multi-purpose projects. Recently, on December 26, 1977, MONRE issued Decision No. 3399/QD-TNMT approving the task of river basin planning, such as the water resources planning for the Red - Thai Binh River basin to 2020, vision to 2050. However, in accordance with the Law on Planning 2017 and the amended and supplemented Law 37, water basin planning is replaced by inter-provincial river basin integrated planning and inter-provincial water sources. Also, the provincial river planning to be converted into a content of the provincial plan.
- The three organizations managing the Red - Thai Binh, Dong Nai and Cuu Long River basin have been established under the Decision No. 37, 38 and 39 of the Minister of Agriculture and Rural Development have come to operation from 2001. The management boards have identified priority issues for each basin.

In addition, representatives of provinces of the Cau and Nhue-Day river basins were convened in 2003 - 2004 to establish the river basin organization, and recently Ministry of Natural Resources and Environment submitted to the Government the proposal on the establishment of six river basin committees, although, they have not yet been established.

In order to implement the policies mentioned above, the Government of Vietnam has issued many legal documents directly related to integrated water resources management. In addition, water management policies are implemented in accordance with other relevant laws such as laws on investment, state budget, public investment, land and planning. including:
Framework of legal documents:
1) So far, a series of legal documents have been issued and gradually improved, forming a relatively adequate institutional framework for management of river, river basins, and water resources. The institutional framework includes not only specialized legal provisions but also other relevant legal provisions.

2) In the period from 1998 to 2012, especially after the Ministry of Natural Resources and Environment was established in 2002, there are still conflicting laws, not consistent because of the Decree No. 120/2008/ND-CP on river basin management was issued based on the Law on Water Resources 1998, however many provisions of this Decree are not in accordance with the provisions of the Law, for example:
- The Law on Water Resources 1998 regulates that MARD is responsible to the Government for the state management of water resources, while the Decree 120 stipulates that this responsibility belongs to MONRE and many tasks of MARD are transferred to MONRE.
- The Law on Water Resources 1998 regulates river basin planning and river basin management agencies under MARD, while the Decree 120 stipulates responsibility for river basin planning is of the Ministry of Natural Resources and Environment, and the River Basin Committee and the Committee Office are under MONRE. As such, for a river basin, there exist River basin planning committee under MARD and River basin committee under MONRE at the same time. In addition, there is also the River Basin Environmental Protection Committee established under the Law on Environmental Protection. However, no River basin committee has been established since 2008.
3) From 2013 up to now, the amendment of the Law on Water Resources 1998 by the promulgation of the Law on Water Resources 2012 has overcome these shortcomings. The Law on Water Resources 2012 has entered in force for nearly 8 years and Decree 120, although promulgated under the Water Resources Law 1998, is still in force today. Meanwhile, the Law on Water Resources 2012 and Decree 120 has different regulations: the Decree 120 addresses river basin planning, while the Law on water resources 2012 addresses water resources. In addition, as the Planning Law 2017 regulates the type of planning, the water resources planning is the national planning and integrated interprovincial river basin/water resource planning is specialized planning. The Law amending and supplementing a number of articles of 37 Laws related to the planning modified this provision of the Law on Water Resources 2012 and thus overcome this shortcoming.

Apart from a number of inconsistent and overlapping regulations, as mentioned above, the current shortcomings are not caused by the institutional arrangements but by the organization for implementation and the cooperation between the ministries and sectors, especially between the two ministries MONRE and MARD. However, it is very necessary to have a river basin/river basin water resources planning, which is a basis for the implementation of river basin management as it has been done in Vietnam since the 1960s.

Regarding river basin management organization:

1) A list of 33 inter-provincial river basins has been issued in 6 regions: North, North Central, South Central, Central Highlands, Southeast, and Mekong River Delta.
2) There have been regulations on models, functions and authority to set up river basin committees. However, so far only 09 organizations related to river basin management, include: 06 River Basin Planning Management Board and River Basin Council and 03 River Basin Environmental Protection Committees. These organizations are organized in three different models including: River Basin Planning Management Board, River Basin Council, and River Basin Environmental Protection Committee.
3) Some shortcomings in the organization and operation of organizations related to the current river basin: The formation of river basin organizations in the past years is the first step to implement the principle of IWRM based river basin combined with administrative unit management. This is an advanced management model that many countries around the world have successfully applied, meeting the aspirations, desiring to contribute to the management of water resources by the relevant ministries, branches and local authorities. However, the operational efficiency is still very limited, mainly organizing meetings, sharing information, decisions making low enforcement effect, so the performance of these organizations remains

limit. Some more shortcomings in the operation of organizations related to river basin organizations are as follows:

For River Basin Management Boards and River Basin Management Councils:

1) The River Basin Management Board is a non-business unit; The River Basin Management Council is an advisory and consulting organization so they do not meet the requirements on coordination of relevant agencies in activities of protecting, exploiting and using water resources, and preventing damages caused by water in river basins.

2) The functions, tasks, powers and working regulations of the Boards or Councils do not clearly show their roles in participating in and solving issues related to water resources in the river basins, especially the inter-sectoral and inter-regional issues; the mechanisms and tools for monitoring the activities of protection, exploitation and use of water resources in river basins have not yet been established.

(3) The organizational system is week, lacking of necessary resources (staff, material conditions...) to ensure effective operation; Operation cost is still limited, depending on the contribution of provinces, projects and donors.

4) These boards and councils are established and operated by the Ministry of Agriculture and Rural Development on the basis of the 1998 Law on Water Resources, before the issuance of the resolution of the National Assembly on the establishment and transfer of state management functions on water resources to the Ministry of Natural Resources and Environment.

For the current river basin environmental protection committees, there are some major shortcomings:

1) The organization and operation of the river basin environmental protection committees is not strictly binding, the coordination among provinces is limited; the participation and coordination of ministries and branches in the operation of the river basin environmental protection committees is not yet strict.

2) Lack of special investment resources, specially the financial source to implement the river basin environmental protection scheme, which is the current major constraint of the Committees; The lack of clear identification of funding sources should make it difficult for localities to identify funding sources for implementing the tasks of river basin environmental protection schemes.

3) Lack of legal basis to organize the implementation of tasks, such as the development of policy mechanisms or overall solutions from the viewpoint of integrated management across the river basin in accordance with the Law on Water Resources.

From the current situation and legal basis as well as the requirements of water resources management are increasingly, coordination and supervision of water resources in river basins, prevention of harms caused by water on river basins, environmental protection and water resources protection on river basins are becoming an urgent issue in the socio-economic life so that the establishment of river basin committees to help the Government, the Ministry of Natural Resources and Environment in Water resource management by river basin is necessary.

4) The Ministry of Natural Resources and Environment has proposed to the Prime Minister to establish 05 River Basin Committees and consolidate the Vietnam Mekong Committee. The Ministry also proposed the functions and tasks of these committees. However, this proposal has not been approved by the Prime Minister.

Policy and process of IWRM

Research results on water environment management, water utilization management, flood control and challenges of IWRM show that:

1. Water environment management:

a. Achievements:

1) The system of policies and laws on environmental protection in general and water

environment in particular is basically sufficient and can regulate all aspects of water environment protection activities, from the orientations of the Party, laws promulgated by the National Assembly to a series of documents issued by the Government and Ministries.
2) State management organization apparatus for environmental protection in general and water environment protection in particular has been synchronously set up at both central and local levels and has been gradually improved.
3) Participation of Vietnam in international treaties related to water environment management is the basis for implementing the management of the water environment in Vietnam, contributing to enhancing participation in international economic integration.
b. Difficulties and challenges:

Vietnam is facing four major environmental challenges: residues of Agent Orange left over from war; increasing environmental pollution and limitation in environmental management; more and more complicated increasing climate change, negatively affecting the ecological environment and sustainable development.
1) Great challenge on water pollution.
- Water pollution continues to increase in terms of scope and intensity; in many sites, water cannot be used due to pollution. Surface water in most urban areas, industrial parks and craft villages are polluted. In some places, the pollution level is high, such as in Nhue-Day, Cau and Dong Nai rivers. Most of the wastewater containing oil and grease, chemical detergents and dyestuffs ... not appropriately treated is directly discharged into rivers and lakes. An example is the case of Thi Vai River pollution by the chemicals discharged from Vedan's factory for 14 continuous years. Therefore, in the past years, the Prime Minister has issued a number of programs and plans to deal with establishments seriously polluting environment, for example, the Decision 174 in 2006, Decision 187 in 2007, Decision 57 in 2008, Decision 1946 in 2010, Decision No. 64 in 2013, Decision No. 1788 in 2013 and most recently Decision No. 807 dated July 3, 2018. It can be seen that every plan targets the treatment of establishments polluting environment, especially those causing the water pollution in river basins and considerable funding source has been allocated for this; anyhow there are still many establishments causing severe environmental pollution that in July 2018, the Prime Minister directed to thoroughly dealt with the establishments of public interests in the 2016 - 2020 period.
- There are many objective and subjective causes of water pollution, such as population increase, negative effects of industrialization and modernization process, poor and backward infrastructure; low people's awareness on environmental issues. In large cities, untreated waste water from hundreds of industrial establishments discharged directly into the environment is the main cause of pollution of the water environment. In rural areas, the infrastructure is outdated, most human and animal wastes are not treated and discharged to the soil or washed away, resulting in organic and microbial pollution. In addition, the abuse of plant protection substances in agricultural production leads to serious pollution in rivers, lakes, canals and ditches, which directly affects human health.
- For the Mekong Delta, the Resolution No. 120/NQ-CP dated 17/11/2017 of the Government identifies: “In the context of globalization and international integration, the Mekong Delta has a great opportunity for development but also faces a big challenge because it is vulnerable to natural changes. Climate change and sea level rise are occurring much faster than expected, causing extreme weather events and affecting people’s livelihood. The use of water from upstream area of the delta, especially the construction of hydroelectric power plants, cause a change in flow, reduction in sediments and fisheries resources, deeper salinization, which exerts negative impacts on the region’s socio-economic development. The intra-regional economic development in high intensity has led to harmful consequences, such as environmental pollution, serious ecological imbalance, land subsidence, groundwater level decline, coastal encroachment and reduction in area of natural forests, especially mangrove forests, cajuput

forests and protection forests, being destructed, changed in use purpose or severe degraded. Besides, the over-extraction of sand and construction of houses and infrastructure along river, canals and ditches increase the risk of erosion."

- Transboundary pollution. Vietnam is a country with abundant water resources with 3,450 rivers and streams of 10 km or more, distributed in 108 river basins. However, Vietnam's water resources are mainly dependent on foreign countries, because nearly two thirds of Vietnam's water coming from overseas. Although not the main cause, cross-border pollution has posed an increasing impact on Vietnam's ecological environment.

2) Limitation in environmental management:

- The state management system, although been strengthened, has not effectively dealt with inter-sectoral, inter-regional and transnational issues, and has not meet the requirements of the environmental protection in the period of industrialization and modernization of the country, in the context of climate change.
- The staffs working on environmental are inadequate in quantity and weak in quality, which fail to meet the new requirements, especially at local level and in the establishments; the staff capacity is still low compared to that of other countries in the region.
- The allocation of state management tasks of water environment protection is still inappropriate with overlaps.
- Awareness at different levels of government, in management agencies and organizations, and of individuals, responsible for environmental protection tasks is low and insufficient. There is not full recognition that water pollution is a direct and everyday danger to the human life as well as the sustainable development of the country.
- There are no strategies and plans for exploitation, use and protection of water resources in river basins and in large areas.
- Investment and regular expenditures from the state budget and mobilization of resources in society are limited, not meeting the requirements; the use of financial resources is spread, with no focus, that leads to the low efficiency. Regular expenditures for the environment have reached 1% of total state budget expenditure, but still with no focus. In some provinces, the use of regular expenditures for environment is not yet for the right purpose, so not effective. The rate of investment back to environmental protection from the revenues on environment is low. The ODA funding for environmental protection is also low, scattered and tending to decrease. There are no reasonable regulations on financial contribution to management and protection of the water environment that results in financial shortage for water environment protection. The principles "the polluter pays for the costs of environmental remediation" and "beneficiaries of natural resources and environment must pay" have not been fully applied, and the payments are not adequate.

3) Climate change is becoming increasingly complex and faster than forecast, negatively affecting the ecological environment and sustainable development of the country. According to Minister Tran Hong Ha, climate change has impacted the environment for many years and is becoming clearer, manifested in the natural disasters and extreme weather events. According to the scenarios of climate change and sea level rise, Vietnam is one of the countries which bear the most negative impact. In the future, climate change will make environmental pollution more complex in many fields, such as the pollution in river basins.

4) Environmental monitoring: Despite many efforts, the management and implementation of environmental monitoring also have some inadequacies. Specifically:

- The current network of natural resources and environment monitoring has not met the demand for socio-economic development, especially in key economic areas, urban areas and craft villages; limitation in number of stations and low monitoring frequency are not enough for comprehensive assessment of the quality of environmental components in space and time. The number of automatic water and air pollution control stations is still limited, not meeting the

needs of monitoring and warning. Hardware systems (automated stations) and software (management, connection and data transmission) have not been synchronously invested. Data quality of some monitoring programs is not guaranteed.
- Still lack of regulations on technical procedures, methods of environmental monitoring, regulations on limit of the concentration of parameters for some environmental components and production fields.
- Lack of regular coordination and cooperation in environmental monitoring between agencies inside and outside the Ministry of Natural Resources and Environment.
- The professional staffs (especially the technical staff) who conduct monitoring and analysis in general are still lacking and have limited qualifications and professional skills, that makes them difficult to approach the high monitoring technology.
- The results of environmental monitoring are still scattered in many agencies and organizations, which have not been synthesized and stored in the database, even within the Ministry of Natural Resources and Environment.
- Information and monitoring data are rarely shared; the implementation of the reporting regime is not complete; there is a lack of regulations on the exchange of monitoring data among agencies within the Ministry of Natural Resources and Environment, as well as with other ministries and agencies. Data transfer requirements under Circular No. 24/2017/TT-BTNMT have not been fully implemented and are currently in the process of upgrading or replacing the equipment.
- The information dissemination to the community is limited, not yet exploiting new but quite popular communication channels in the current period, such as smart phones, social networks.
- The capital from enterprises and other sources of social mobilization in environmental monitoring has not been utilized.

2. Water utilization management (irrigation)
- Institutional frameworks related to water use management have been established very early and continuously adjusted and supplemented in a way that is consistent with the market mechanism, encouraging participation of the private sector and increasing international cooperation. To date, the institutional framework for water use management has been substantially and fully regulated by the two specialized laws, the Water Resources Law 2012 and the Irrigation Law of 2017, and other relevant laws and sub-law documents.
- The State management agencies assisting and responsible to the Government for the management of the use of water resources assigned are the two ministries, MONRE and MARD: MONRE is responsible for the Law on Water Resources, while MARD is responsible for the Law on Irrigation.

Thus, the exploitation and use of water resources are governed by two different water use law (Water Resource Law and Irrigation Law), and managed by two different ministries (MONRE and MARD); besides, there are other specialized laws (on waterway navigation, tourism, electricity development, minerals ...), other Ministries involved (Ministry of Transport, Industry, etc.) and local governments involved. There is no a competent "conductor" and the management of water resource use is not yet effective.
- Transfer of irrigation fees to prices of irrigation products and services is a very new policy, which is the most important provision of the Irrigation Law of 2017.
- The key issue in the management of water resources use is the need to determine the water price immediately according to the nature of the water as the good. However, in order to do this, it is necessary to have support and learn experience from international organization and foreign countries.

3. Integrated Flood control: there are the following strengths and weaknesses:

a. Strengths:

- Flood management has been attracting the attention of the Party and State of Vietnam. Therefore, the Party's resolutions always emphasize the importance and requirements of flood control; strategies, policies and legislation on flood control has been gradually improved with some major laws, such as the Law on Water Resources, the Law on Irrigation and a series of sub-law documents and guidelines on flood management, such as the reservoir operation procedure and flood drainage. The state management apparatus on water resources management in general and flood control in particular have been gradually upgraded and improved by the establishment of specialized general departments, such as General Department of Water Resources, General Department of Disaster Management and General Department of Hydrology.
- There have been flood control mechanisms in the direction of integrated flood management, initially implemented by research in some river basins. Integrated flood management maximizes the capacity of floodplains and minimizes the damage caused by floods. Flood management requires a balanced approach between structural and non-structural methods, such as flood transfer, flood storing, deployment of drainage systems and flood prevention works, and groundwater management.

In recent years, with the support of international organizations, especially JICA, flood management has been studied and implemented at central and local levels. Specifically:

- The project "Building flood management framework for some typical river basins in Central Vietnam" implemented by the Institute of Water Resources Planning, Ministry of Agriculture (completed).
- Integrated Flood Management Plans implemented by some provinces such as: Thua Thien Hue Province (Integrated Flood Management Plan for Huong river basin); Binh Dinh province (the Provincial People's Committee issued Decision No. 1546/QĐ-UBND dated 11/5/2018 approving the task of developing the integrated flood management plan for Kon river; Quang Binh province (the Provincial People's Committee has approved the detailed flood management plan for the Gianh and Nhat Le river basins in the period 2016-2020, with orientation to 2030.

b. Some difficulties and obstacles:

1) Regarding the legislation:

- There are no specific regulations on integrated flood management. Although the principle of flood management is use of integrated management approach, there is no specific regulation and guidance on integrated flood management and planning; there is only implementation in some provinces.
- Regulations on reservoir operation and hydropower dam safety management. Regarding the legal corridor, the operation of reservoir and management of dam safety are governed by the laws on Natural Disaster Prevention, Electricity, Construction and Irrigation. However, there are some difficulties, such as: There is a legal gap on the operation of reservoirs and management of dam safety of the hydropower reservoirs. Technically, the requirements related to reservoir operation and dam safety management are the same as for irrigation reservoirs, but the Law on Irrigation does not regulate the operation and safety management of hydropower dams. There is a legal gap on the operation of reservoirs and management of dam safety of the hydropower reservoirs. Technically, the requirements related to reservoir operation and dam safety management are the same as for irrigation reservoirs, but the Law on Irrigation does not regulate the operation and safety management of hydropower dams. Some overlapping regulations, such as the setting up disaster response plans according to regulations on natural disaster prevention and response with the natural disasters response scenarios for constructions and downstream areas under the Law on Irrigation; reporting on hydrometeological monitoring and operation of reservoirs is not in accordance with the regulations on hydrometeorology and dam safety management.

2) Human resources: Human resources for the state management of natural calamities in general and flood control in particular are limited; there is a lack of qualified staffs to meet the requirements of work.
3) Hydrometeological monitoring. Hydrometeological monitoring plays an important role in the safe and efficient operation of the reservoir and assuring the safety of the downstream area. However, there is a big difference between the hydrometeological forecasting report and what occurs in reality, that creates difficulty for hydropower dam owners in operating the hydropower reservoir safely and effectively. The hydrometeorological forecasting is limited with not applicable forecast of the flow to the reservoir within 24 hours, prior to the flooding threshold achieved.
4) Flood drainage corridors. At present, there are no regulations on the definition and management of flood drainage corridors, so many households have constructed works and organized agricultural production in flood drainage corridors. Some flood drainage works can only meet about 30-50% of the design discharge, that impacts on safety for the downstream areas.
5) On flood control plans for downstream areas. every year, the relevant agencies/organizations set up flood control plans for downstream areas. However, in the case of emergency of flood drainage or dam breakdown they are not synchronously implemented. The preparation of flood control plans for the downstream area is still difficult: there is a lack of topographic maps and data on distribution of people in downstream area; it is difficult to determine the impact boundary in downstream area of the dam; there is no synchronization in the overall coordination between the dam owners when the flood discharge is implemented with all reservoirs in one basin.
6) Despite the regulations on integrated flood management regulations, the integrated flood control mechanisms have not been developed yet.

4. The cores and challenges of IWRM:
a. Integrated water resources management in the river basin has been applied very early in Vietnam and has been as effectively applied for example for the Red River Basin in the 1950s through the Red River Basin Planning and the establishment of the Red River Committee.
b. Experiences of the Red River Basin Management in Vietnam show that the two core areas of integrated water resources management are river basin planning and river basin coordination.
c. Challenging issues: While new developments have been made in building the basis for integrated water resources management as described above, the implementation of this approach is still challenging, because:
- Water resources planning by integrated approach, flood management planning by integrated approach and development of water prices according to market mechanism, etc. are areas that Vietnam lacks of experience and qualified source people.
- Regarding river basin coordination organization: MONRE has submitted to the Prime Minister the establishment of river basin management committee. However, this has to be considered in the current context, because there are many regional and sub-region coordination organizations, and as decided by the Government and the regions and sub regions can establish the organization under the voluntary mechanism.

In addition, the mechanism of integrated river basin management is inter-provincial and inter-regional, while according to the existing laws, such as the Constitution, Local Government Organization Law and Budget Law, the management is still by administrative boundary.

Planning on water resources and inter-provincial river basins and inter-provincial water sources

From January 1, 2019, the Act of planning will take effect such as the Law on Planning 2017 and the Law amending and supplementing a number of articles of 37 Laws related to planning (hereinafter referred to as the Law amending and supplementing 37 Laws). These laws have fundamentally changed the types of planning and planning processes, especially water resources planning and integrated inter-provincial river basin planning and inter-provincial water resources. These laws also stipulate a new approach to integrated management, which is planning-based management.

1. Types of planning related to water resources and river basin:

According to the provisions of the Law amending and supplementing 37 Laws:

- General planning of water resources of the nation will be named water resources planning; The water resources planning in the inter-provincial river basin is no longer available but replaced by Integrated inter-provincial water sources and inter-provincial river basins planning; water resources planning of provinces and centrally-run cities is no longer available, Provincial People's Committees direct professional agencies on water resources, based on national planning, regional planning, integrated inter-provincial water sources and inter-provincial river basin planning , to develop plans to exploit, use and protect water resources and remedy harmful effects caused by water, and add into the provincial planning. Essentially, the change is a return to the provisions of the 1998 Law on Water Resources and is consistent with the requirements of integrated river basin management, which is integrated planning for the river basin, not only the planning for water resources in river basin.
- Water resources planning is the national, sectoral planning under the provisions of the Law on Planning 2017, the planning period of the national planning system is 10 years , vision from 30 years to 50 years . Thus, water resource planning is made for the period of 10 years, but the vision is not the 20 years but from 30 years to 50 years.
- General planning of inter-provincial river basin, inter-provincial water source is established for 10-year period, the vision from 20 years to 30 years.
- Law amending and supplementing 37 Laws stipulates the relationship between water resources planning and integrated interprovincial river basins, Inter-provincial water sources planning. This provision is the basis for making and adjusting planning types, overcoming previous shortcomings in the selection of planning when there is a contradiction between plans on the same content.
- According to the Law on Water Resources 2012: Planning period for water resource planning is 10 years, vision to 20 years. Thus, this provision on the period of water resource planning is in accordance with the Law amending, supplementing 37 Laws, but these two Laws stipulate differently about vision period. However, according to regulations, when there are differences, they must comply with the Law amending and supplementing to 37 Laws.

2. On an inter-provincial basin, many economic sectors and many localities jointly exploit and use water resources, therefore according to the provisions of the Law amending and supplementing 37 laws, one of the principles in water resources planning is to ensure harmony of interests in water use between localities and departments, between upstream and downstream. And one of the foundations for the general planning of inter-provincial river basin and inter-provincial water sources is the demand for water exploitation and use by sectors and localities. Thus, when setting up water resources and integrated planning of inter-provincial river basins, it is necessary to consider the planning of the provinces and the water resource exploitation and use planning of sectors.

Under the provisions of the Law on Water Resources 2012, sectors which use water resources in river basin include : agricultural production; hydroelectric; aquaculture; industrial production, mineral exploitation and processing; Waterway transport (river ports, seaports, transport, other).

Under the provisions of the Law amending and supplementing 37 Laws, besides the water

resources planning which is the national sectoral planning, integrated inter-provincial water resources, inter-provincial river basin planning is technical, specialized planning and above water exploitation and use sectors also have sectoral planning, including the national sector planning and technical, specialized planning, specially:

a) National sectoral planning comprises water resource planning; Overall seaport system development planning (including the sea ports located on the river basins); Planning of inland waterway infrastructure; Master plan of energy; Fishing ports and storm shelters for fishing ships system planning; Planning to protect and exploit aquatic resources; Planning on exploration, exploitation, processing and use of minerals; Environmental protection planning.

b) Planning with technical and specialized characteristics comprises planning for water resources and intergrated inter-province river basin, inter-province water sources; Master plan for basic water resources survey; Planning for protection, exploitation and use of international water sources; Irrigation planning; Planning on flood prevention and control of dyke rivers; Dyke planning; Detailed planning on seaports, docks, piers, buoys, water parks, water bodies.

Thus, when implementing water resources planning and inter-provincial river basin integrated planning, inter-provincial water sources planning, it is required to consider the water utilization and river basin planning of the relevant sectors.

3. Relationship between types of planning

a. planning for integrated inter-province river basin and inter-province water sources:

- National master plan is the basis for water resource planning and water resource planning must be in line with the national master plan.
- Regional and provincial planning must be in line with water resource planning. If regional and provincial planning conflict with the water resources planning, it is required to adjust according to the water resources planning.
- When there is a conflict between the water resource planning and the overall inter-provincial water sources and inter-provincial river basin planning, it is required to adjust according to the water resources planning.

However, there are no regulations on the relationship between planning within the same national level or between technical and specialized planning. This leads to the determination of the relationship between water resource planning and other specialized planning at the national level, the relationship between the inter-provincial water sources and inter-provincial river basin planning and the integrated inter-provincial river basin and inter-provincial water source planning with other sectoral technical, specialized planning.

b. Relationship between national planning and inter-national planning:

Under the provisions of the International Treaty Law: In case of legal documents and international treaties of which the Socialist Republic of Vietnam is a member having different provisions on the same issue, it shall apply provisions of such international treaties, except the Constitution.

Therefore, when there are different regulations for the same content between the planning of protection, exploitation and use of inter-national water sources with the planning of water resources, the overall inter-provincial river basin and water sources planning. and other related planning, it is required to follow the plan of protection, exploitation and use of inter-national water sources.

4. Sequence in planning activities:

a. Process for development of planning includes: Development of planning (including establishing, appraising and approving planning tasks; Organize planning); Planning appraisal; Decision or approval of planning; Planning announcement; Implement planning.

b. Water resource planning:

- Authority: The Ministry of Natural Resources and Environment will be the agency to organize the planning of water resources. The Prime Minister is competent to organize the appraisal and

approval of the task of planning water resources.
- the development of water resources planning must follow the steps stipulated in the Law on Planning; At the same time, it must be based on higher planning and must integrate planning components of water-using sectors. This requires not only time but also the orientation of other relevant national sectoral planning to ensure the feasibility of the planning.
- Implement the planning: *the Ministry of Natural Resources and Environment shall develop an implementation plan and submit it to the Prime Minister for approval*.
c. Integrated inter-province water source and inter-province river basin planning
- Foundation of the planning: The development of integrated inter-provincial water sources and inter-provincial river basins planning shall base on the following factors: Water resources strategy, water resource planning; Characteristics of natural, economic - social and specific conditions of the river basin, of each region, potential of water resources and forecast the impact of climate change on water resources; Demand for water exploitation and use by sectors, localities and environmental protection; Results of basic water resources survey; Norms, standards and technical regulations issued by competent authorities; The provisions of international treaties to which the Socialist Republic of Vietnam is a member in the case of inter-national water resources; Approved planning tasks.

Thus, when making integrated inter-provincial water sources and inter-provincial river basin planning, in addition to the above factors, one of the important factors is to be built on water resources planning.
- Competence in development of planning: The Ministry of Natural Resources and Environment has the authority to organize the planning and approve planning tasks for the integrated inter-provincial water sources and inter-provincial river basin planning.
- Competence in approve of planning: The Prime Minister has the right to approve the planning, adjust the integrated inter-provincial water sources and inter-provincial river basin planning.
- The development of the integrated inter-provincial water sources and inter-provincial river basin planning includes the following contents: Overall reviewing natural, economic - social characteristics, status of water resources, water resource protection, exploitation and use, prevention, control and remedy of harms caused by water; Preliminary determining of functions of water sources, water demand and drainage, issues to be addressed in the protection, exploitation and use of water resources, prevention, control and remedy of consequences caused by water; Determining the objects, scope and contents of the planning in order to ensure the function of the water source, solve the problems identified at the previous content; Determining solutions, funding, progress and schedule for planning.
- Contents of integrated inter-provincial water sources and inter-provincial river basin planning:
a. Water resource allocation: Assessing the quantity and quality of water sources, the current state of water resource exploitation and use; forecasting the trend of flow fluctuations, water levels of aquifers, water demand; Functional zoning of water sources; Determining the proportion of water resource allocation to the subjects of water exploitation, use, priority order and allocation rate in case of drought and water shortage; identify reserve water sources for domestic water supply in case of occurrence of water pollution incidents; Identify water resource monitoring system, monitor water exploitation and use; Determine the demand for water transfer among sub-basins in the river basin, the need to transfer water to other river basins; Identify constructions regulating, exploiting, using and developing water resources; Solutions, funding, plans and implementation schedule;
b. Protection of water resources: Determination of water resource protection requirements for exploiting, using water and aquatic ecosystems; Identify contaminated, degraded, exhausted areas; assessing changes in water quality, water quality zoning; Determining constructions, non-constructions measures to protect water sources, recover polluted or degraded water sources to ensure the function of water sources; Determination of water quality monitoring system,

monitoring of wastewater discharge into water sources; Solutions, funding, plans and implementation schedule;
c. Preventing, controlling, and overcoming consequences caused by water: Determining areas where river banks are collapsed or landslides or at risk of landslides, landslides or land subsidence or at risk of landslides, subsidence, saline intrusion due to underground water exploration and exploitation; assess the situation, happenings, identify the causes and zoning effects of water; Overall assessment of the effectiveness and impacts of works and non-construction measures to prevent, combat and overcome the harmful consequences defined at Point a of this clause; Determining solutions to improve the quality and efficiency of the activities of preventing, combating and remedying the harmful effects caused by water, and solutions to improve the quality and efficiency of water warning and forecasting systems cause; Determining non-structural works and measures to minimize harms caused by water; Solutions, funding, plans and implementation schedule;
d) In case of necessity, the planning contents also propose the adjustment of tasks and operation processes of exploitation, use and protection of water resources, prevention and combat of consequences caused by water.

the approved integrated inter-provincial water sources and inter-provincial river basin planning is the basis for the river basin organization to supervise the implementation and propose, recommend to competent state agencies to issue mechanisms and policies to ensure the implementation of the plan; propose solutions to problems arising in the process of organizing the implementation of the integrated inter-provincial water sources and inter-provincial river basin planning.

Road Map for IWRM in Viet Nam

The development of a roadmap for IWRM in Vietnam is based on the experiences of managing water resources that have been implemented for more than 15 years, activities that have been implemented and are based on the actual resources of the water resources sector to be carried out. Priority should be given to improving policies and institutions. Implementation resources, especially resources for development planning is still lack both quantity and experience, so it is impossible to massively implement the planning of integrated river basin. Therefore, it is expected that about 49 activities are proposed for the next 10 years according to 05 areas. However, the implementation depends mainly on the resources and funding of stakeholders: (i) 16 activities on strategy and policy development; (ii) Law: 01 proposal to amend the Law on Water Resources and the Law on Environmental Protection in accordance with the provisions of the Law on Planning and Law 35; (iii) 03 capacity building activities; (iv) 08 activities on building institutional framework and focus on river basin level; (v) 21 activities to apply water resources management tools (including planning and development of river basin management plan). Activities are divided into 3 main stages as follows:

Phase of policy improvement and preparation for establishment of River Basin Organization from 2020 - 2024 and pilot operation of Vu Gia - Thu Bon river basin organization: Many river basin organizations have been established but most are inefficient. Therefore, the establishment of a new river basin organization must be very careful, it is necessary to carefully study the models of other countries and apply it appropriately to Vietnam. It is difficult to have a river basin organization with enough power like the River Basin Committee in French or Australian. Therefore, empowering this organization and how it should work should be carefully studied through the construction of the Vu Gia - Thu Bon river basin organization model. The main function in the experiment is to collect information and support the Department of Water Resource Management to perform the function of "supervision" activities of exploiting and utilizing water and discharging waste water in the basin; so that the obtained experiences can be apply to other river basins. This period needs to be done at least in

4 years, including administrative procedures to establish the River Basin Committee, develop regulations and plans for the activities of the River Basin Committee, and establish the integrated river basin planning.

Phase of 2025 - 2030: establishing some priority river basin organizations and supporting the Department of Water Resource Management to successfully test the function of "supervision": After withdrawing the experience of Vu Gia - Thu Bon River Basin Committee, the establishment of other River Basin Committees is prioritized for important river basins such as the Red - Thai Binh river basin, the Cuu Long river basin, and the Sre San - Sre Pok river basin and Dong Nai river basin. The development of integrated river basin planning for large and complex basins will take more time and in its' process of operation, it is necessary to establish additional sub-river basin committees, the planning function only belongs to the National Center for Investigation and Water Resource Planning, so this period requires a very sophisticated combination of activities and agencies inside and outside the Ministry of Natural Resources and Environment. The River Basin Committee at that time will support the Department of State Management in addition to the following "monitoring" function, which will expand the function of "sanctioning" activities of small-scale water exploitation and discharge in the basin and possibly add other functions authorized by the Department of State Management. So, this period must be at least 5-6 years before it can be implemented.

Period after 2030: the period of establishing and operating the remaining River Basin Committees and perfecting the functions of each River Basin Committee to the IWRM of the river basin. *Promoting the application of economic instruments in IWRM, promote the participation of the private and public sector in the management of water resources*. Completing and supplementing policies to support water governance. Among the approximately 16 major river basins, one can consider the establishment of River Basin Committees of the Ba, Mã, Cả, Trà Khúc-Vệ-Trà Bồng, Kone-Hà Thanh, Bằng giang – Kỳ Cùng. Depending on the river basin, the operation regulation can be adjusted accordingly

Proposing activities and implementing organization**:**

Summary of activities and implementing agencies, coordinating agencies in the Table 1.

Table 1: Proposal activities for IWRM

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
I		***Development of strategies and policies***		
1	P.01	01 Development of national strategy on water resources	WRMD	Institute of Strategy and Policy on Natural Resources and Environment MONRE
2	P.02	02. Revision of Circular No. 42 on planning integrated river basin management	NAWAPI	WRMD, Experts
3	P.07	07. Modification of 05 rules for inter-reservoir operation	WRMD	Vietnam Meteorological and Hydrology Administration
4	P.04	04. Development of Circular on guideline on development of master planning of national water resources	WRMD	Experts
5	P.03	03. Development of circular on	NAWAPI	WRMD, MOF

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
		norm for planning development		
6	P.06	06. Revision of circular No. 65 on minimum flow	WRMD	Vietnam Meteorological and Hydrology Administration, MARD, Experts
7	P.13	13. MONRE coordinates with MPI to develop national strategy investment for water sector.	WRMD	MPI, Institute of Strategy and Policy on Natural Resources and Environment, MONRE
8	P.10	10. Ministry of Agriculture and Rural Development coordinates with the Ministry of Natural Resources and Environment and the local government to apply disaster management method based on community	MARD	MONRE
9	P.14	14. Policy development "mobilization private sector for participating water service"	WRMD	MARD, MOIT, MOC
10	P.12	12. MARD and MOIT control craft village pollution	MARD	MOIT, VEA – MONRE
11	P.11	11. Completing the land use policy to manage urban and rural development associated with water supply and water discharge	General Department of Land - MONRE	WRMD. MOC, VEA, MARD
12	P.08	08. Determining the limitation of surface water exploitation of river basin, underground water in some priority acquirers	NAWAPI	WRMD
12	P.09	09. Assessing risk of degradation of surface water source of Red river, Dong Nai river and Cau river.	WRMD	Institute of Water Resources Science
14	P.05	05. Development of a circular guiding the recovery of degraded surface water and aquifers	NAWAPI	Institute of Water Resources Science
15	P.16	16. Policy development "The original river"	WRMD	Institute of Water Resources Science, University of Natural Resources
16	P.15	15. Development of policies "Priority / capital support for wastewater treatment"	VEA	WRMD, MOF, MPI
II		***Finalization legal document***		
17	L.17	Revision of Law on water	WRMD- LWR	WRMD, VEA, Experts

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
		resource, Law on environment protection, and Law on irrigation and continuous finalization of legal document as required	VEP – LEP	
III		***Development and finalization of institutional framework***		
18	I.18	18. Research for determining appropriate institutional model for priority river basins	WRMD	Ministry of Home Affairs, Experts
19	I.22	22. Improving the upgrade of the Vietnam Mekong Committee (including Cuu Long river basin committee, and Sê San-Sre Pok river basin committee)	Vietnam MeKong Committee (VNMC)	Ministry of Home Affairs, WRMD, PPCs in river basin
20	I.19	19. Integrated river basin management model pilot for Vu Gia - Thu Bon river basin: - Integrated river basin management; -Development of river basin management plan -Development of integrated coastal zone management master -Development of water resources monitoring system; - Establishment of trial RBO - Development of action plan for RBO -Inspection, monitoring water resources - Experience	WRMD	NAWAPI; Vietnam Meteorological and Hydrology Administration, Institute of Water Resources Science, University of Natural Resources & Environment
21	I.23	23. Establishment of Hong-Thai Binh RBO, Development of operation regulation and action plan for Hong-Thai Binh RBO	WRMD	Ministry of Home Affairs, 23 PPCs in river basin
22	I.24	24. Establishment of Dong Nai RBO, Development of operation regulation and action plan for Dong Nai RBO	WRMD	Ministry of Home Affairs, 6 PPCs in river basin
23	I.25	25. Establishment of other RBOs, Development of operation regulation and action plan for other RBOs	WRMD	Ministry of Home Affairs, PPCs in river basin
24	I.20	20. Strengthening institutions for water service provision, private participation	WRMD	Ministry of Home Affairs, Experts
25	I.21	21. Developing and applying the	Institute of	WRMD, MOIT, MARD

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
		policy of transferring infrastructure for private participation in management, prioritizing small-scale irrigation infrastructure	Strategy and Policy on Natural Resources and Environment	
IV		***Strengthening capacity***		
26	C.26	26. Strengthening executive and enforcement capacity, especially operating the water environment through training, training, and learning of developed countries	WRMD, RBO, DONRE	
27	C.27	27. Strengthening the inspection, checking and resolutely handling violations for the operation of flood reduction for downstream, regulating water in the dry season, ensuring to maintain the minimum flow of lakes in the process of inter-reservoirs	WRMD, MONRE - Inspection Department	
28	C.28	28. Strengthening capacity of water resources management and technical management training at all levels including strengthening the capacity of RBO Vu Gia - Thu Bon CPVS and other RBOs	WRMD, RBO (typical Vu Gia-Thu Bon RBC) and established RBOs	
V		***Application of IWRM tools***		
29	T.29	29. Development of master Plan of integrated river basin management for water resources survey to 2030, vision to 2050	WRMD	NAWAPI
30	T.31	31. Piloting integrated river basin management development for Vu Gia - Thu Bon river basin: - Water resources allocation - Protect water resources - Prevention of harm caused by water - Institutional activities - Develop a support framework for DSS decision making - Activities of monitoring digital architectures, discharging waste water into water sources - Development of river basin	NAWAPI	WRMD

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
		management plan for Vu Gia – Thu Bon		
31	T.30	30. Development of water management indicators	WRMD	Institute of Water Resources Science
32	T.34	34. Development of the master planning of national water resources	WRMD	MARD, MOC, MOIT
33	T.36	36. Development of a project to strengthen national water security measures in the context of climate change	WRMD	Vietnam Meteorological and Hydrology administration, experts
34	T.39	39. Research on the protection of underground water in large urban areas	NAWAPI	WRMD, MOC
35	T.37	37. Development of a monitoring system for water quality activities; discharge of wastewater into water sources; Inter-reservoir operation - Pilot application for Vu Gia - Thu Bon river basin	WRMD	Vietnam Meteorological and Hydrology administration, Experts
36	T.35	35. The Master planning of integrated river basin management for coastal zone, pilot Vu Gia – Thu Bon river basin	NAWAPI	Institute of Water Resources Science University of Natural Resources
37	T.44	44.Development of the master planning of integrated river basin management for the Cuu Long river basin	NAWAPI	VNMC, Vietnam Meteorological and Hydrology Administration, Experts, MARD, local government
38	T.45	45. Development of the river basin plan management for Cuu Long river basin	WRMD	RBO, VNMC, Ministries and local governments
39	T.46	46. Development of the master planning of integrated river basin management for Sê San – Sre Pok river basin	NAWAPI	VNMC, EVN, Vietnam Meteorological and Hydrology administration Experts, MARD, local government
40	T.47	47. Development of the river basin plan management for Sê San – Sre Pok river basin	WRMD	RBO, VNMC, EVN, Ministries, local governments
41	T.42	42. Development of the master planning of integrated river basin management for the Red River - Thai Binh river basin	NAWAPI	MARD, EVN, ROB, local governments

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
42	T.43	43. Development of the river basin plan management for the Red River - Thai Binh river basin	WRMD	MARD, MOIT, EVN, MOC, RBO, local governments
43	T.48	48. Development of the master planning of integrated river basin management for the Dong Nai river basin	NAWAPI	MARD, MOIT, EVN, MOC, RBO, local governments
44	T.49	49. Development of the river basin plan management for the Dong Nai river basin	WRMD	MARD, EVN, MOC, RBO, local governments
45	T.50	50. Development of the master planning of integrated river basin management for the other river basins	NAWAPI	MARD, MOIT, EVN, MOC, RBO, local governments
46	T.51	51. Development of the river basin plan management for the remaining river basins	WRMD	MARD, MOIT, EVN, MOC, RBO, local governments
47	T.32	32. Assessment of the application of water prices and adjust water prices to match the new context	WRMD	MOF, related Ministries and Sectors
48	T.40	40. Research for development of Pollution Charge framework	VEA	WRMD, MOF
49	T.33	33. Pollution Charge research for Vu Gia - Thu Bon river basin	VEA	WRMD, MOF, RBO, Local governments
Note: P: Policy I: Institutional L: Law C: Capacity Building T: Management Tools				

Proposed Roadmap

Roadmap for IWRM is proposed in 3 phases in Table 2, 3 and 4.

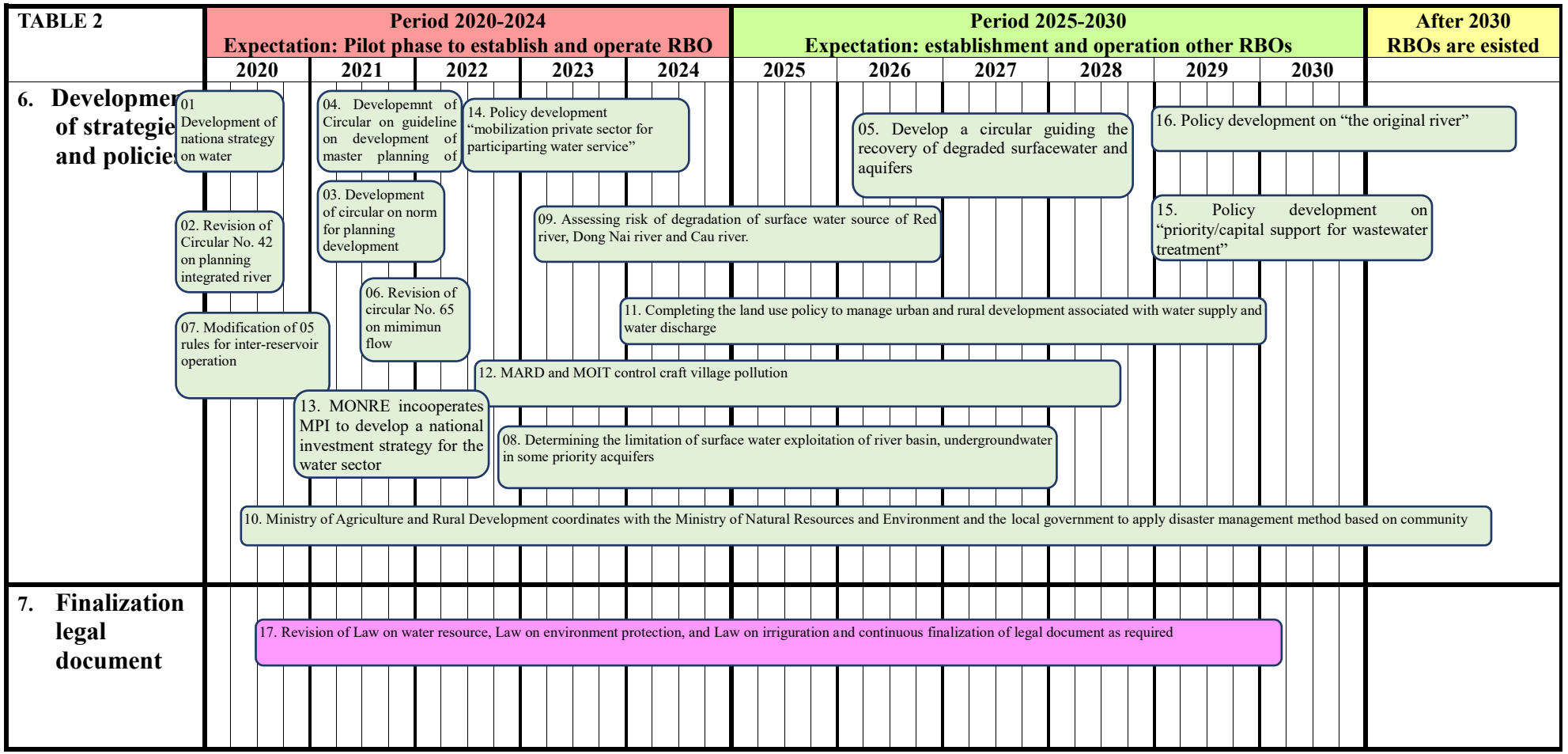
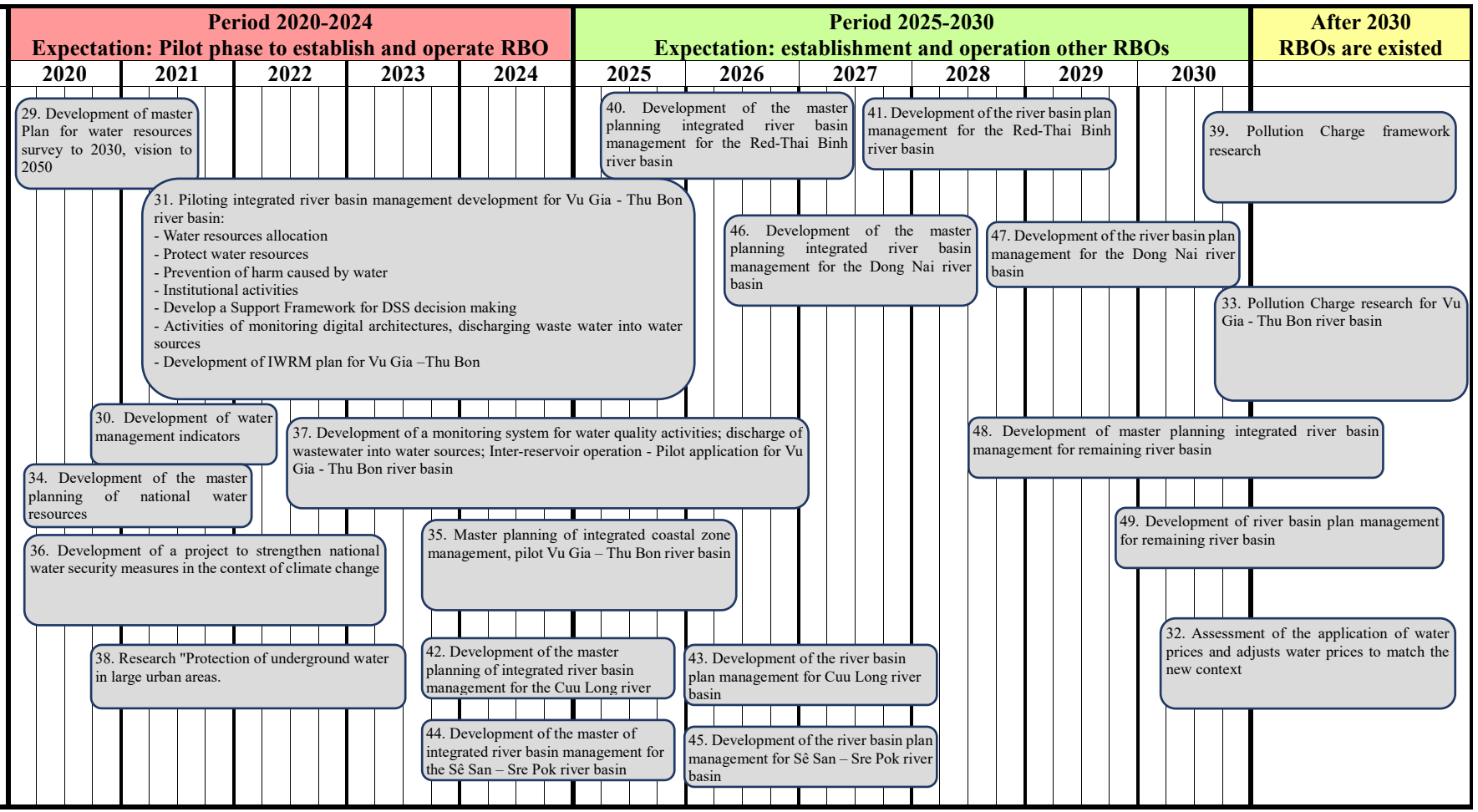


TABLE 2
Period 2020-2024
Expectation: Pilot phase to establish and operate RBO
Period 2025-2030
Expectation: establishment and operation other RBOs
After 2030
RBOs are esisted
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
6. Developmer of strategie and policie
7. Finalization legal document
01 Development of nationa strategy on water
04. Developemnt of Circular on guideline on development of master planning of
14. Policy development "mobilization private sector for participarting water service"
05. Develop a circular guiding the recovery of degraded surfacewater and aquifers
16. Policy development on "the original river"
03. Development of circular on norm for planning development
02. Revision of Circular No. 42 on planning integrated river
09. Assessing risk of degradation of surface water source of Red river, Dong Nai river and Cau river.
15. Policy development on "priority/capital support for wastewater treatment"
06. Revision of circular No. 65 on mimimun flow
11. Completing the land use policy to manage urban and rural development associated with water supply and water discharge
07. Modification of 05 rules for inter-reservoir operation
12. MARD and MOIT control craft village pollution
13. MONRE incooperates MPI to develop a national investment strategy for the water sector
08. Determining the limitation of surface water exploitation of river basin, undergroundwater in some priority acquifers
10. Ministry of Agriculture and Rural Development coordinates with the Ministry of Natural Resources and Environment and the local government to apply disaster management method based on community
17. Revision of Law on water resource, Law on environment protection, and Law on irriguration and continuous finalization of legal document as required

TABLE 3	Period 2020-2024 Expectation: Pilot phase to establish and operate RBO					Period 2025-2030 Expectation: establishment and operation other RBOs						After 2030 RBOs are existed
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
8. Development and finalization of institutional framework	18. Research for determining appropriate institutional model for priority river basins	19. IWRM model pilot for Vu Gia - Thu Bon river basin: - Integrated river basin management; - Development of river basin management plan - Development of integrated coastal zone management master - Development of water resources monitoring system; - Establishment of trial RBO - Development of action plan for RBO - Inspection, monitoring water resources - Experience				23. Establishment of Hong-Thai Binh RBO, Development of operation regulation and action plan for Hong-Thai Binh RBO	24. Establishment of Dong Nai RBO, Development of operation regulation and action plan for Dong Nai RBO		25. Establishment of other RBOs, Development of operation regulation and action plan for other RBOs			
	22. Improving the upgrade of the Vietnam Mekong Committee (including Cuu Long river basin committee, and Sê San-Sre Pok river basin committee)					20. Strengthening institutions for water service provision, private participation						
						21. Developing and applying the policy of transferring infrastructure for private participation in management, prioritizing small-scale irrigation infrastructure						
9. Strengthening capacity	26. Strengthening executive and enforcement capacity, especially operating the water environment through training, training, and learning of developed countries											
	27. Strengthening the inspection, checking and resolutely handling violations for the operation of flood reduction for downstream, regulating water in the dry season, ensuring to maintain the minimum flow of lakes in the process of inter-reservoirs											
	28. Strengthening capacity of water resources management and technical management training at all levels including strengthening the capacity of RBO Vu Gia - Thu Bon RBO and other RBOs											

TABLE 4


Period 2020-2024
Expectation: Pilot phase to establish and operate RBO
Period 2025-2030
Expectation: establishment and operation other RBOs
After 2030
RBOs are existed
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
10. Application of IWRM tools
29. Development of master Plan for water resources survey to 2030, vision to 2050
40. Development of the master planning integrated river basin management for the Red-Thai Binh river basin
41. Development of the river basin plan management for the Red-Thai Binh river basin
39. Pollution Charge framework research
31. Piloting integrated river basin management development for Vu Gia - Thu Bon river basin:
- Water resources allocation
- Protect water resources
- Prevention of harm caused by water
- Institutional activities
- Develop a Support Framework for DSS decision making
- Activities of monitoring digital architectures, discharging waste water into water sources
- Development of IWRM plan for Vu Gia –Thu Bon
46. Development of the master planning integrated river basin management for the Dong Nai river basin
47. Development of the river basin plan management for the Dong Nai river basin
33. Pollution Charge research for Vu Gia - Thu Bon river basin
30. Development of water management indicators
37. Development of a monitoring system for water quality activities; discharge of wastewater into water sources; Inter-reservoir operation - Pilot application for Vu Gia - Thu Bon river basin
48. Development of master planning integrated river basin management for remaining river basin
34. Development of the master planning of national water resources
49. Development of river basin plan management for remaining river basin
35. Master planning of integrated coastal zone management, pilot Vu Gia – Thu Bon river basin
36. Development of a project to strengthen national water security measures in the context of climate change
32. Assessment of the application of water prices and adjusts water prices to match the new context
38. Research "Protection of underground water in large urban areas.
42. Development of the master planning of integrated river basin management for the Cuu Long river
43. Development of the river basin plan management for Cuu Long river basin
44. Development of the master of integrated river basin management for the Sê San – Sre Pok river basin
45. Development of the river basin plan management for Sê San – Sre Pok river basin

Chapter 1. Introduction of integrated water resource management

1.1. General Concept of integrated water resource management (IWRM)

1.1.1. What is IWRM?

The world's freshwater resources are under increasing pressure. Growth in population, increased economic activity and improved standards of living lead to increased competition for and conflicts over the limited freshwater resource. In addition, the lack of pollution control measures further degrades water resources.

Growing demand for drinking water will put a strain on existing sources as urbanization rates increase and land cover changes. Feeding a planet of 8 billion people by 2030 will require that more food is produced with less water by enhancing water efficiency in agriculture. Demand for energy will more than double in developing countries in the next 25 years, and hydropower will need to be a key contributor to clean energy production. Adding uncertainty, climate change will increase the complexity of managing these often-competing demands.

IWRM is a management approach that views water resources and human activities relating to water in the context of the whole ecosystem. It aims to optimize natural water flows, including surface water and groundwater so that human needs can be satisfied without compromising the sustainability of ecosystems. Therefore, planning and management have to consider all sectors that might affect the ecosystem. Human activities should focus on the sustainable use and protection of resources.

Water quality degradation like pollution and usage conflicts do not stop at national borders. Therefore, management entities must follow hydrological rather than political boundaries. These problems call for all stakeholders and affected groups to participate so that they can share their economic and social interests.

Nowadays, IWRM is more than just a compilation of abstract principles; it is a worldwide agenda for reforming the water sector in many countries. However, IWRM implementation strategies vary depending on national circumstances. These reform processes are still in their infancy. Success stories are thus inevitably sporadic, while the change processes that they have triggered are much broader and their impacts will be visible only in the future.

1.1.2. The concept of Integrated water resource management

General principles, approaches and guidelines relevant to IWRM are numerous and each have their areas of appropriate application. The Dublin principles are a particularly useful set of such principles. They have been carefully formulated through an international consultative process culminating in the International Conference on Water and the Environment in Dublin, 1992.

The Dublin principle[1] stated as follows in first paragraph. "Scarcity and misuse of fresh water pose a serious and growing threat to sustainable development and protection of the environment. Human health and welfare, food security, industrial development and the ecosystems on which they depend, are all at risk, unless water and land resources are managed more effectively in the present decade and beyond than they have been in the past".

The Dublin principles significantly contributed to the Agenda 21 recommendations adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, 1992. Since then, these principles (referred to as the Dublin-Rio principles) have found universal support amongst the international community as the guiding principles underpinning IWRM. More recently, they have been restated and elaborated at major international water conferences in Harare and Paris, 1998, and by the UN Commission on Sustainable Commission (CSD) at its "Rio +5" follow-up meeting in 1998

[1] http://un-documents.net/h2o-dub.htm

The four principles are set.

1) Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
2) Water development and management should be based on a participatory approach, involving users, planners and policymakers at all levels.
3) Women play a central part in the provision, management and safeguarding of water.
4) Water has an economic value in all its competing uses and should be recognized as an economic goods.

IWRM needs a holistic approach to management, recognizing all the characteristics of the hydrological cycle and its interaction with other natural resources and ecosystems. The statement also recognizes that water is required for many different purposes, functions and services; holistic management, therefore, has to involve consideration of the demands placed on the resource and the threats to it.

Moreover, human beings can clearly affect the productivity of the water resource. They can reduce the availability and quality of water by actions, such as mining of groundwater, polluting surface- groundwater, and changing land use (afforestation, deforestation, urbanization) which alter flow regimes within surface water systems. The effects of human activities lead to the need for recognition of the linkages between upstream and downstream users of water. Upstream users must recognize the legitimate demands of downstream users to share the available water resources and sustain usability.

Water is a subject in which everyone is a stakeholder. Real participation only takes place when stakeholders are part of the decision-making process. This can occur directly when local communities come together to make water supply, management and use choices. These participants approach only can achieve consensus. However, for this to occur, stakeholders and officials from water management agencies have to recognize that the sustainability of the resource is a common problem and that all parties are going to have to sacrifice some desires for the common good. Participation is about taking responsibility, recognizing the effect of sectoral actions on other water users and aquatic ecosystems and accepting the need for change to improve the efficiency of water use and allow the sustainable development of the resource.

To create participatory mechanisms and capacity, Governments at national, regional and local levels have the responsibility for making participation possible. This involves the creation of mechanisms for stakeholder consultation at all spatial scales; such as national, basin or aquifer, catchment and community levels.

Water has a value as an economic good. Many past failures in water resources management are attributable to the fact that water has been – and is still – viewed as a free good, or at least that the full value of water has not been recognized. In a situation of competition for scarce water resources such, a notion may lead to water being allocated to low-value uses and provides no incentives to treat water as a limited asset. In order to extract the maximum benefits from the available.

IWRM, a holistic institutional approach is key and required. Holistic management not only involves the management of natural systems; it also necessitates coordination between the range of human activities that create the demands for water, determine land uses and generate water-borne waste products. Creating a water sensitive political economy requires coordinated policy-making at all levels (from national ministries to local government or community-based institutions). There is also a need for mechanisms which ensure that economic sector decision makers take water costs and sustainability into account when making production and consumption choices. The development of an institutional framework capable of integrating human systems – economic, social and political – represents a considerable challenge.

1.1.3. Definition of IWRM

In this document, IWRM is defined as follows.

"IWRM is a process that promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems"[2].

1.1.4. The necessity of IWRM in Vietnam

The exploitation and use of water resources and other natural resources in river basins in Vietnam has been contributing significantly to the socio-economic development of the country. However, river basin management is facing many challenges such as the demand for water resources during some dry months, water use and exploitation infrastructure development, inefficient use of water resulting in water loss in urban areas, severe water flow degradation in downstream areas, increased salinity intrusion and impact on access to water resources of people living in the downstream areas and so on.

Nowadays, water use pressure extremely increased for supply water and industrial water due to the economic development. Lifestyle change also affect the consumption amount of water. In this situation, IWRM is quite important concept for the water resource management in Vietnam.

In fact, Viet Nam has started to shift towards Integrated Water Resource Management (IWRM) when the Law on Water Resources was enacted in 1998. As this law revealed many weaknesses, and for example, did not regulate key aspects of water resource management, such as the protection of water resources, it was revised in 2012 to meet Viet Nam's new development policies and to be in line with the global development context.

A dedication towards IWRM is also reflected in the Approval of the National Strategy on Water Resources to 2020 (Decision 81/2006/QD-TTg) which states that "water resource management must be implemented in an integrated manner on a river basin basis'. However, water resources are still mostly managed within the boundary of individual sectors and provinces; as opposed to an integrated river basin management system. Viet Nam has officially established the Mekong River Basin Committee as part of the Mekong River Commission. From 2016, the government and relevant ministries have discussed the establishment of another six major river basin management committees (River Basin Organization).

1.1.5. Actors and Subjects of IWRM

Effective management is a necessity, since IWRM should involve a range of actors who reflect the complexity of the government system and the relationships between water, land and other resources. It is said that the biggest challenge in IWRM implementation is the integration of the different but related considerations to reach the project's ultimate goal. Various projects focus on different aspects of integration. Some studies attempt to integrate water resource management with resource extraction and conservation, while others concentrate on integrating technology, social factors and cultural factors with natural and ecological conservation for better watershed management.

The management of water systems, such as environmental improvement and stakeholder collaboration conflicting with regulatory reform. Meanwhile, regional watershed management confronts a complex web of challenges that involve a diversity of stakeholders. IWRM practice highlights the important role of local stakeholders, such as villagers, farmers, local communities and authorities, while acknowledging the supporting roles of outside actors, specifically the private sector, state authorities, academia, NGOs and donors. Each stakeholder's function and responsibility is reported as Table 1-1[3]

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[2] 2000 Integrated Water Resources Management Global Water

[3] "Integrated Approaches to Water Resource and Solid Waste Management for Sustainable Development",

Table 1-1. Actors and subjects of integration involved in IWRM

Watershed scale	Internal actors	External factors	Subjects of integration
Local	communities, villagers, farmers, fishermen, government, city authorities, private entities, enterprises, academia	provincial authorities, state authorities	water resource abstraction (water supply, hydropower generation), quality management, flood control, climate change resilience
Regional	communities, NGOs, associations (fishermen, farmers)	government policy planners, researchers, international NGOs, national donors and the private sector, federal/state government	river basin, regional watershed and floodplain management: resource management, livelihood improvement, economic growth, biodiversity conservation
International	country-level representatives (authorities, policy makers, researchers, practitioners)	political and nonpolitical Nile River Commission	water quality, water delivery, water use

As shown in this table, a lot of stakeholder and actors' participation are required for IWRM. It means that development policy, institutional development and implementation capacity are also necessary. For applying IWRM to water management in Vietnam, we analyze actual situation and develop one Road Map in this document.

1.2. The development history to the IWRM in Japan

1.2.1. The history of the water resource management in Japan

Japan's average annual precipitation is 1,690 mm which is about twice the world average (810mm). On the other hand, Japan's potential water resources per capita is 3,200mm3 per year, less than half the world average, which is about 8,400mm3. Recently, the gap in rainfall between years of low precipitation and high precipitation has been expanding and there is a tendency for potential water resources to decrease in years of drought.

Because of the location in the Asia Monsoon zone, rainfall is concentrated in rainy and typhoon seasons, so that a significant portion of potential water resources is discharged into the sea without being used. In addition, Japan has a mountainous topography with steep slopes and its rivers are short and flow rapidly out to sea. There are such difficulties to store water efficiently in Japan that various and historical measures have been taken to use water effectively.

The history of water resource management in Japan is divided into four major periods.

1. Water Use for Stable Food Production - from Ancient Times to the 17th Century
2. Building the Modern Economy - from 19th through mid-20th Century

3. Important Role for Water in Socioeconomic Development-High-Level Economic Growth and after Period in 20th Century
4. New age of water resource management in Post-modern society – From 21th Century

The details in each period are as follows:

1) Water Use for Stable Food Production — from Ancient Times to the 17th Century

Water use in Japan has developed over the centuries to ensure a food security mainly by rice cropping. The introduction of paddy agriculture also meant the beginning of the construction of irrigation ponds. Small and medium-size rivers began to be used for irrigation as the manorial system expanded and rice production increased under the management of feudal lords. Further advances were made in irrigation and flood control in the 17th century, as paddy fields were cultivated on the alluvial plains of the Kanto area. Flood prevention works were undertaken along large rivers, including the Tone River. Channels for domestic water such as the Kanda Waterworks and Tamagawa Waterworks were later built to meet demand for water in Tokyo and other large cities.

2) Building the Modern Economy ― from 19th through mid-20th Century

The beginning of modern foreign trade and internationalization in the 19th century spurred the development of new industries in Japan. The rise of heavy industry, including chemical industries, triggered a rapid rise in demand for industrial water. Also, modern water supply and sewerage systems were installed to cope with population growth in urban areas and prevent epidemics of cholera and plague in urban areas such as Yokohama. Hydroelectric power generation projects were promoted in the course of urbanization and industrialization.

3) Important Role for Water in Socioeconomic Development-High-Level Economic Growth and after Period in 20th Century

In response to the steady rise in demand for domestic water, industrial water and agricultural water triggered by rapid economic development and population growth, Japan embarked on comprehensive development of water resources. This included building multipurpose dams to secure stable water supplies. In the 1960's a legislation for water resources development was enacted, including dam construction, provision of water for each purpose and prevention of ground subsidence. Water demand in Japan dramatically increased due to the remarkable industrial development. The rapid increase in the urban population and the improving living standards during the high economic growth period that started in the late 1950s. The Water Resources Development Promotion Law was enacted in 1961. It designates river systems in need of broad-based water supply measures with due consideration given to industrial development and population growth in urban areas. Along with this, a basic plan for water resources development (“Full Plan”) was formulated as an integrated water supply plan for the designated river systems. Japan embarked on comprehensive development of water resources. This included building multipurpose dams to secure stable water supplies. From the 1970s, another legislation on development in water resources areas, water quality and environmental conservation, were enacted.

The rise of heavy industry, including chemical industries, triggered a rapid rise in demand for industrial water. In addition, modern water supply and sewerage systems were installed to cope with population growth in urban areas and prevent epidemics of cholera and plague in urban areas. Hydroelectric power generation projects were promoted in the course of urbanization and industrialization.

4) New age of water resource management in Post-modern society – In 21th Century

Until recently, Japan’s population has steadily increased along with rising nominal and per capita GDP until the mid1980s. However, now that population has started to decrease and is expected to continue to decrease. It is important to maintain the quality of life without reducing the scale of the economy. The past water resources policy was based on the need to

secure a stable supply of water. The country has built water supply facilities such as dams, intakes, and canals to meet increasing water demand. Nowadays, a stable water supply is possible except for a few areas. The basic need has shifted from building facilities to their management.

They are also facing new challenges such as climate change and problems related to aging facilities that could affect supply capabilities. Therefore, Japan's aim is to provide management that will meet demand even when faced with problems related to climate change, aging facilities and the need to respond to natural disasters. In this situation, the challenge will be to develop highly integrated water resources management.

They are implementing IWRM for moving toward integrated management of the quantity and quality of water used, the conservation and utilization of groundwater, and the conservation of river basins. This effort is utilization maintenance updating designed for more effective water utilization, efficient operation and maintenance, updating, and renewal of facilities at the river basin level in a comprehensive as unified manner.

1.2.2. Management system in Japan

(1) Backgrounds

The use status of water resources is indicated by the classification of water use type. The total amount of water used in the country in 2015 (based on water intake) is about 79.9 billion m3 / year in total, and it is the city which is the total of domestic water and industrial water by application About 25.9 billion m3 / year of irrigation water and about 54 billion m3 / year of agricultural water. About the amount of city water consumption shown with freshwater supply, quantity of industrial water (but targeted establishment of 30 or more employees.) and domestic water (but targeted at water intake of water supply business and water supply business). It has been on an increase since 1965, but in recent years it has been on a gradual decline from a nearly flat trend reflecting the social and economic conditions.

In Japan, the national government is responsible for formulating and implementing water resources policies at the national level. It formulates river basin management, an overall plan of water resources development and environmental conservation.

The river basin management is managed by the Ministry of Land, Infrastructure and Transport. Moreover, the river law is only one regulation for managing rivers in Japan.

The Comprehensive National Water Resources Plan is the national basic plan for water resources development under which dams and water systems are developed. The Basic Environment Plan clarifies long-term and comprehensive environmental policies related to water quality and quantity, including water conservation.

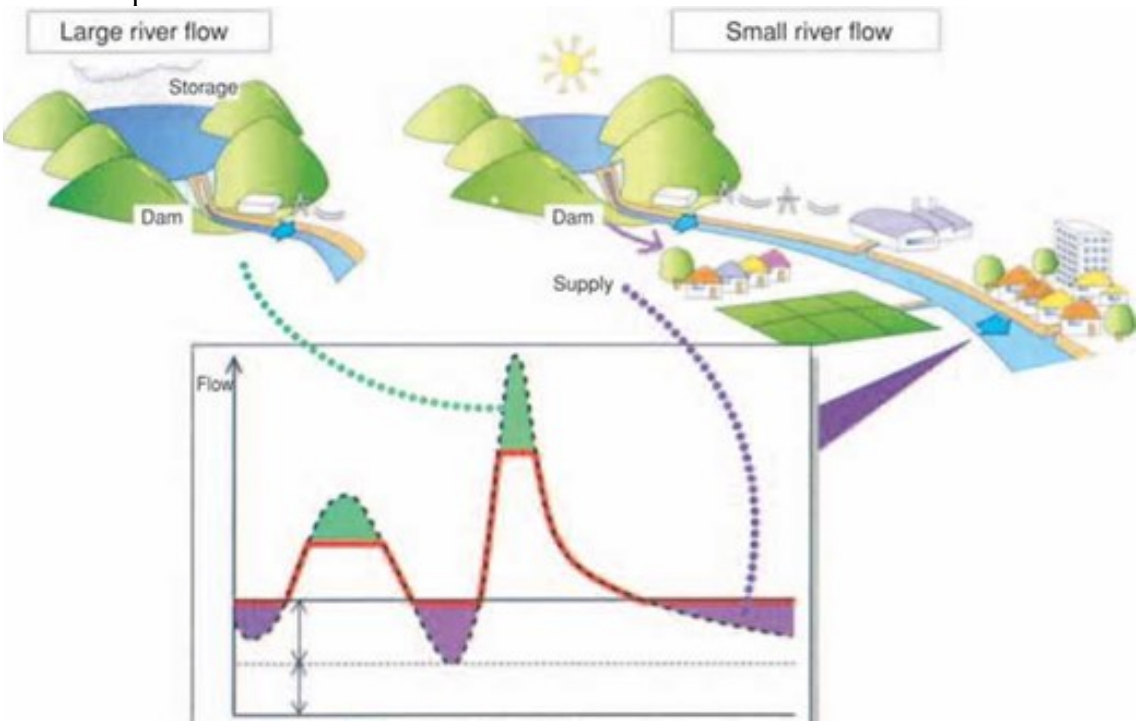
Column-1 Mechanism of water resources development

Let us assume the river flow at a point where the water intake is planned. In a natural state without a dam, the river flow is large in rainy and typhoon seasons as shown with broken lines in the figure, but it decreases in other seasons. If intake of a constant amount of water is to be attempted throughout the year, only the water amount equivalent to A can be taken.

Accordingly, a dam is constructed to store water (the green portion in the figure) when the river flow is large during rainy and typhoon seasons and to discharge water to replenish river water when the river flow is small (the blue portion in the figure). The water flow fluctuates as indicated by the red line, enabling an intake up to A + B throughout the year.

The water volume indicated by B in the figure, which is the amount newly available, is sometimes called the "developed water amount" of the dam.

The following facilities will be developed as water resources development facilities to enable utilization of the new water amount. Channels are also constructed to direct water from the river to points of water utilization, such as agricultural land and drinking water treatment plants.



Brief descriptions on the river administration system and both plans (Water Plan and Basic Environment Plan) are summarized below.

(2) The river administration system

The river administration system has been revised several times since the enactment of the so-called "Old River Law" in 1896. Under the "new River Law" enacted in 1964, the institutional framework for flood control and water use was improved systematically by, for example, introducing an integrated river system management system. The River Law of 1964, therefore, has played an important role in forming river administration today.

However, as the economic and social conditions have changed in the subsequent years, the conditions surrounding the river administration system have changed dramatically. Today, Projects are expected not only to perform flood control and water use functions but also to

provide an attractive waterside space and habitat for diverse plants and animals. There is also a growing demand for creative efforts to make effective use of rivers as an important component of the regional climate, landscape, and culture.

In addition, in keeping pace with the improvement of socioeconomic status and lifestyles, social impact of drought has become much more serious than before, and there is a pressing need for measures to ensure a smooth coordination of water use during periods of drought. In view of these changes, in December 1996 the River Council made "recommendations on the reform of the river administration system for meeting the change of social and economic needs." The River Law was amended on June 5, 1997.

The history of the river basin management in Japan

1890: Birth of modern river management system; flood management

1964: Establishment of systems for systematic flood management and water utilization
Flood management + Water utilization
Introduction of integrated management system for river systems
Establishment of water utilization rules and regulations

1997: Establishment of integrated river management system
Flood management + Water utilization + Environmental conservation
Improvement and conservation of river environment
Introduction of a system for river planning reflecting the opinions of local

(3) The Comprehensive National Water Resources Plan (the Water Plan)

The Water Plan, prepared by the Ministry of Land, Transport and Infrastructure, is formulated and revised in accordance with the Comprehensive National Development Plan, which is stipulated in the Comprehensive National Land Development Act and approved by the Prime Minister's cabinet. The Water Plan is a multi-year plan and addresses basic medium to long-term planning issues regarding water resources development, conservation and utilization, as well as makes forecasts of long-term water demand. The Ministry of Land, Transport and Infrastructure uses the Water Plan to formulate more detailed annual development plans and their related budgets.

The Water Plan 21 stresses the efficient utilization of existing water resources facilities rather than the development of new water resources. Nowadays, the contemporary water recycle is replaced to the Basic Plan on Water Cycle in 2015.

(4) The Basic Environment Plan

The Cabinet, under the Basic Environment Law, approves the Basic Environment Plan in December 1994. And In 2006, an outline of the revised Basic Environment Plan has been published, in which the government gives priority to 10 priority fields for implementation. Among the 10 priority fields mentioned in the new Basic Environmental Plan, the government plans to put efforts to secure an environmentally sound water cycle, more concerns on, conservation and sustainable use of the water environment including water quality, water quantity, aquatic life and waterside areas, and creation of a rich community through contact with accessible water environments.

- Formulation of a plan by regions that is consistent with water utilization and flood control
- Maintenance and improvement of storage penetration and recharge performance throughout all basins
- International dissemination of the efforts and contribution to solving the world's water problems.

1.2.3. Institutional system of water resource management in Japan

In Japan, the national government formulates and implements comprehensive policies such as those for water resources development, the administration of waterworks, and the protection of water quality. Five related ministries (Ministry of Land, Transport and

Infrastructure, Ministry of the Environment, Ministry of Health, Labor and Welfare, Ministry of Economy, Trade and Industry, Ministry of Agriculture, Forest and Fisheries) take charge of the various administrative areas, and cooperate with each other to formulate water-related policies.

The Ministry of the Environment primarily plans and formulates policies and guidelines relating to water conservation including the setting of Environmental Water Quality Standards and water pollution control measures (the Effluent Standard settings). Local governments. In general, local governments in Japan operate, maintain and manage domestic, industrial, and sewerage water utilities and related facilities.

Local government agencies also continuously monitor public water quality and supervise private entities to ensure that wastewater effluent standards are being met.

The Ministry of Land, Transport and Infrastructure uses the Water Plan to formulate more detailed *annual development plans* and their *related budgets*. The latest Water Plan, *Water Plan 21*, stresses the efficient utilization of existing water resources facilities rather than the development of new water resources. Given the recent trends in total water demand (essentially stable or with a slight decrease)

Japan has already developed enough facilities to ensure a stable water supply.

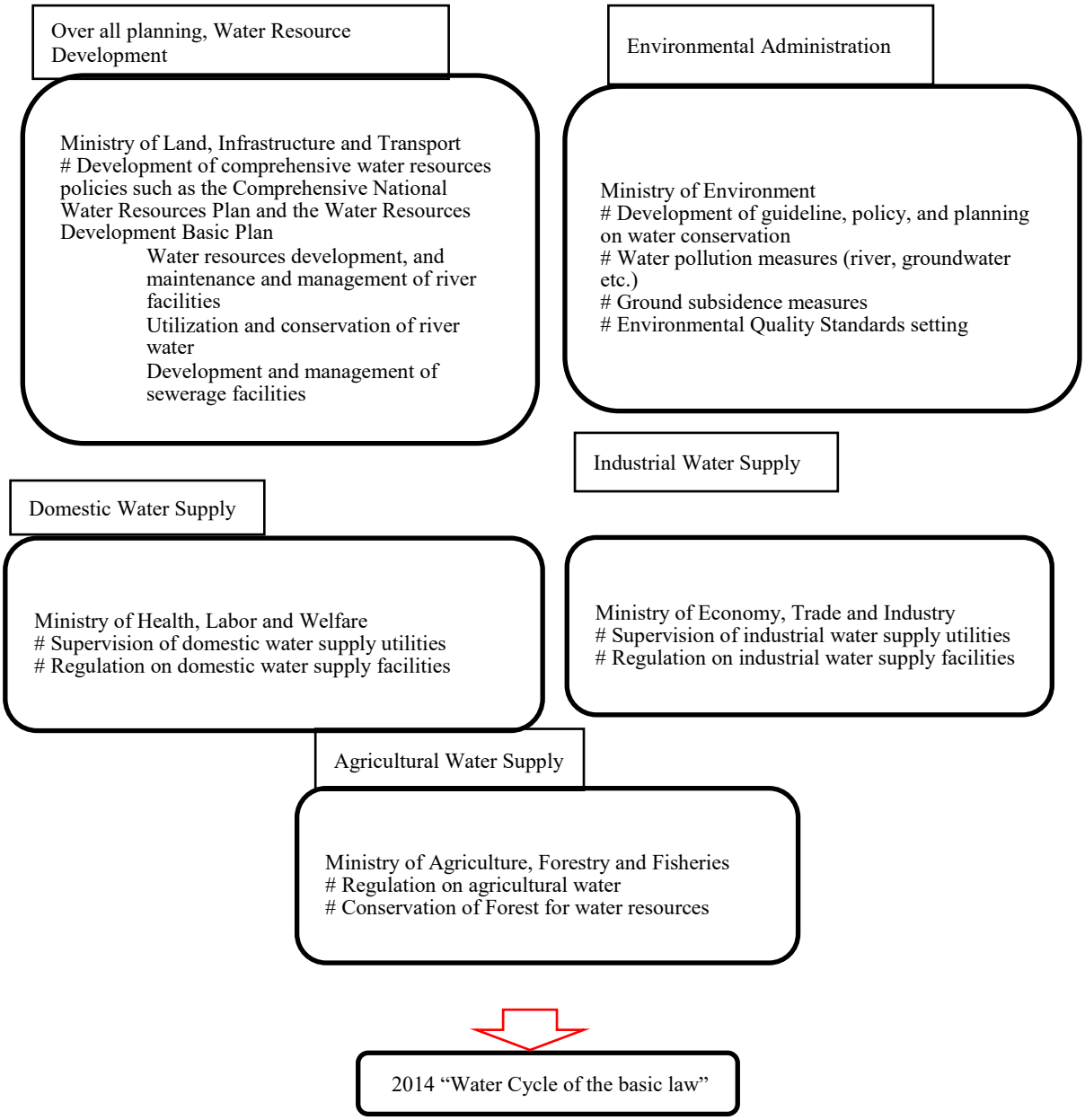


Figure 1-1 Government Organization and the role of Ministries.

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1.2.4. The Institutional framework for water resources

The management in Japan is divided into five broad areas:

(1) The overall planning of water resources development,
(2) The development of water-related facilities including the basis for subsidies,
(3) Water rights and water trading,
(4) Water Utilities,
(5) The conservation of the water environment.

1) The overall planning of water resources development

The Comprehensive National Land Development Law sets out the national plan that is the basis of the Comprehensive National Water Resources Plan (the Water Plan). Each year’s budget is formulated based on the Water Plan. The Water Resources Development Basic Plan (the Full Plan) stipulated by the Water Resources Development Promotion Law is also based on the Water Plan and implemented by the Japan Water Agency (JWA) as mandated by the

JWA law.

Nowadays, based on new law on basic water cycle, the Basic Plan on Water Cycle has been developed.

2) The development of water-related facilities including the basis for subsides

The national and local governments directly finance most new construction such as dams and sewerage waterworks. Relevant laws identify each of the areas subsidized by the national government.

Subsidies are classified depending on the relevant laws, cabinet orders, and municipal bylaws. These laws and cabinet orders stipulate the ratio of subsidies to total expenses that should be paid for by the national and local governments.

National and local governments cover most of the expenses for flood control and sewerage works, and operation, maintenance and management costs of existing facilities for flood control such as dams and waterworks are also covered by governments. On the other hand, the operational, maintenance and management (O & M) costs of water treatment facilities are usually borne by the users.

3) Water rights/water trading

Surface and ground water are managed differently. For surface water users, each public-owned water utility (for both domestic and industrial uses) and Land Improvement District (public entities for irrigation development and management) is allocated rights to river water, i.e. exclusive use of water in a certain region, according to the River Law. However, there is no comprehensive law regarding ground water, and users are free to withdraw ground water from wells on privately owned lands.

However, the Industrial Water Law and the Law for Ground Water Use in Buildings require permits from local governments before users can withdraw/ extract ground water in areas where serious land subsidence is a concern or where ground water resources are scarce.

In general, water trading of both domestic and industrial water is prohibited by the River Law. It is only allowed inside certain Land Improvement Districts.

Column-2 Water resource allocation: water rights/permits

The River Law stipulates a formal allocation procedure for rights to river water. The law defines river water as public property, and a certain amount of river water can be withdrawn for a defined use by obtaining a "water right" through specific administrative procedures. Under the River Law, water rights for major rivers have been allocated to various uses: agricultural, domestic, industrial water supply, and hydropower generation. On the other hand, there is no comprehensive law regarding ground water use. In general, there are no restrictions on withdrawing ground water, the ownership of which belongs to the landowner. However, ground water extraction has had a serious potential impact due to ground subsidence in urban areas such as the Tokyo and Osaka. To control this problem the Industrial Water Law and the Law for Ground Water Use in Buildings were enacted in 1956 and 1962 respectively.

These laws require permits from local governments in order to withdraw ground water in certain designated areas where land subsidence is an issue or where ground water resources are scarce.

Regulations allocating water rights (surface and ground water)

	Water rights		
Type of water use	Domestic Water	Industrial Water	Agricultural water
River Water	River Law		
Ground Water	Law for Ground Water Use in Buildings	Industrial water law	No regulation

4) Water Utilities

Water utilities are categorized by the main purpose each serves. These uses include domestic water supply, sewerage water treatment, agricultural water supply, and industrial water supply. Appropriate sectoral law regulates the operation and management of water utilities.

5) The conservation of the water environment

The basic principles of pollution control and nature conservation are stipulated in the Basic Environment Law. More detailed guidance is given in the Water Pollution Control Law.

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1.2.5. Financial system

The bulk of national expenditures are direct subsidies (transfers) to local governments and publicly owned water utilities for constructing new facilities. These transfers enable water utilities to maintain domestic water and sewerage water charges (user fees) at very low levels. Water users (the general public) benefit from these subsidies and can therefore afford to pay the user fees without getting into financial difficulties. These transfers, therefore, are actually subsidies to water users.

The National budget is primarily used for construction of flood control facilities and sewage treatment systems. For a number of reasons (excess capacity; environmental concerns; budget concerns) the construction of new dams has been reduced, except in the case of emergency disaster prevention facilities. About 40% of the water-related budget is spent on flood control investments such as the construction of dams, waterworks, and related facilities. Around 35% of the water-related budget is spent for sewerage treatment systems.

The national government covers expenses for a new construction and improvement of important civil engineering facilities related to rivers by the Local Finance Law. The River Law,

Water Supply Law, Sewerage Water Law, Industrial Water Supply Business Law, and the Land Improvement Law stipulate the ratio of subsidy of the state and the local government to total projects budget individually.

Column-3 Infrastructure development Subsidies and difficulties in Japan

In Japan, direct government subsidies have been the primary tool promoting the development of water resources. To date, Japan has developed an additional annual volume of 16.6 billion m3 of water resources by constructing new dams. The national and local governments pay most of the construction costs. Currently, about 55% of total water consumption for domestic and industrial use depends on these newly developed water resources. Water is allocated in a variety of ways. Local governments allocate river water rights for urban and industrial use to public water utilities in each region. Moreover, the Industrial Water Law and the Law for Ground Water Use in Buildings regulate ground water abstraction. These laws require permits from local governments to withdraw ground water in certain designated areas where serious land subsidence is a threat or where ground water resources are scarce.

Environmental Quality Standards, along with water quality monitoring systems and effluent regulations, have worked well to protect the overall quality of water resources. Various demand-control measures have also been implemented using both market-based instruments and regulations. For example, most public water utilities introduced incentive-based-pricing schemes such as increasing-block charges and differential user charges. As a result, water scarcity problems have decreased over time along with the gradual improvement of drinking water quality.

Recently, inefficient public investments and poor management of water utilities are challenging issues. The increasing repayment burden of public debt has created calls for more efficient management of water utilities. In order to address this issue, regulations and laws have been amended to enable private entities to participate in water utilities management, but the use of Private Financial Initiatives (PFI) and comprehensive contracts are still not common. Water trading for domestic and industrial water should also be examined as another way to increase the efficiency of water use and water resource management.

1.3. New age of the water resource government (start of the IWRM in Japan)

1.3.1. Backgrounds of the IWRM challenge in Japan

As it is described, at present the administration of water is segmented among different government organizations. Rivers and sewerage systems are under the jurisdiction of the land and infrastructure ministry; headwater areas in mountains under the Forestry Agency; agricultural water under the farm ministry; city tap water under the health and welfare ministry; and water for industrial use under the trade and industry ministry. This reflects the lack of a system for protecting the nation's water resources from the viewpoint of the water cycle.

The basic law calls for setting up a policy headquarters on water-related issues at the Cabinet level, which will be tasked to write a basic plan to keep the natural movement of water in smooth conditions. Policy coordination among the government bodies concerned is needed to work out a comprehensive policy to achieve the law's goal.

And in recent years, Japan has seen increasing purchases of forest land in headwater areas by foreign capital. This has raised alarms over the preservation of the nation's water resources, with concerns growing among local governments in those areas that public use of underground water beneath the purchased land could be blocked. According to the Forestry Agency, foreign capital bought up 800 hectares of forest land in 68 cases from 2006 to 2012, raising fears that spring sources and underground water in headwater areas could be controlled by these parties. The central government needs to go further and enact a law to provide a legal background for

local governments' attempt to prevent excessive pumping of ground water by private-sector businesses. Financial support for local government efforts to purchase private land in headwater areas should also be considered. There are many other issues that the central and local governments must jointly tackle in managing water resources. In urban areas, pavement prevents rain water from seeping into the ground, disrupting the water cycle. Efforts to recycle rain water for flushing toilets or watering plants have so far been left in the hands of municipalities or commissioned businesses. The basic law calls for a unified approach for preservation of the water cycle in each basin, but such efforts require better coordination if a basin spreads across more than one prefecture.

As torrential downpours become more common due to changing weather pattern caused by global warming, flood control other than dams should be an option. The central and local governments should quickly set up systems conducive to finding effective solutions for protecting water resources and quality. Environment groups and other nongovernmental organizations are strongly encouraged to participate fully in these efforts.

1.3.2. "The Basic Water Cycle act"

Water is the essence of life, incessantly circulates around the earth, and has been offering a lot of benefits to diverse ecosystems, including humankind, while interacting with other natural components of the environment, such as atmosphere and soil. However, water cycle has recently changed due to various factors, including the concentration of population in urban areas, changes in industrial structures, and meteorological fluctuations caused by global warming, and then we witnessed the emergence of many problems, including drought, flood, water pollution, and effects on ecosystems.

Based on this, it is indispensably important to renew the acknowledgement of water as a common asset of humanity and implementation of measures to maintain and/or restore the sound water cycle in order to circulate water soundly and elicit continuous benefits from water.

Accordingly, "the Basic Water Cycle act" was enacted in July 2014 and the Basic Plan on Water Cycle based on the law was adopted at a Cabinet meeting in July 2015, for the purpose of promoting water cycle measures comprehensively and consistently.

The objectives of the Basic Act on Water Cycle are to specify the basic principles for water cycle measures, clarify the obligations of the national and local governments, enterprises, and citizens, design basic plans for water cycle, stipulate the fundamental items of water cycle measures, establish the Headquarters for Water Cycle Policy, promote water cycle measures comprehensively and consistently, and then contribute to the healthy development of economy and society and the sound improvement of human life.

Disruption to this cycle could result in water shortages or declines in water quality. Water shortage is already a serious issue in many other countries. On the strength of the basic law, the government needs to adopt concrete measures so that Japan can continue to secure a sufficient amount of clean water, which is indispensable in ensuring a healthy life for people and a vigorous pursuit of economic activities.

"Water circulation," as referred to in the Act, means the cycle of water evaporation and of rain falling, running down over the ground surface, sinking into the ground, and reaching the sea. Rivers are the centers of the circulation. ("The Basic Water Cycle act", art. 2.) The Act recognizes that proper water circulation is important for the environment, people's daily life, and industrial production, and that water is valuable property of the nation. Therefore, maintaining proper water circulation is important and water circulation through rivers must be managed comprehensively. (Id. art. 3.) According to the Act, the national government will establish a Water Circulation Basic Plan. (Id. art. 13.) National and local governments are to take measures to improve the ability of land to retain water by, for example, proper retention of forests and management of farm lands. (Id. art. 14.) The national and relevant local governments

will coordinate to manage river systems that cross local boundaries. (Id. art. 16.).

Column -4 The outline of "The Basic Water Cycle act"

BASIC LAW ON THE WATER CYCLE is promulgated on April 2, 2014 (2014 act No.16)

ARRANGEMENT OF SECTIONS
Preamble
Chapter 1 Generality(§§ 1. to 12.)
Chapter 2 Master Plan for the H2O Circulation(§ 13.)
Chapter 3 Fundamental Policies(§§ 14. to 21.)
Chapter 4 Headquarters on Aquatic Revolution Tacks(§§ 22. to 31.)
Supplementary

In the preamble of this law, it is written as follows.

"Water, which is the source of life, circulating constantly on, over and beneath the Earth, has continued to bestow a great boon on a variety of ecological systems inclusive of homo sapiens interacting with air, soil and other natural elements of the environment and also has played an important role in the development of industry and culture that enriches human living in the course of its circulation.

In particular, our country that enjoys the benefit of the water cycle by reason that its most part has been covered with forests can create rich society and unique civilization through long history.

However, in recent years the water cycle has been transformed in view of manifold factors, for example the concentration of population into metropolises, an alteration in industrial structure, climatic changes caused by global warming, so that sundry problems, such as droughts, floods, hydro pollution, influence on an ecosystem and so on, are in the spotlight.

It is under these circumstances indispensable to promote comprehensive policies to maintain or restore the sound watery rotation so that we can rejoice in blessings brought thereby for good and all, recognizing anew that is the common property of mankind.

We hereby establish this Act in order to make clear cardinal principles of policies for the water cycle and advance the policies in synthetic and united manners."

Chapter 1 Generality

This Act is aimed at the maintenance or restoration of the sound water cycle as well as the healthy development of our economic society, and the stability and improvement of national life by providing for—
(a) cardinal principles;
(b) the responsibilities of the State, etc.;
(c) the formation of master plan for such cycle and other elementary matters thereof; and
(d) the establishment of the Headquarters on Aquatic Revolution Tacks,
in order to advance policies for the said cycle synthetically and unitedly.
§ 2.(Definitions)
(1) In this Act, "water cycle" means that surface or ground water circulates in the main around a river basin in the course of its arrival at a sea area or the like by reason of its vaporization, falling, flow or infiltration.
(2) In this Act, "sound watery rotation" means any condition in which the cycle functions suitably to human activities and the environmental preservation.
§ 3.(Cardinal principles)

(1) Seeing that water sustains life on the Earth and plays an important role in the people's living and industrial activities in the course of the sound watery rotation, it must be encouraged positively to tackle its maintenance or restoration.
(2) Seeing that water is valuable public property owned by the people in common, it must be ensured the all of them can enjoy its blessings through its appropriate use in the future.
(3) On the occasion of the use of water, attention must be paid to the avoidance or minimization of an influence on the sound watery rotation and its maintenance.
(4) Any phenomenon which has occurred in the course of water cycle produces an effect in subsequent one, aqua must be controlled synthetically and unitedly every river basin.
(5) Seeing that the maintenance or restoration of the sound watery rotation is a task common to mankind, activities therefore must be done under international cooperation.

Chapter 2. Introduction and context of river basin management in Vietnam

2.1. History of river basin management

2.1.1. Backgrounds

Vietnam has 3450 rivers and streams with a length of more than 10 km. These rivers and streams belong to 108 river basins that are distributed throughout the country. According to the length, the rivers are classified in those of over 10 km, under 10 km. By watershed area, the river basins are divided into large, medium and small ones. By administrative boundaries, river basins are divided into provincial and inter-provincial. According to the list of river basins[4], Vietnam has 8 large river basins with total area of about 270,000 km^2; 25 inter-provincial river basins of about 35,940 km^2; and 75 provincial river basins of about 24,560 km^2.

In each river basin, water resources are used by different entities for different purposes, such as for domestic use, industry, irrigation, electricity generation, aquaculture, salt water intrusion prevention, navigation, river sand mining, creation of environmental landscapes and many others, for example joining the water cycle in nature, maintaining the healthy water ecosystems, conserving biodiversity, etc. For the different values and users of water resources, river basin management needs to be managed by integrated approach, which is widely used in countries around the World, including Vietnam.

The exploitation and use of water resources and other natural resources in river basins in Vietnam has been contributing significantly to the socio-economic development of the country. However, river basin management is facing many challenges such as: in many river basins, the demand for water has exceeded the supply capacity of water resources during some dry months; water use and exploitation infrastructure is being degraded and the wasteful, inefficient use of water is not improved, resulting in water loss in urban areas, severe water flow degradation in downstream areas, increased salinity intrusion and impact on access to water resources of people living in the downstream areas; water scarcity in the dry season, downstream flow reduction and increase of river water pollution lead to water use competition in the dry season among water users; no guarantee for multi-purpose water exploitation and use; population growth, high economic growth and poverty; the effectiveness of prevention and fight against harmful effects caused by water is not high; water continues to be deteriorated and polluted.[5]

Over the past years, the policy and institutional framework on river basin management has been increasingly improved. However, the implementation of mechanisms and policies, as well as the establishment of river basin management organizations as regulated in the legal documents are so far not effective, with many things missing, overlapping and inadequate. Thus, copping the current challenges, it is necessary to review and evaluate the existing mechanisms and policies, based on practical demands on the management of water resources in river basins, in order to propose solutions for effective management of river basins.

2.1.2. History of river basin management

2.1.2.1 Concepts

Before analyzing the contents, an overview of some key concepts should be introduced.

1) River Basin Concept

- According to Clause 15, Article 3 of the Law on Water Resources 1998, the river basin is a geographical area, in which surface water and underground water naturally flow into the river.
- According to Clause 3, Article 2 of the Law on Water Resources 2012, the river basin

[4] Decision No.89/QD-TTg dated 01/11/2010 of the Prime Minister on the list of inter-provincial rivers.

[5] To Van Truong. "River Basin Management: Challenges and Solutions", 12/05/2015. Website "Vietnam National Committee on Large Dams and Water Resources Development" (http://www.vncold.vn/Web/Content.aspx?distid=3798)

means a land zone, in which surface water and underground water flow naturally into rivers which pour to a common water body or to the sea.

2) River Basin Management Content

- The content of water resources management in the river basin usually includes six major issues related to the river basin, including land management; forest development; development of irrigation works; managing the linkage between development activities in the river basin; disaster management and mitigation; and water management from the upstream to the last canal level of the irrigation system[6].
- Regarding the state management, the Clause 5, Article 3 of Decree No. 120/2008 / ND-CP stipulates that the contents of water management in river basins include:
  + Developing and directing the baseline investigation of the environment and water resources in river basin, formulating the list of river basins, and developing a mega-database and database on environment and water resources in the river basin.
  + Building and directing the implementation of the river basin planning.
  + Deciding the measures to protect the water environment and responding to water environment incidents; preventing, combating and overcoming the harmful effects caused by water in river basin.
  + Regulating and allocating water resources, and maintaining minimum flow in rivers; transferring water between sub-basins in a river basin, and from one river basin to another.
  + Inspecting and examining the implementation of the river basin planning and handling violations of regulations on river basin management; setting disputes between localities, sectors, organizations and individuals in the exploitation, utilization and enjoyment of benefits related to the environment and water resources in the river basin.
  + Conducting international cooperation on management, exploitation and sustainable development of river basin; implementing international watercourse commitments in the river basin that the Socialist Republic of Vietnam has signed or acceded to.
  + Establishing river basin coordination organization.

3) The concept of irrigation:

According to Clause 1, Article 2 of the Irrigation Law 2017, the irrigation is a combination of measures to store, regulate, transfer, distribute, supply and drain water for agriculture, aquaculture and salt production; combining with water supply and drainage for daily-life activities and in service to economic sectors; contributing to the prevention and fight against natural disasters, environmental protection, climate change adaptation and security of water sources.

2.1.2.2. Brief history of river basin management

1. Prior to 1998 (before the 1998 Law on Water Resources enactment)

Vietnam is a country of dense and complex system of rivers and streams and wet rice agriculture, so the river system plays a very important role in the life and economic development of the society. Vietnam is also a country strongly affected by natural disasters, which is "fighting thunderstorm in the morning and preventing sunburn in the afternoon". Thousands of years ago, by digging drainage channels, making embankment for water retention, building dams sewers to get and drain water and to protect flood, the Vietnamese people have pushed back floodplain, waterlogging and drought, and opened up fertile cultivated land from mountainous and midland areas to the large deltas for cultivation, animal husbandry and socio-economic development,

[6] To Van Truong. "River Basin Management: Challenges and Solutions", 12/05/2015. Website "Vietnam National Committee on Large Dams and Water Resources Development" (http://www.vncold.vn/Web/Content.aspx?distid=3798)

creating the early wet rice civilization in Southeast Asia[7].

However, since ancient times, people used only the terminology "water source" to describe the flow of nature, rather than "water resources"; so only the words "water", "water source" and "irrigation" have been used[8]. The term "irrigation" is understood to be general and inclusive, including irrigation, hydropower generation, and many other uses of water[9]. Irrigation sector of Vietnam from the 50s of the 20th century has used the terminology "Irrigation" (translated into English as Water Resources) derived from Chinese meaning, which includes the flow of nature and the human impact on the flow to limit the advantages and exploit the advantages of water to serve people and ecological environment[10]. This meaning is in line with the concept of irrigation in the encyclopedia: "Irrigation is a science to study the application of economic and technical achievements to develop, exploit and rationally use water resources, and prevent and overcome consequences caused by water. It includes assessment and forecast of natural resources and environment (for both surface water and underground water); determination of the water demand for people's life and national economic sectors in each period of socio-economic development; analysis of water balance in the river basin, region and whole country; establishment of water supply and drainage measures for urban centers, economic zones and rural areas; conduct of survey, design and construction (including the river and sea coast adjustment measures); management and efficient exploitation of irrigation works and systems, flood and storm control and dyke management, watershed management, environmental protection and ecological balance[11].

During the French colonial period, France was very interested in river water management by building irrigation works and dykes for the development of agriculture, first of all in the South, including dredging, expanding river systems and digging canals for transportation and agriculture. In 1867, after the occupation of the South, France set up a committee under the General Staff of Saigon, specialized in research and identification of rivers and canals to be dredged and expanded in priority. The strengthening of canal dredging in the South West region created favorable conditions for the formation of French agricultural plantations in the South.

In the 1950s, recognizing the importance of water, the 14th Plenum of the Central Committee of the Party (II) on October 1958 has approved the Resolution on the tasks of the three year plan (1958-1960), which determines that *water is the most important issue it is necessary to ensure the countermeasures against drought, inundation and storm, and salinity intrusion prevention; the principle is water retention is the main, the small irrigation is the main and the people are the main. The state does some large class works*. On 01/10/1958, the construction of Bac Hung Hai irrigation system was started. Bac Hung Hai irrigation system is located in Bac Ninh, Hung Yen and Hai Duong provinces. Bac Hung Hai is the most fertile land in the Red River Delta, with an area of 167,000 hectares, sandwiched between four rivers, including Hong River, Luoc River, Duong River and Thai Binh River, where the natural disasters are continuous, and Van Giang dike had broken for 18 years continuously under the reign of Tu Duc.

On September 28, 1959, the Secretariat of the Party Central Committee promulgated Directive 104-CT/TW on the development of Red River water control and exploitation plan which determines that water management and exploitation in the Red River system is of crucial importance and has key role in promoting the socialist regime construction in the North. It not only eliminates the floods in the downstream area, but also creates great opportunities for water

[7] Dao Xuan Hoc "63 years of construction and development of Vietnam's irrigation sector", 01/09/2008. Website "Vietnam National Committee on Large Dams and Water Resources Development"
[8] Tran Nhon, Preliminary comments on Draft Law on Water Resources, May 2015.
[9] Tran Nhon, Preliminary comments on Draft Law on Water Resources, May 2015.
[10] Tran Nhon, Preliminary comments on Draft Law on Water Resources, May 2015.
[11] Vietnamese Encyclopedia, Vol. 4, pp. 302.

transport, electricity generation and irrigation, boosting mineral exploitation, timber production, forestation, animal husbandry, in the upper reaches, opening the prospects for the comprehensive development of the national economy. River water control and integrated exploitation are two closely interrelated aspects of one field that need to be fully recognized, in which flood control, electricity generation, water transport and irrigation are important. Particularly for the downstream area, the task of flood prevention is very important. The Directive also clearly states that the water control and exploitation in the Red River system is a great and long-term problem, which requires a master comprehensive planning, carried out over many years. Therefore, it is necessary to have a close coordination between the planning of the Red River system with the national long-term development plans and long-term plans of sectors and localities. The Red River Water Resources Control and Exploitation Committee (Red River Committee) in the North was established by the Government. This Organization is headed by a Deputy Prime Minister. Office of the Red River Committee is under the Ministry of Water Resources, carrying out all specific works related to planning. The planning has been conducted in four areas: flood prevention, water supply and drainage, waterway transport and hydropower development and overall ladder exploitation scheme, specifically:

- The early flood prevention planning was aimed at combating those similar to the massive 1945 flood. Is has identified 6 specific measures for planting and protection of forests, strengthening dyke system, strengthening the organization for dyke protection against floods, building flood diversion and retention projects, adjusting river bed for flood drainage, and use of the existing and planned reservoirs to reduce floods in downstream areas.
- Water supply and drainage planning considers the connection with water control planning and upstream construction planning and focuses on solving the irrigation and water drainage, prioritizing the water supply for people's domestic use and animal husbandry, and creating water sources for industrial parks and urban centers. Water supply and drainage planning is considered in each region and each province in the Northern Plain, while for the mountainous areas it is only considered for concentrated agricultural areas. Water supply and drainage are considered in each period of each specific area, with properly evaluating the water availability of the area and finding specific solutions, suitable for each region, for different areas in region in each period, to address new demands. Water supply and drainage planning also lists construction works, especially for near period.
- “Ladder” planning for upstream area is conducted on the basis of field surveys, meeting the needs of electricity development, navigation, water supply for the basin and flood prevention for the downstream area. In the period prior to 1965, the focus was on the development of Da river ladder scheme which includes: Hoa Binh + Ta Bu (Son La) + Thac Lai + Huoi Vai (Nam Na) + Huoi Quang (Nam Mu) + Ta Pao (Nam Muc); and comparing Tuyen Quang and Thac Cai (Lo river) + Pilot (Gam river) scheme for the Lo river basin. The policy is development from the downstream to upstream areas, taking Tuyen Quang and Hoa Binh as the first focusing works. Later, the ladder constructions were added on the Gam River and other river branches. For Da river, more study on the option: Hoa Binh = Ta Bu (Son La) + Hat Hin.

The Red river/river basin planning was developed in accordance with the requirements of that period, so the investment in irrigation development under the Red River basin planning has brought about great results for the comprehensive development of economic and social sectors, especially in midland and Red River Delta.

From the planning experience of the Red River, in subsequent years, the planning for other rivers and areas of the old zone IV of Vietnam was conducted, while the Red river basin planning was continuously updated.

With regard to the planning work concern, at the end of 1962, the report on orientations

for Red River water control and exploitation was submitted to the Politburo and President Ho Chi Minh. On January 2, 1963, the Politburo issued the Resolution 65-NQ/TW on the orientations for Red River system water control and exploitation planning. Resolution sets requirements and measures for flood prevention and control, irrigation, salt water intrusion prevention, hydropower development, waterway transport, aquaculture and mountainous area development; at the same time, it sets the subsequent tasks of river basin planning to be further improved.

The Red River Committee has worked very effectively and brought positive results in the planning and exploitation of water resources and flood prevention in the Red River basin, period1960-1980.

In the South, then the Republic of Vietnam, there was National Committee of the Mekong River. If the Red River Committee in the North was established with the main function of studying, planning and exploiting the irrigation and hydropower works in the Red River Delta, the Mekong River Basin National Committee in the South was established for the cooperation with the three Upper Mekong Countries (Laos, Thailand and Cambodia) under the Lower Mekong Basin Research Coordination Committee. After the unification of the country, in 1978 the Prime Minister established the Vietnam Mekong River Committee to provide advices in cooperation with the Mekong River Commission and other countries in the Lower Mekong Basin.

The implementation of irrigation management in general, river and river basin management in particular, is allocated to agencies in each period as follows:

1) Period of 1945-1954: After the August Revolution was successful, the work of embanking dykes against floods was particularly interested by the President Ho Chi Minh; on May 22, 1946, the President signed Decree No. 70-SL on setting up the National Committee of Dyke Protection for the North; on May 28, 1948, the President signed the Ordinance No. 149-SL on the establishment of the Committee for Dyke Protection from the inter-regional to the provincial, district and commune levels. During this period, the Ministry of Agriculture was established on November 14, 1945 under the decision of the Government Council and the Ministry of Transport and Public Works - established on August 28, 1945 by the Proclamation of the Provisional Government of the Democratic Republic of Vietnam).

2) Period of 1955-1975:

- Ministry of Water Resources and Architecture (1955): was split from the Ministry of Transport and Public Works (the first National Assembly meeting from 15-20 September 1955 endorsed the proposal of President Ho Chi Minh splitting the Ministry of Transport and Public Works into the Ministry of Transport and Post and Ministry of Water Resources and Architecture).
- Ministry of Water Resources (1958): The Standing Committee of the National Assembly, term I issued a resolution to split the Ministry of Water Resources and Architecture into the Ministry of Water Resources and Ministry of Architecture.
- Ministry of Water Resources and Electricity (1960): In late 1960, the General Electricity Department of the Ministry of Heavy Industry was merged into the Ministry of Water Resources, which was then renamed by Ministry of Water Resources and Electricity.
- Ministry of Water Resources (1962): On December 28, 1962, the Government Council issued Decision No. 216-CP on merging the General Department of Electricity from the Ministry of Water Resources and Electricity to the Ministry of Industry. Ministry of Water Resources and Electricity then became Ministry of Water Resources.
- Ministry of Agriculture and Rural Development (1995): The 9th National Assembly, 8th session, from October 3 to 28, 1995, approved the resolution on MARD's foundation based on the three Ministries: Forestry, Agriculture and Food Industry, and Water Resources.

Conclusions:

- *During this period, river basin management is carried out under the task of irrigation management (in broad meaning), including hydropower generation, waterway navigation and other activities for economic and social development. The river planning has been developed and the contents of the master plan are integrated into the inter-sectoral, inter-provincial and inter-regional management, which is the basis for efficient river water management and exploitation. And it can be said that, river management during this period has showed the initial application of the integrated management contents.*
- *Regarding international cooperation, Vietnam has joined the Mekong River Commission and established the Vietnam Mekong River Committee.*
- *The performance of the state management of irrigation and river/river basin management has been assigned to different ministries in each period in conformity with the management purposes and requirements.*

2. Period from 1998 - now

1) Document of the Party

Water and irrigation remain a matter of concern to the Party and State of Vietnam, so from 1996 to present, all the resolutions of the Party Congress have determined the direction of investment to development and improvement of the legislation on management of river/river basin, water resources and irrigation.

Report of the 7th Party Central Committee at the 8th Congress defines the tasks for the 1996-2000 period:

- Period of 1996-2000: Rapidly developing irrigation systems in all regions, especially rehabilitating, repairing, upgrading and expanding the existing irrigation systems in the two major deltas in the country; implementing programs on prevention of salt intrusion, water infection by aluminum or of low pH level, and floods in the Mekong Delta; building water reservoirs in a number of midland and mountainous areas in service of production and improvement of water sources for domestic use. It is expected that in 5 years, the irrigation capacity will increase by 20 thousand hectares, the water drainage capacity will increase by 25 thousand hectares, creating irrigation water source for 50,000 hectares, and preventing salinity intrusion for 10 thousand hectares in the South.
- Elaborating a planning on the protection and rational exploitation of water sources, meeting the requirements of production and daily life.
- Preventing at root the agents causing pollution, first of all to the water and air environment, in the process of industrialization and modernization.
- Promulgating of the Law on Water Resources.

Report of the 8th Central Committee of the Party at the 9th Congress:

The ten-year socio-economic development strategy 2001-2010 clearly states:

- The objective is to stabilize the fragile dyke systems and solidify irrigation system developed.
- Development orientation: increasing investment to the construction of socio-economic infrastructure in rural areas; rationally planning and raising the efficiency of land, water sources and forest uses in association with environmental protection; preserving the marine and river environment, ensuring the reproduction and development of aquatic resources.

Report of the Central Committee of Party IX at the 10th Congress:

- Evaluation of the 2001-2006 period: the irrigation system has not met the requirements of agricultural and rural development; the reservoirs in the Central, Central Highlands and mountainous areas have not been fully invested; the quality of some works is low, the efficiency is poor; irrigation works focused on rice production, but not served well the development of industrial crops and aquaculture. Investment top irrigation system in Mekong Delta was not synchronous, there were many weaknesses and inadequacies; water resource management was loose.
- Orientation and tasks for 5 following years: 2006-2010:

+ Consolidating the system of lakes, dams, and embankments along river and coastline; upgrading warning systems, taking initiative in flood and storm prevention, natural disaster damage mitigation and water environment protection.
+ Renovating, upgrading and building new irrigation works of urgent need in association with the hydropower development, meeting the demands of agricultural production, aquaculture, daily-life water uses of the population and mitigation of the natural disasters damage.
+ Strengthening the protection and improvement of the environment and natural resources; applying potent measures to prevent the acts of causing environmental pollution and environment destruction, step by step overcoming the degradation of environment, improving environmental quality, especially overcoming the environmental pollution in river basins.

- Forecast for the coming years: more scarcity of energy sources, depletion of natural resources and deterioration of the natural environment; weather is getting worse and worse, accompanying terrible natural disasters.

Report of the 10th Party Central Committee at the 11th Congress:

Orientation and tasks for the 5 years 2011-2015:

- Raising the awareness and perception of environmental protection, integrating tasks and objectives of environmental protection into socio-economic development; Renovating natural resources management and environmental protection; Including environmental protection contents in strategies and plans for development of sectors, regions areas, as well as programs and projects; Ensuring the environmental requirements in new investment projects; Strictly implementing the process of handling polluting establishments; Improving the legal system on environmental protection, developing strong sanction mechanism to prevent and handle violations; Overcoming environmental degradation, protecting environment and balancing ecology; Effectively managing, exploiting and using land, water and other resources.
- Building multi-purpose irrigation works, raising the irrigation and drainage capacity; Building more water reservoirs in drought-prone areas and more river dykes.

Report of the 11th Central Committee of the Party Congress at the 12th Congress:

- Overall objectives by 2020: Prioritizing and diversifying forms of investment in irrigation infrastructure to meet the requirements of agricultural development and response to climate change and sea level rise.
- Strengthening the management of natural resources and environmental protection; Actively preventing natural disasters and coping with climate change; Promoting investigations and assessments of potential, reserves, economic values, current status and trends in the evolution of national resources, especially water resources.

Conclusions:

The reports and resolutions of the Party provide orientations and tasks on water resources, irrigation development, disaster prevention, response to climate change and environmental protection for each period. On the basis of these orientations, the National Assembly and Government promulgate specific policies and laws.

2) Documents of the National Asembly and Government:

In the 1980s, the Ministry of Water Resources developed the Water Law. After more than 10 years in charge of drafting the law, in 1995 the Ministry of Irrigation was merged with MARD, so the task of drafting the Law was transferred to MARD and after 2 years of continuous work, the draft Water Law was completed and submitted to the National Assembly for consideration and promulgation. However, to avoid misunderstanding when using the word "water" with the word "country", the Law was issued under the name of the Law on Water

Resources, effective from January 1, 1999[12].

Water Resources Law 1998 is the highest legal framework for water resources management, water sources, river basins and irrigation work. This is also the first law regulating the concepts, implications of water resources, water sources, river basins, river basin planning and irrigation works. In addition to regulating water resources management policies, the law regulates other major contents, such as protecting, exploiting and using water resources; preventing, fighting and overcoming consequences of floods and other harms caused by water; exploiting and protecting irrigation works; and international cooperation on water resources. Water Resources Law 1998 also provides the principles of dispute resolution on water resources, which encourages the conciliation parties in resolving disputes, the responsibility of the licensing agency on water resources in settling complaints arising from the grant of permits and responsibilities of other relevant agencies. In addition, the parties may resolve disputes over water resources at the Court and in accordance with the law. In particular, the Water Resources Law 1998 contains a separate chapter on the exploitation and protection of irrigation works[13]. However, the Ordinance on Exploitation and Protection of Irrigation Works 2001 is still in force and only the provisions not in accordance with the new 1998 Law on Water Resources were abolished.

Inheriting the experience of river planning undertaken after 1945 and recognizing the need for river and river basin planning, the 1998 Water Resources Law was developed containing regulations on river basin and river basin planning, on the systematic nature of the river basin which not depending on the administrative boundaries; and that the exploitation and use of river water must comply with the river basin planning. On the basis of the 1998 Law on Water Resources, detailed legal documents and guidelines have been promulgated, step by step improving the law on water resources in general and the management of rivers and river basins in particular. The Law also provides for the state management of water resources and assigns the Ministry of Agriculture and Rural Development (MARD) to be responsible to the Government for the state management of water resources. At the same time, the Law clearly regulates the authority of the National Assembly, the Government and MARD to approve water resources planning and projects, in which the Government approves the list and planning of river basins, and large and important projects on water resources; MARD approves the river basin planning and irrigation system planning as authorized by the Government. The Law also assigns the Government to establish the National Water Resources Council to advise the Government on important water resources decisions under the Government's mandate.

In 1999, the Government issued Decree No. 179/1999/ND-CP dated 30/12/1999 regulating the implementation of the Law on Water Resources, which contains provisions on river basin planning. Under the provisions of Article 64 of the 1998 Water Resources Law and this Decree, the river basin planning authority is a business agency under MARD; the authority to set up river basin management committees is assigned to MARD and PPCs. Based on these regulations, river basin management committees and river basin organizations under MARD were established, such as: Red - Thai Binh River basin Planning Committee (9/4/2001), Day River basin Planning Sub-Committee (01/12/2005), Cau River basin Planning Sub-Committee (05/9/2006) (These two Sub-Committees belong to the Red - Thai Binh River basin Planning Committee), Vu Gia - Thu Bon River Basin Planning Committee, Srepok river basin Council (9/2005), Dong Nai River basin Planning Committee (2001) and Mekong River basin Committee (09/4/2001).

The Prime Minister issued Decision No. 67/2000/QD-TTg dated June 15, 2000 on establishing the National Council on Water Resources. According to this Decision, the Chairman of the Council is the Deputy Prime Minister, the standing member is the Minister of

[12] Tran Nhon, Preliminary comments on Draft Law on Water Resources, May 2015.
[13] Chapter 5.

Agriculture and Rural Development; The Office serving the Council is located in MARD.

In 2002, pursuant to the Resolution No. 02/2002-QH11 dated 05/8/2002 on the establishment of the Ministry of Natural Resources and Environment, on November 11, 2002, the Government issued Decree No. 91/2002/ND-CP defining the functions, tasks, powers and organizational structure of the Ministry of Natural Resources and Environment. According to this Decree, the function of state management of water resources was transferred from MARD to MONRE.

In 2006, the Prime Minister issued Decision No. 81/2006/QD-TTg dated April 14, 2006 approving the National Strategy on Water Resources to 2020. The decision by Prime Minister has been applied for river basin management administrative strategies, regulations, and activities in Vietnam. The Strategy clearly defines the viewpoint that Water resources management must be implemented in an integrated manner on a river basin basis and set specific objectives for the protection of water resources of rivers and river basins in the areas of exploitation, use and development of water resources; minimizing the harm caused by water; and improving capacity of water resources management. At the same time, the Strategy also identifies key tasks and measures, including that on river basin planning, to achieve the stated objectives.

In 2008, on the basis of the Water Resources Law 1998, the Government issued a separate Decree on management of river basins, Decree No. 120/2008 / ND-CP, providing the regulations on baseline investigation of environment and water resources in river basin; river basin planning and river basin planning management content; environmental protection in river basins; water resources regulation, allocation and transfer among river basins; international cooperation and the implementation of international treaties on river basins; river basin coordination and river basin management responsibilities. The Decree specifically stipulates the requirements on the river basin planning, such as content, term, time of preparation, tasks, bases for river basin planning and mission; main contents of the water resource allocation plan in the river basin; main contents of the planning on protection of water resources in river basins; and main contents of the plan for the prevention and overcoming of consequences of harm caused by water in the river basin. Also, according to the provisions of this decree, the task of drafting river basin planning and plans has been transferred from MARD to MONRE and provincial People's Committees. Although the 1998 Water Resources Law, the National Water Resources Strategy and the River Basin Management regulations require river basin planning, as the basis for exploitation, use and management of river basin, and river basin planning committees have been established in reality, since 1999 no river basin planning has been prepared and approved. At the beginning of the 1960s, river/river basin planning was developed, which was the basis for the management and exploitation of rivers and river basins in serving socio-economic development.

In the context of the inter-provincial rivers threatened by environmental degradation, along with the river management committees established by the Ministry of Agriculture and Rural Development, 03 Environmental Protection Committees have been established, including the Cau River Environmental Protection Committees (11/11/2007), Dong Nai River Environmental Protection Committees (01/12/2008) and Nhue-Day River Environmental Protection Committees (31/8/2009). These committees have the function of directing and organizing the interdisciplinary and inter-regional coordination in order to uniformly implement the contents of the master project on protection and sustainable development of the ecological environment and landscapes of the river basins.

In addition to Decree 120, after 1999, a series of documents related to river basin management have been issued. They include policy and management regulations; technical regulations, standards; regulations on sanction against violations related to river basins.

On September 20, 2011, the Government issued the Letter No. 163/TTr-CP to the National

Assembly on the amendment of the 1998 Law on Water Resources. In 2012, the National Assembly promulgated a new Law on Water Resources to replace the old one. The Law on Water Resources 2012 takes effect on January 1, 2013 and the 1998 Law on Water Resources expires on January 1, 2013. In the Law on Water Resources 2012 some new regulations have been added and some provisions of the Water Resources Law 1998 were amended or removed. In particular: (i) the provision on river basin planning no longer exists, but replaces by "inter-provincial river basin water resource/source planning, water resource/source planning for provinces and cities under central authority[14]. Therefore, the principles of water resource management, protection, exploitation and use, as well as prevention and mitigation of water damage also change, following the water resource planning[15] instead of river basin planning[16]; (ii) Cut off the entire chapter on the exploitation and protection of irrigation works[17], thus it is understood that regulations on exploitation and protection of irrigation works are still applied in accordance with the Ordinance on Utilization and Protection of Irrigation Works 2001; (iii) The agency responsible to the Government for the state management of water resources and river basin management nationwide has moved from MARD[18] to MONRE[19]. The experiences of other countries and Vietnam in previous years show that the main tool for river basin management is the river/river basin planning, meeting the development objectives of the sectors, so when the Law on Water Resources 2012 does not address river basin planning as the 1998 Water Resources Law and Decree 120 on river basin management do, the river basin planning is required as part of the water resources planning.

One noteworthy point is that the Law on Water Resources 2012 regulates river basin organization and MONRE is responsible for unified coordination of activities of this organization[20]. As of 2013, in relation to river basin management, there were some organizations such as the River Basin Committee, the River Basin Commission and the River Basin Planning Management Board under the Ministry of Agriculture and Rural Development (established under Water Resources Law 1998); the Environmental Protection Committee under MONRE (established under the Law on Environmental Protection 2005) and the River Basin Committee under MONRE (as stipulated in Decree 120 and the Law on Water Resources, 2012, but have not been established until now)[21].

Based on the Law on Water Resources 2012, a series of documents on water resources management, and river and river basin management have been issued. In addition, river and river basin management is also governed by other relevant laws, such as the Law on Investment, the Law on Prices, the Law on Fees and Charges and the Law on Planning (see Appendix 1).
In 2017, the Law on Irrigation was promulgated, becoming effective from 01/7/2018 and the Ordinance on Exploitation and Protection of Irrigation Works 2001 shall be no longer effective from this date. Irrigation Law 2017 has a number of amendments to the Law on Water Resources 2012 on regulating MARD's authority to issue, extend, adjust, suspend and revoke permits for water resources in the event of waste water discharge to the irrigation works[22]. One of the noteworthy points is that under Irrigation Law 2017, irrigation products and services include the public products and services, and other products and services[23]. Previously, the Law

[14] Article 15 of the Law on Water Resources 2012.
[15] Clause 3, Article 3 of the Law on Water Resources 2012.
[16] Clause 1, Article 5 of the 1998 Law on Water Resources.
[17] Chapter 5 of the 1998 Water Resources Law.
[18] Article 58 of the 1998 Law on Water Resources.
[19] Article 70 of the Law on Water Resources 2012.
[20] Point a, Clause 2, Article 72 of the Law on Water Resources 2012.
[21] MONRE submits to the Government the proposal on the establishment of six river basin committees, but the Prime Minister is requesting to establish only five committees.
[22] Article 58 of the Irrigation Law 2017.
[23] Article 30 of the Irrigation Law 2017.

on Charges and Fees (2015) stipulated the transfer of irrigation fee to irrigation products and services (public products and services) [24].

Conclusions:

Since 1998, the management of rivers and river basins has been improved in line with the development of the national economy. Up to now, related to river water management, the river basins and river water environment protection have been implemented in accordance with the regulations of three specialized laws: Law on Water Resources 2012, Law on Environmental Protection 2015 and Law on Irrigation 2017. In addition, a series of sub-law documents, together with other relevant legal regulations, have provided a sufficient legal framework for the management of rivers and river basins in Vietnam.

2.2. Integrated water resource management

2.2.1. Main policies on water resource management

2.2.1.1. An overview of Vietnam's water resources

According to the Water Resources Laws 1998 and 2012, water resources include surface water, rainwater, groundwater and seawater within the territory of the Socialist Republic of Vietnam. However, the 1998 and 2012 Water Resources Laws do not regulate sea water and groundwater in the exclusive economic zone, continental shelf of the Socialist Republic of Vietnam, mineral waters and natural hot water.

When addressing the river basin management, it is important to consider integrated water resources management (IWRM). IWRM is generally related to all aspects of the nature of the water resource, water users, relevant institutional framework and all sectors involved. With the concept of river basin and river basin management as described above, river basin management is sufficient to address the problem of integrated management within it.

1) Water resources in Vietnam:

Vietnam is located in the humid tropical region with average rainfall of 1,800 mm - 2,000 mm, unevenly distributed, but mainly concentrated in the rainy season from April, May to October. For the Central Coast, the rainy season starts and ends in few months later. The uneven distribution and fluctuations over time of precipitation are the causes of erratic floods and droughts, devastating crops and property, affecting the national economy. In addition, these create obstacles to river water management and exploitation. According to estimates, the annual rainfall of the whole Vietnam territory is about 640 km^3, which results in the flow of rivers and lakes of about 313 km^3. Taking into account the amount of water flowing into the Vietnamese territory through two major rivers, the Mekong River (550 km^3) and the Red River (50 km^3), the total annual rainfall is about 1,240 km^3 and the river flow discharged to the sea annually is about 900 km^3. Water stored in the ground aquifers is also a part of water resources in Vietnam. Total water reserve in Vietnam (m^3/day) in 2014 is 2,270 million cubic meter of surface water and 130.017 million cubic meters of underground water[25]. In addition, Vietnam also has a wide range of mineral water and natural hot water.

2) Water utilization in Vietnam:

In economic and living activities. Vietnam is the country paying highest cost for irrigation in the Southeast Asia. By 2015, there were 75 irrigation systems in the whole country with 659 large and medium lakes and dams, over 35,000 small lakes and dams, 1,000 drainpipes, over 2,000 large and small pumping stations, over 10,000 types of pumping facilities capable of supplying 60 -70 billion m^3 of water per year. However, the irrigation system has been seriously degraded, meeting only 50-60% of designed capacity. Annual water used for agriculture is about

[24] Appendix 2 of the Law on Fees and Charges.

[25] National Bureau of Scientific and Technological Information "Water Resources Synthesis - Water Resources Management in Vietnam -General Summary on Science – Technology and Economy, No. 7 - 2015.

93 billion m^3, for industry: about 17.3 billion m^3, for service: 2 billion m^3, and for domestic use: 3.09 billion m^3. By 2030, the structure of water use will change with the trend: 75% for agriculture, 16% for industry and 9% for domestic use. Demand for water will double, accounting for about one-tenth of river water, one third of inland water, one third of stably flowing water. Due to the high rainfall and steep terrain, Vietnam has great hydropower potential. Hydropower plants produce about 11 billion kWh, accounting for 72 to 75% of the country's electricity output. With the total length of rivers and canals of about 40,000 km, 1,500 km it has put into operation for waterway transport, of which over 800 km are managed. On aquaculture, Vietnam has 1 million hectares of fresh water surface, 400,000 hectares of brackish water surface and 1,470,000 hectares of river surface. However, only 31% of fresh water is currently used. There are many small lakes and dams are in service for irrigation throughout the country. According to data from the Department of Water Resources, Vietnam has about 6,500 reservoirs with the total capacity of about 11 billion cubic meters (about 560 large reservoirs with a capacity of over 3 million cubic meters), which can be used for irrigation, agriculture, aquaculture, hydropower development, tourism development, ... Besides, the reservoirs also play an important role in regulating ecological functions and protecting living environment for human.

In living activities. By 2017, Vietnam has 813 urban centers[26], about 240 urban water supply plants with a total designed capacity of 3.42 million m^3/day, of which 92 plants use surface water with capacity of 1.95 million m^3/day. Some provinces exploit 100% of underground water for production and living activities, such as Hanoi, Hung Yen, Vinh Phuc, some exploit 100% of the surface water, such as Hai Phong, Ha Nam, Nam Dinh, Gia Lai, Thai Binh, and some others use both water sources[27].

3) Water related issues in Vietnam: Vietnam is facing enormous challenges in terms of water pollution, especially in industrial and urban areas. For surface water, the quality of main rivers in the upstream areas is still good, but many downstream areas are heavily polluted. In particular, the level of pollution in the rivers increases in the dry season as the water flow in the rivers decreases. Water quality becomes polluted significantly, with many parameters, such as BOD, COD, NH_4, N, and P, higher than permitted values. The main rivers have been polluted. Groundwater is also facing problems, such as salinity intrusion, pollution by pesticides and other harmful substances, etc. Unplanned water exploitation has led to the lowering of underground water levels, especially in the Northern Delta and Mekong Delta.

2.2.1.2. Main policy on water resources

1) Period to 01/01/2013*:*

Unlike other assets such as land and minerals, the resources constantly located in a certain area, the water resources are characterized by movement over the basin in systematic manner. The management of water resources and irrigation works is an unified task, very difficult to be separated: (i) The systematic basin character and water movement in the river basin represent the intimate relationship between upstream and downstream areas, i.e. all upstream changes in water intake, discharge, water retention, flow improvement, water quality, etc. are related to positive or negative changes in the downstream area; (ii) Relationship between river basin surface and water source: each effect on the basin surface, such as deforestation, cultivation land expansion, urbanization, agro-chemical use, etc. can change the flow regime and water quality in the basin; (iii) Relationship between surface water and groundwater: surface water and groundwater within the basin are closely related; in flood season, the surface water provide

[26] Letter to the Government No. 06 / TTr-BXD dated 09/02/2018 on the Law on Urban Development Management of the Ministry of Construction.

[27] National Institute of Scientific and Technological Information, Integrated Water Resources Management - Water Resources Management in Vietnam, No. 7 - 2015.

additional reserve for underground water, while in dry season, ground water replenishes the surface water. Therefore, afforestation and reservoirs construction are positive measures to regulate water volume for both components.

As discussed above, from the late 1950s until the end of 1998, recognizing that "water is the most important issue" and “must ensure drought, waterlogging and storms, and salinity intrusion prevention", the Party has determined the investment policy for management and rational use of water resources which focuses on " water retention is the main, small irrigation is the main and the people doing is the main, and Government does large scale works". With this policy, the Government has invested in the construction of irrigation works (such as Bac Hung Hai irrigation work) with state budget. Integrated water resources management, river basin management has been implemented by river basin planning and the establishment of river basin coordination organizations such as Red River System Water Control and Exploitation Committee, Mekong River National Committee in the South (became Vietnam Mekong River Committee after 1978, which cooperates with other countries in the Lower Mekong Basin). From 1997-1998, Vietnam joined and became a member of the Global Water Partnership Network and Southeast Asia Water Partnership Network (SEATAC, now SEARWP). In 2000, the Vietnam Water Partnership Network (VNWP) was established.

In 1998, the Law on Water Resources was issued regulating the direction of water resource management in Vietnam with the following main contents:

1) Regulating the responsibilities on water resources management of the Government, People's Councils, People's Committees at all levels; responsibilities of the Vietnam Fatherland Front and its member organizations in propagating and mobilizing people to implement the legislation on water resources, and supervising the implementation; State bodies, economic organizations, political organizations, socio-political organizations, social organizations, people's armed force units and all individuals shall have the responsibility to implement the legislation on water resources[28]; Regulating the National Council on Water Resources, which is Chaired by a Deputy Prime Minister has the Minister of Agriculture and Rural Development to be the Council Permanent Member.

2) Policy on protection, exploitation and use of water resources; prevention and overcoming of consequences caused by water[29]:

- The protection, exploitation and use of water resources, and prevention, combat and overcoming of harmful effects caused by water must comply with the river basin planning already approved by the competent State agency; Ensuring the systematic nature of river basins, not dividing it by administrative boundaries.
- The protection of water resources, prevention and fight against degradation and depletion of water sources must be associated with the protection and development of forests and the ability to regenerate water sources; constructing and protecting of irrigation works; preventing and combating water pollution; carrying out integrated economical, safe and efficient use of water sources.
- In the prevention, control and overcoming of harmful effects caused by water, there must be plans and measures to actively prevent, avoid, mitigate and reduce the harm caused by water; ensuring the harmonious combination of the interests of the whole country with those of regions and sectors, advanced science and technology with traditional experience of the people and in accordance with the ability of the economy.
- Projects on protection, exploitation and use of water resources, prevention and mitigation of damage caused by water, must contribute to socio-economic development and take measures to ensure the people life population, national defense and security; protecting historical and cultural relics and sites of scenic beauty, and the environment.

[28] Article 4.
[29] Article 5.

3) Investment policy for water resources development[30]:

- The State invests in the basic investigation of water resources, development of monitoring system and data and information system, enhancement of the ability to forecast flood, drought, salinity intrusion, sea level rise and other negative effects caused by water.
- The State plans to prioritize investment in the settlement of water for people life in areas of special water scarcity; investment and support to the development of water resources infrastructure.
- The State shall adopt preferential policies for domestic organizations and individuals as well as foreign organizations and individuals to invest in the development of water resources; in studying, applying scientific and technological advances to develop water resources and protect their legitimate interests.

4) Financial policy on water resources[31]:

- Organizations and individuals that exploit and use water resources have the financial obligations and should contribute their efforts and expenditures to the construction of works for the protection, exploitation and use of water resources, and preventing, combating and overcoming the damage caused by water.
- The State shall implement the policy on exemption and reduction of water resource and water resource tax in geographical areas with difficult socio-economic conditions and areas with extremely difficult socio-economic conditions.

5) Policy on water related international relations[32]:

The State encourages the expansion of international relations and international cooperation in basic investigation, protection, exploitation and use of water resources; preventing, combating and overcoming the harmful effects caused by water for the purpose of developing water resources on the principle of protecting the sovereignty, territorial integrity, mutual benefit and conformity with treaties to which the Socialist Republic of Vietnam signed or joined.

Period after 01/01/2013:

State policies on water resources, in addition to the orientations defined in the Resolutions of the Party, are also stipulated in strategies and laws, such as Water Law 2012 and Irrigation Law 2017. In particular:

National Strategy on Water Resources to 2020, issued by the Decision No. 81/2006/QD-TTg, dated 14 April 2006

1) The state's views on water resources and water resource management:

- Water resources constitute a major component of the living environment, and a particularly important element is to ensure the successful implementation of socio-economic development strategies and plans, as well as the maintenance of national defense and security.
- Water resources are under the entirety of the owners and uniformly managed by the State. All organizations and individuals have the right to exploit and use water resources to meet their daily life and production demands, and have the responsibility to protect and develop water resources in a sustainable manner, prevent and mitigate harms caused by water in accordance with the provisions of law.
- Water resources must be managed in an integrated and uniform manner, on the basis of river basins. The water use structure must conform to economic restructuring in the period of accelerated national industrialization and modernization.
- Water resources must be developed in a sustainable manner; Truly exploited and used, efficiently, in an integrated manner and for multi-purposes. Water products must be

[30] Article 6.
[31] Article 7.
[32] Article 8.

considered commodities; The subsidy mechanism must be soon eliminated and the protection and development of water resources and the provision of water services be socialized.

- To cooperate, to share benefits, and to ensure equity and rationality in the exploitation, use, protection and development of water resources as well as the prevention and mitigation of harms caused by water in trans-boundary rivers and river basins sovereignty, territorial integrity and national interests.

2) Direction principles

- The management, protection and development of water resources must ensure the systematic nature of river basins, not be divided by administrative boundaries and concurrently ensure the natural disposition of aquatic systems, water basins and ecosystems, especially of precious and rare aquatic species of scientific and economic value; preserve and develop the diversity and originality of Vietnam's aquatic ecosystems.
- To enhance the effectiveness and efficiency of the state management of water resources; raise the responsibilities of organizations and individuals in the protection, exploitation and use of water resources, as well as the prevention, mitigation and remedying of consequences and harms caused by water.
- The socio-economic development must be associated with the capacity of water sources, with the protection and development of water resources. The exploitation and use of water resources must be integrated and for many purposes, harmonizing interests of branches, localities and communities in the comprehensive relationship between upstream and downstream, between areas and regions, ensuring balance and concentration for high socio-economic benefits and environmental protection.
- Investment in the protection and sustainable development of water resources is investment for development, which will bring about immediate and long-term socio-economic benefits. The State shall guarantee necessary investment resources, adopt policies to mobilize contributions of enterprises and communities and expand international cooperation so as to increase investments in the management, protection, sustainable development of water resources and the prevention, mitigation of harms caused by water.

Sustainable Development Strategy of Vietnam 2011-2020) issued by Decision 432/QD-TTg dated 12/4/2012

Orientation for water environment protection and sustainable use of water resources:

- Protecting and effectively exploiting and sustainably using national water resources on the basis of integrated and unified management of water resources, ensuring water security for social economic development and promoting cooperation with neighboring countries in the sharing of transboundary water resources. Thriftily using and increasing the economic efficiency in the use of water resources. Water is considered as important national asset and increasing effectiveness and efficiency in the management of water resources. Focusing on environmental protection of the river basins. Developing and implementing programs and projects of integrated management of river basins, watershed and groundwater.
- Strengthening the building of wastewater collection and treatment system in urban areas and industrial zones. Strengthening the research of methods of wastewater treatment from activities of agricultural production and aquaculture. Preventing degradation and restoring the quality of water resources, especially water quality restoration in the main river basins.
- Rate of reduction of groundwater and surface water: 2098 *(m^3/person/year)* in 2010 and 2020 reduced to 1770 *(m^3/person/year)* in 2020.

Law on Water Resources 2012 stipulates:

1) To ensure water resources being managed, protected, exploited, use resonablely, in saving and effectiveness, satisfying demand of socio-economic sustainable development and

assurance of national defense and security.

2) To invest and organize basic survey, master plans on water resources; to build system of observation, overseeing water resources, information system, the water resource database, to improve capacity of forecast on water resources, pollution of water sources, floods, drought, salinization, sea-level rise and other harmful effects caused by water; to assist for development of water sources and development of infrastructure relating to water resources.
3) To prioritize to invest in research, explore, exploit water sources, have incentive policy for investment projects on water exploitation in order to solve living and production water for people in mountainous areas, areas of ethnic minority groups, border areas, inslands, areas in difficult socio-economic conditions, areas in extremely difficult socio-economic conditions, areas where fresh water is scarce.
4) To invest and have mechanism to encourage organizations, individuals for investment in research, advanced science and technology application in order to manage, protect, develop water sources, exploit, use in saving, effectiveness for water resources, handle sewage meeting technical regulations and standards in order to reuse, process saline water, brackish water into fresh water, collect, use rain water, supply artificial underground water, recover water sources polluted,deteriorated, depleted, prevent, combat against and overcome harmful effect caused by water.
5) To ensure state budget for operations of basic survey, master plan on water resources, water resource protection, prevention of, combat against and overcoming of harmful effects caused by water.

Irrigation Law 2017 provides:

1) Prefer investing in development of irrigation projects of special importance, large-scale irrigation projects, or irrigation projects located at minority regions, mountains, islands or regions facing extreme socio-economic difficulties, regions with severe water shortages or regions significantly affected by climate change.
2) Provide tax incentives for organizations or individuals charged with managing or operating or utilizing irrigation projects that supply public irrigation products or utilities in accordance with tax laws.
3) Provide subsidies or support for organizations or individuals for investment in development, repair or improvement of systems of small-scale or inter-field irrigation projects; advanced and water-efficient irrigation systems; advanced and modern irrigation and drainage systems; effluent or wastewater treatment systems that serve water reuse purposes.
4) Provide subsidies or support for investment in improvement or modernization of irrigation projects.
5) Provide financial subsidies for use of irrigation products or services appropriate for respective fields or groups of users.
6) Provide favorable treatment for organizations or individuals providing irrigation products or services when they are needed to support prevention, control or mitigation of drought, water shortage, saltwater intrusion, desertification, flood, inundation or waterlogging.
7) Diversify investment forms; provide incentives or favorable conditions for organizations or individuals to facilitate their investment in development, management and operation of irrigation projects.
8) Provide support for persons directly carrying out or those engaged in irrigation operations to have access to training classes and courses for improvement of their competence; provide incentives and favorable conditions for organizations or individuals in order for them to conduct research on or application and transfer of technologies in irrigation operations.

National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020) notified by Decision 172/2007/QD-TTg dated Nov.16, 2007)

- Ensure safety for the dyke systems at provinces from Ha Tinh province up to the North of the country; improve the flood-resistant capacity of embankment systems in the Coastal Central region, Central Highlands and the Eastern South; complete the consolidation and upgrading of sea dyke systems, especially the large reservoirs and the ones related to crowded residential areas, to politically, economically, culturally sensitive areas, and to important structures of national security and defense downstream.
- Financial resources: The State budget ensures the investment for natural disaster prevention, response and mitigation projects and the contingency for disaster relief and recovery; take advantage of ODA; the State decentralizes to People's Committees of provinces and districts in investment and mobilization of legitimate resources for disaster prevention, response and mitigation; gradually increase the annual budget for strengthening the management capacities, implementing new construction projects, upgrading and maintaining structures; and for projects of planning, of improving equipment and facilities for disaster forecast, warning; having the policies to provide preferences and to protect legitimate interests of organizations and individuals investing in disaster prevention, response and mitigation.
- Tasks and solutions to natural disaster prevention and mitigation for each region:
  a) The Red River Delta and the North Central: Enhance flood-prevention capacity for river dyke systems, conduct in a synchronous manner solution including making flood control planning for river systems, reviewing and adjusting dyke system planning; constructing new reservoirs and establish operation procedures of the existing large reservoirs to regulate water levels for the downstream areas, preventing flood; improve the flood discharge capacity for river channels.
  b) The Central Coast, the Eastern South and Islands: Establish planning of residential, industrial and tourism areas; plan and construct disaster prevention and mitigation structures, and transportation infrastructures ensuring a flood resilience and flood drainage ability; Strengthen dykes; conduct solutions to increase run-off and underground water; build structures to control inundation; build bank protection structures, dredge river channels; promote research to find out solutions to prevent river mouth deposition, to dredge river channels for enhancing flood discharge and waterway transportation.
  c) The Mekong River Delta: The approach of natural disaster prevention, response and mitigation applied for the Mekong river delta is "living with flood", ensuring safety for a sustainable development: Establish planning of flood control, to be proactive in flood prevention; improvement of flood discharge for rivers and canals, construction of sea dykes, estuary dykes, embankments, reservoirs, and other structures for salinity prevention and fresh water preservation; Proactively take advantages of flooding; research and invest to explore the flooding environment: alluvium, reduced acidity and salinity, aquaculture, fisheries, ecotourism, water transport, cultural and sports activities which are typical for the flooding region. Enhance international cooperation with countries in the Mekong river basin to reasonably use and protect water resources. Continue researching, coordinating with upstream countries to find out solutions for flood control in rainy season, run- off maintaining in dry season to prevent saline intrusion; and for response to the sea level rise.
  d) Mountainous areas and Central Highlands: Define and map areas highly prone to flash floods, landslides, geological hazards; establish warning and communication systems down to commune and village levels; build structures to prevent landslides and flash floods; expand flood discharge openings of sluices and bridges on traffic roads to ensure flood drainage ability; build reservoir system for both flood and drought control.

In summary:

Policies on integrated water resources management in Vietnam are defined in the strategic orientations and related laws as outlined above and can be grouped into*:*

1) Policy group on sustainable socio-economic development. The development of water resources is linked to each national goal and strategy in each period. The success of the policy of sustainable development will make an important contribution to improving the lives of people and all socio-economic sectors. This is confirmed by the results recorded in the activities on water supply, irrigation and flood prevention.

2) Natural disaster prevention and mitigation. Vietnam is located in the region of tropical monsoon with high rainfall and many unusual events of the weather. The occurrence of floods, inundations, landslides is inevitable. To minimize the impact of disasters, it is necessary to understand the behavior, evolution, impacts of weather and natural conditions of each region. Knowledge of natural disasters needs to be improved, especially for policy makers at central and local levels. The options for prevention and effective overcoming of storms and flash floods are mentioned in the current laws. At present, the flood prevention plans in the Red River Delta, Mekong Delta, Central region and Central Highlands have been gradually completed. Large flood protection networks have been set up, such as Red River - Thai Binh, Ma River, Ca river, etc. ; system of sea dykes, saltwater prevention sluices in Northern and Northern Central Vietnam; embankment system, and flood drainage canals in Me Kong Delta; big reservoirs, such as Hoa Binh, Ba Be, Tri An, Dau Tieng, Phu Ninh, Thac Mo, Vinh Son, Binh Dien-Ta Trach ... for relief of flood and protection of people's lives, infrastructure and production in the important plains of the country during the rainy season. Effectiveness has been recorded in preventing and mitigating harms caused by water and at the same time exploiting the benefits of floods and flooded areas.

3) Socialization in water resources management. Socialization of water resources management on the principle: Government and people work together, focusing on promoting the internal capacity and strength of the whole society, and encouraging domestic and foreign investors to participate in investing to and exploiting water resources; managing the huge investment capital of the State and the people, and the value of water resources; confirming that the management of water resources is the responsibility, obligations and interests of each citizen.

4) Effective use of surface water and groundwater potential: Water resources in Vietnam are relatively abundant but not infinite. On the other hand, the water distribution is uneven in space and time in the year, so the policy of effective use of water and the water saving, in accordance with multi-sectoral and inter-provincial coordination is necessary.

5) Financial investment policy. The investment to the management and rational use of water resources has attracted the attention of the Party and Government of Vietnam since the 1960s, particularly through the construction of irrigation works (such as Bac - Hung - Hai irrigation work) with domestic capital. The investment in water infrastructure such as dykes, canals and multi-functional lakes are considered to be expanded with all sources in various forms. State-owned investment represents a significant proportion of the state budget. Since 1999, this proportion has decreased due to the fact that investment in the water sector mainly focused on irrigation and drainage. In the period 1996 - 2001, an estimated 64% of the total investment in the water sector came from ODA, while 36% was from direct investment. The total investment for the irrigation sector in the 10 years from 1991 to 2000 is estimated at 2.5 billion USD, of which the contribution of the people is about 1/3, the State budget (both central and local) about USD 1.7 billion, and the investment in period 1996-2000 equals to 2.4 times of that in the period 1991-1995. In addition, river basin management is supported by Asian Bank (ADB) and AusAID funding in planning and identifying priority issues for each basin[33].

6) Water Resources Planning by Basin. Vietnam is located in the tropical monsoon region, so

[33] Department of National Information on Science and Technology, Integrated Water Resources Management - situation of water resources management in Vietnam, number of July 2015

floods and droughts are frequent, and the management of water resources in the river basin is necessary to address the imbalance of water by space and time. As mentioned above, Vietnam has long been developing river and river basin planning. Then, when the 1998 Water Resources Law was enacted, many programs for water resource management were conducted in the river basin with a water resources planning approach. Many management organizations for water resources have been established: the National Council on Water Resources and the planning management bodies of three major rivers: Red - Thai Binh, Dong Nai and Cuu Long rivers. According to MARD's assessment, the policy of applying integrated water resources *management in the basin has been proven to be correct with the following results:*

- *Previous irrigation planning projects have been carried out by basin and following the direction of integrated use of river water resources and river ecology protection. Works were proposed in multi-sectoral and multi-purpose projects. Recently, on December 26, 1977, MONRE issued Decision No. 3399/QD-TNMT approving the task of river basin planning, such as the water resources planning for the Red - Thai Binh River basin to 2020, vision to 2050.*
- *The three organizations managing the Red - Thai Binh, Dong Nai and Cuu Long River basin have been established under the Decision No. 37, 38 and 39 of the Minister of Agriculture and Rural Development have come to operation from 2001. The management boards have identified priority issues for each basin.*
- *In addition, representatives of provinces of the Cau and Nhue-Day river basins were convened in 2003 - 2004 to establish the river basin organization, and recently Ministry of Natural Resources and Environment submitted to the Government the proposal on the establishment of six river basin committees, although, they have not yet been established.*

In order to implement the policies mentioned above, the Government of Vietnam has issued many legal documents directly related to integrated water resources management. In addition, water management policies are implemented in accordance with other relevant laws such as laws on investment, state budget, public investment, land and planning.

2.2.2 Institution system for water resource management

2.2.2.1. Institutional framework development

The institutional framework is developed based on the synthesis of legal documents related to water resource management, which include: general legal documents; legal documents on river/river basin management, environmental protection of river/river basin waters; management of irrigation activities related to river, river basin and river flood control; coordination of river basins (summarized in the attached Annex 1 and Annex 2).

2.2.2.2. Legislation

Specialized legislation on water resources management includes the Law on Water Resources and sub-law documents. The Law on Water Resources was first promulgated in 1998 and later amended and promulgated by the new Law in 2012. The Law on Water Resources 2012 replaced the Law on Water Resources1998. Law on Water Resources 2012 was continued to be amended at Item 1 of Article 37 by the provisions of the Law on Irrigation, promulgated in 2017. On this basis, the Office of the National Assembly has merged the Law on Water Resources 2012 with the amendment of the Law on Irrigation 2017 into the new Law on Water Resources 2017 (hereinafter referred to as Law on Water Resources 2017).

Law on Water Resources 1998 (expired on 01/01/2013, replaced by the Law on Water Resources 2012 effective January 1, 2013).

This is the first law and the highest legal document on water resources management, marking an important step in the management of water resources in Vietnam. The law has institutionalized the views and lines of the Party and the State, and the country's development

strategy related to water resources.

The Vietnamese Constitution states that rivers, lakes, natural resources in the ground, important irrigation works and other natural resources, which are regulated by the law, belong to the entire people[34]. Based on this, the 1998 Water Resource Law states that water resources belong to the entire people[35]. The Law includes 10 chapters with 75 articles on management, protection, exploitation and use of water resources; preventing, combating and overcoming the harmful effects caused by water.

Some important contents of the 1998 Water Resource Law are the regulations on integrated water resources management; river basins, river basin planning and river basin planning management; Organizing directing and commanding the prevention and combat and overcoming of flood consequences; and Establishment of the National Council on Water Resources. MARD is responsible to the Government for the management of water resources and the Minister of Agriculture and Rural Development is the standing member of the National Council on Water Resources.

Decree 179/1999/ ND-CP dated 30 December 1999 on implementing the 1998 Water Resources Law (expired on 01/02/2014 and replaced by Decree 201/2013/ND-CP dated 27/11/2013, detailing the Law on Water Resources 2012).

On the basis of the 1988 Law on Water Resources, on December 30, 1999, the Government issued Decree No. 179/1999 / ND-CP regulating the implementation of the Law on Water Resources. The Decree specifies the licensing of wastewater discharge into water sources; licensing the exploitation and use of water resources; licensing fees and charges; the authority in water flowing through; and the responsibility of each ministry and province in the management of water resources. On June 15, 2000, the Prime Minister issued Decision No. 67/2000/QD-TTg on establishing the National Council on Water Resources.

Decree 91/2002/ND-CP regulates the functions, tasks, powers and organizational structure of MONRE (expired on 04/04/2017, replaced by Decree 36/2017/ ND-CP dated 04/04/2017).

For completing the system of management and protection of water quality at all levels nationwide, in 2002 the Ministry of Natural Resources and Environment was established as an important step in strengthening the state management of water resources. On November 11, 2002, the Government issued Decree 91/2002/CP regulating the functions, tasks, powers and organizational structure of MONRE.

According to this Decree, the Ministry of Natural Resources and Environment is a governmental agency which performs the function of state management of land resources, water resources, mineral resources, environment, meteorology, hydrology and meteorology, metrology and cartography nationwide; perform the state management over public services and act as representatives of owners of State capital portions at enterprises with State capital in the domain of land and water resources, mineral resources, environment and hydro-meteorology, metrology and cartography according to the provisions of law.

Thus, according to this Decree, the function of state management of water resources was assigned to MONRE. However, this provision is contrary to the 1998 Water Resources Law, because the 1998 Water Resources Law assigns this function to MARD.

Decree No. 120/2008/ND-CP on River Basin Management (partially ineffective as of 01/02/2014 on river basin management, in contrary to the provisions of the Law on Water Resources 2012).

On 01/12/2008, the Government issued Decree No. 120/2008/ND-CP regulating river basin management. This is a separate decree on river basin management, which covers regulations on consultation of community representatives in water resource exploitation and use, discharge of wastewater into water sources; basic survey of water resources; licensing of

[34] Article 1 of the 1998 Law on Water Resources.
[35] The Constitution of 1946, 1980, 1992, 2013.

water resources; the grant of rights to exploit water resources and transfer the right of exploiting water resources; river basin organization, and coordination and supervision of water resource exploitation, use and protection, and prevention and overcoming of consequences of harm caused by water in river basins. This Decree regulates the management of river basins, covering basic surveys of the river basin environment and water resources; river basin planning; protection of the river basin water environment; regulation and allocation of water resources and river basin water transfer; international cooperation and implementation of treaties on river basins; organization of river basin coordination; and river basin management responsibilities.

- The list of river basins is divided into: the list of big river basins, including those of the Red, Thai Binh, Bang Giang, Ky Cung, Ma, Ca, Vu Gia, Thu Bon, Ba, Dong Nai and Mekong rivers; the list of inter-provincial river basins, including those with a catchment area located in two or more provinces or centrally-run cities; the list of inner-provincial river basins, including those with a catchment area located in a province or centrally run city. Classification of the river basin is the basis for the decentralization of river basin management, defining responsibilities of ministries, sectors and provinces; and prioritizing investment in protection of water resources and sustainable development of water resources.
- Investment policies for sustainable development of river basins: The State prioritizes investment capital for the management, protection and sustainable development of river basins, covering: (i) Basic surveys of the river basin environment and water resources; formulation of river basin environment-water resource data directories and building of systems for observation, warning and forecast of the river basin environment and water resources; (ii) Formulation and implementation of river basin planning and plans for pollution prevention and combat, address of consequences of harms caused by water, plans for regulation and allocation of water sources and development of river basin water resources. (iii) Formulating and materializing programs and projects on integrated management of river basin water sources, ensuring the water source balance on national and regional scales in order to meet the water needs of the people's life and sustainable socio-economic development. (iv) Investment in sustainable development of river basins is development investment (the State encourages and creates favorable conditions for all organizations, individuals and communities to invest in the management, protection and sustainable development of water resources in river basins and prevention and combat of harms caused by water). (v) Expanding and attracting international capital sources for the management and protection of the river basin environment and water resources.
- A river basin planning includes the planning of components: planning on the protection of water resources; planning on prevention, combat and addressing of harms caused by water. and several sub-basins. The spatial scope of component planning can be either basin, one or several sub-basins.
- The regulations on water environment protection in the river basin include regulations on survey of pollution sources and protection of water quality in the basin; plans on water pollution prevention and restoration and polluted water sources restoration in river basins; and responding and overcoming water environment incidents.
- The regulations on balancing and allocating water resources and water transfers in river basins include the regulations on minimum flow maintenance, water resource balancing, allocation of water resources and water transfer in river basin.
- The regulations on organization of river basin coordination is that the river basin committee has the function of coordinating the activities of relevant ministries, sectors and provinces in the implementation of the river basin planning; proposing policies and recommendations on measures for the protection of water environment, exploitation, use and development of water resources, prevention and mitigation of harms caused by water in river basins. The area under the responsibility of the River Basin Committee can be either a river basin or a river basin group. The Committee consists of the leaders of the concerned ministries and sectors, leadership of the

provincial People's Committees of the provinces in the river basin and representatives of organizations/agencies managing the works on exploitation and use of water resources on a large scale (if any). The Committee is chaired by a Vice Minister of Natural Resources and Environment. On the competence to set up the river basin commission, the Prime Minister decides to set up a river basin committee for big river basins; the Minister of Natural Resources and Environment sets up a river basin or sub-basin committee for the inter-provincial river basins. The River Basin Office is responsible for assisting the River Basin Committee to carry out the tasks assigned by the Committee; the Office is under the Ministry of Natural Resources and Environment.

Law on Water Resource 2012 (in effect from 01/01/2013) with Clause 1 of Article 73 amended by the Water on Irrigation, 2017, effective from 01/07/2018).

The Law on water resources 2012 includes 10 chapters with 79 articles on management, protection, exploitation and use of water resources and overcoming the consequences of damages caused by water in the Vietnamese territory. The Law stipulates that:

- Water resources management must be conducted in the whole river basin, for all water sources and administrative units in the basin; It should be in a unified and integrated manner in terms of water quantity and quality, between upstream and downstream.
- MONRE is responsible for organizing and coordinating ministries, sectors and provinces to formulate the water resources strategy and master plan on water resources to submit to the Prime Minister for approval. Water resources planning includes: (i) General water resource planning for the whole country; (ii) inter-provincial water resources/sources planning, (iii) water resources planning of provinces and cities under central authority.
- Regulations on responding to and overcoming water pollution incidents and restoring polluted and exhausted water sources; monitoring and supervising water resources, water use and wastewater discharge into water sources; ensuring water flow; setting up a water resource protection corridor; protecting the quality of water sources for domestic use, and agricultural, aquaculture and industrial production. Water resource exploitation and use must comply with the water resource planning; if pollution incidents happen, the compensation for damage caused by water pollution incidents is applied in addition to the administrative measures.
- Regulations on saving and efficient use of water sources; limiting water losses in the water supply system; encouraging the efficient water use; creating favorable conditions for organizations and individuals to conduct effective scientific and technological researches on water use; licensing the exploitation and use of water resources for domestic use, agricultural production, hydropower, salt production aquaculture and navigation; construction of reservoirs in rivers/river basins and streams; Setting up river water transfer project in the basin; Harmonization and distribution of water resources for different purposes of use, based on water resources planning, actual water availability and responsibility for regulating and distributing water resources in inter provincial river basins.
- Responsibility for the prevention, control and overcoming of harmful effects caused by water, such as floods, and inundation and riverbank erosion.
- Revenues from water resource activities, such as water resource tax and other taxes as prescribed by tax law; Charges and fees prescribed by the law on charges and fees; grant of rights to exploit water resources; compensation for damages to the State and fines for administrative violations.
- Principles applicable to international relations on water resources; protecting the rights and interests of Vietnam for international water sources; solving dispute and disagreement about interstate water sources.

Decree No. 201/2013/ND-CP dated 27/11/2013 detailing some articles of the Law on Water Resources 2012.

- This Decree prescribes the gathering of opinions of communities on the exploitation and use of water resources, the discharge of wastewater into water sources; basic survey of water resources; licensing of water resources; grant of rights to exploit water resources and transfer of the right to exploit water resources; river basins organization and the coordination and supervision of activities for the exploitation, use and protection of water resources, prevention and combat and overcoming of consequences of harms caused by water in river basins.
- Regulations on projects which need consultation; the time, contents, agencies to work with and procedure of gathering opinions communities; the contents are those related to the exploitation and use of water resources, discharge of wastewater into water sources.
- The National Council for Water Resources is chaired by a Deputy Prime Minister and the Minister of Natural Resources and Environment is the vice chairman of the Committee, while and members of the Council are leaders of the concerned ministries and sectors. The Council Office is under MONRE.
- The responsibility of MONRE in maintaining the system of warning and forecast of flood and damage caused by water; The water resource permits include: permits for underground water exploration; permits for surface water exploitation and use; permits for underground water exploitation and use; permits for exploitation and use of sea water; permit for discharge of wastewater into water sources.

Decree No. 33/2017/ND-CP dated 14/9/2017 on handling of administrative violations in the field of water and mineral resources (replacing Decree No. 142/2013/ND-CP).

- This Decree stipulates the administrative violations, penalties, fines and remedial measures against administrative violations, the power to impose penalties against administrative violations and the power to make records of administrative violations against regulations on water and mineral resources.
- Administrative violations against regulations on water resources in this Decree include: Violations against regulations on survey, planning, exploration, extraction and use of water resources; violations against regulations on reservoirs and operation of reservoirs; violations against regulations on water resource protection; violations against regulations on prevention, combat against and overcoming of adverse impacts by water; violations against regulations on community consultation; and other violations against regulations on water resource management.
- Chapter II of the Decree regulates the administrative violations against regulations on water resources, penalties, fines and remedial measures.
- Chapter IV regulates the power to impose administrative violations in water resources field.

Decision No. 459 / QD-TTg dated 2 April 2014 regulating the functions, tasks and powers of the National Council on Water Resources.

1) The Council has the function of advising the Prime Minister on the study, direction and coordination for addressing important issues on water resources:

- Organizing or participating in study and proposing to the Prime Minister the orientations, mechanisms, policies, strategies, target programs and national action programs related to the protection, exploitation and sustainable use of water resources; Preventing, combating and overcoming the harmful effects caused by water.
- Advising the Prime Minister on the direction, coordination and cooperation among ministries, sectors and provinces in settling matters related to water resource planning and sectoral planning which exploits and uses water resources; transferring water between inter-provincial water sources; monitoring the use of interstate water resources and resolving disputes; large programs and projects on the protection, exploitation and use of water resources and other tasks assigned by the Prime Minister.
- Advising the Prime Minister to urge the ministries, sectors and provinces in the

implementation of important inter-sectoral issues related to the protection, exploitation and use of water resources, prevention and combat of the harmful consequences caused by water.

2) The National Water Resources Council composts of: Chairman of the Council which is a Deputy Prime Minister; The Vice Chairman of the Council - Minister of Natural Resources and Environment; Standing Council members - Deputy Heads of the Government Office, Deputy Ministers of Natural Resources and Environment, Agriculture and Rural Development, Industry and Commerce, Construction, Transportation; Non-permanent members - Deputy Ministers of Health, Finance, Planning and Investment, Culture, Sports and Tourism, Foreign Affairs, and Public Security and Defense).

In addition to the above documents, there are other related documents, such as Decree No. 82/2017/NĐ-CP dated 17/7/2017 of the Government stipulating method of calculation and the level of collection of fee for the right to exploit water resources; Circular No. 64/2017/TT-BTNMT dated 22/12/2017 regulating the minimum flow in rivers, streams and downstream areas of reservoirs and dams; Circular No. 47/2017/TT-BTNMT dated 07/11/2017 regulating the monitoring of water resources exploitation and use; Decision No. 1898/QD-TTg dated October 1, 2010 promulgating the list of inter-provincial river basins; Decision No. 341/QD-BTNMT dated March 23, 2012 promulgating the list of inner-provincial rivers.

At the same time, in parallel to the regulations of specialized law, water resources management is also regulated by other relevant laws, such as:

Law on Lan 2013

The river basin, in addition to the Law on Water Resources, is also governed by the Land Law. According to the Land Law of 2013, aquaculture land is agricultural and irrigation land, rivers, canals, streams and specialized water surfaces are non-agricultural land. Therefore, the exploitation of water resources in river basins for economic activities must also comply with the provisions of the Law on Land.

Law on Investment 2014/2016 entered in effect from 01/07/2017

According to the Annex 4 of the Law on Investment 2014 and he revised 2016, the business on water resource exploitation and use, and discharge of wastewater into water sources, are conditional business. On the basis of this regulation, the Government has issued Decree No. 60/2016/ND-CP dated 1 July 2016 stipulating the conditions for business in the field of natural resources and environment. According to this Decree, organizations practicing in the field of water resources must meet the following conditions: (i) having one of the following documents: Decision on the establishment of the organization allowing to perform the tasks related to baseline investigation, planning and other activities on water resources; business certificate, business certificate and tax registration or enterprise registration certificate, granted by a competent agency. (ii) There is a team of professional staff involved in the implementation of the project/master project, and the report preparation, meeting the conditions required by the business sector. This regulation aims to ensure the efficient business and exploitation of water resources.

Law on Planning 2017 entered in effect from 01/01/2019

Law on Water Resources 2012 regulates water resources planning while the Law on Planning 2017 regulates the national water resources and inter-provincial river basin/water source planning. In addition, the Law on Planning also regulates regional planning and that regional planning must have the content river water resource planning, water use and environmental protection. Further, the 2017 Planning Law stipulates that the vision of regional planning and provincial planning is from 20 years to 30 years, while the Law on Water Resources 2012 stipulates the period of 20 years. Therefore, the development of water resources planning and regional planning must be integrated to ensure their consistency.

Conclusions:

1) Over the past few years, the institutional framework for river basin management and water resources management has been gradually improved and, to date, it is a relatively comprehensive framework for river, river basin and water resource management. The institutional framework not only includes specialized legislations, but also other relevant legislations.

2) During the period from 1998 to 2012, especially after MONRE establishment in 2002, legal provisions were inconsistent due to the promulgation of Decree 120/2008/ND-CP on river basin management. This decree was issued based on the Law on Water Resources 1998, but many of the provisions of this Decree are not consistent with the Law, such as*:*

- The Law on Water Resources 1998 regulates that MARD is responsible to the Government for the state management of water resources, while the Decree 120 stipulates that this responsibility belongs to MONRE and many tasks of MARD are transferred to MONRE.
- The Law on Water Resources 1998 regulates river basin planning and river basin management agencies under MARD, while the Decree 120 stipulates responsibility for river basin planning is of the Ministry of Natural Resources and Environment, and the River Basin Committee and the Committee Office are under MONRE. As such, for a river basin, there exist River basin planning committee under MARD and River basin committee under MONRE at the same time. In addition, there is also the River Basin Environmental Protection Committee established under the Law on Environmental Protection. However, no River basin committee has been established since 2008.

3) From 2013 up to now, the amendment of the Law on Water Resources 1998 by the promulgation of the Law on Water Resources 2012 has overcome these shortcomings. The Law on Water Resources 2012 has entered in force for nearly 8 years and Decree 120, although promulgated under the Water Resources Law 1998, is still in force today. Meanwhile, the Law on Water Resources 2012 and Decree 120 has different regulations: the Decree 120 addresses river basin planning, while the Law on water resources addresses water resources. In addition, as the Planning Law 2017 regulates the type of planning, the water resources planning is the national planning and integrated interprovincial river basin/water resource planning is specialized planning.

Apart from a number of inconsistent and overlapping regulations, as mentioned above, the current shortcomings are not caused by the institutional arrangements but by the organization for implementation and the cooperation between the ministries and sectors, especially between the two ministries MONRE and MARD. However, it is very necessary to have a river basin/river basin water resources planning, which is a basis for the implementation of river basin management as it has been done in Vietnam since the 1960s.

2.2.3. New movement and trial to the IWRM

2.2.3.1. Legal basis for the establishment of river basin

- Article 72 of the Law on Water Resources, 2012, regulating the activities and responsibilities of coordinating and supervising the exploitation, use and protection of water resources, prevention and overcoming of harmful consequences due to water pollution in river basins.
- Section 1, Chapter VI of the Law on Environmental Protection, dated 2014 regulating the protection of river water environment.

Article 5 of Decree No. 201/2013/ND-CP of the Government dated November 27, 2013 detailing the implementation of a number of articles of the Law on Water Resources, which regulates the river basin committee model, its function and power.

2.2.3.2. Overview of river basin in Vietnam

According to the Decision No. 1989/QD-TTg dated 01/10/2010 of the Prime Minister

issuing the list of inter-provincial river basins, there are 33 inter-provincial river basins (92.6% of area and 91% of number of rivers and streams of the whole country):

- In the north, there are 4 inter-provincial river basins, including 02 large basins (Hong-Thai Binh, Bang Giang- Ky Cung) and 02 others (Tien Yen and Ba Che);
- In the North Central Region, there are 9 inter-provincial river basins, including 02 large basins (Ma and Ca) and 07 others (Tong, Yen, Lach Bang, Gianh, Ben Hai, O Lau and Huong);
- In the South-Central region, there are 8 inter-provincial river basins, including 02 large basins (Vu Gia - Thu Bon and Ba and 06 others (Tra Khuc, Lai Giang, Kon, Ky Lo, Cai Ninh Hoa and Cai Nha Trang);
- The Central Highlands has four inter-provincial river basins, including Se San, Srepok, Dong Nai sub-basin and Ba sub-basin;
- The Southeast region has nine inter-provincial river basins, including large Dong Nai basin and eight others (Cai Can, Trau, Cai Phan Rang, Luy, Cai Phan Thiet, Dinh, Du and Ray);
- In the Mekong River Delta, there is large Mekong river basin.

2.2.3.3. Current status of organization related to river basins

Vietnam currently has nine river basin organizations under two management systems for agriculture and environment, of which there are 06 river basin planning boards and river basin management councils, established and managed by the Ministry of Agriculture and Rural Development (for the river basins of Red - Thai Binh, Ca, Vu Gia - Thu Bon, Dong Nai, Srepok and Mekong) and three River basin Environmental Protection Committees established by the Prime Minister (for Cau River, Dong Nai and Nhue-Day river basins).

The 06-river basin planning management boards or river basin management councils have been set up under the Decree guiding on the implementation of the 1998 Law on Water Resources; the 03 The River Basin Environmental Protection Committees are the inter-sectoral and inter-regional steering and coordinating bodies for unified implementation of environmental protection master projects approved by the Prime Minister for the respective river basins.

1) Organizational structure

Currently, there are three models of river basin organization, including: River Basin Management Planning Board (for Red - Thai Binh, Dong Nai, Cuu Long and Vu Gia - Thu Bon rivers) River Basin Management Council (for Srepok and Ca rivers) and the River Basin Environmental Protection Committee (for Cau river, Nhue - Day and Dong Nai rivers).

2) Composition of river basin organization

a. For River Basin Planning Management Board, it includes:

- Regular members are leaders of the Ministry of Agriculture and Rural Development, General Department of Irrigation, People's Committees of provinces in the basin and Departments of Agriculture and Rural Development, Environment, Industry and Commerce of the provinces;
- The irregular members are leaders of some relevant departments, sectors and district People's Committees;
- The head of the management board is a vice minister of the Ministry of Agriculture and Rural Development, the standing deputy head is a leader of the General Department of Irrigation.

b. For the River Basin Management Council: the representatives of the agencies on irrigation, provincial people's committees, relevant departments and representatives of water exploiters and users. The Chairman of the Council is the leader of the provincial People's Committee in the basin, who works for a term of 3 to 5 years and transfers the chairmanship to a leader of another province for the next term.

c. For the River Basin Environmental Protection Committee: leaders of the Ministries of Natural Resources and Environment, Planning and Investment, Agriculture and Rural Development, Science and Technology, Industry and Trade, Construction, Transportation, leader of Government Office and representatives of People's Committees of provinces and centrally run cities in the basin. The chairman of the Committee is a chairman of People's Committee of one province for one term. The standing vice-chairman is a vice minister of the Ministry of Natural Resources and Environment.

All members of the River Basin Planning Management Boards, River Basin Management Council and River Basin Environmental Protection Committees work on part-time basis.

3) Supporting members

To assist the above river basin organizations are the Offices as follows:

- The Office of the River Basin Planning Management Board for large river basins is under some department/agency of the Ministry of Agriculture and Rural Development (for instance, Office of the Red River Basin Planning Management Board is under the Institute of Irrigation Planning in Hanoi; Offices of the Dong Nai and Mekong River Basin Planning Management Boards are under the Southern Institute for Water Resources Planning in Ho Chi Minh City, etc.);
- Other River Basin Planning Management Offices and River Basin Management Council Offices are located in the Departments of Agriculture and Rural Development in provinces and centrally run cities in the basin. Some Offices of the River Basin Management Planning Boards, River Basin Management Councils have their Branch Offices;
- The offices of the River Basin Environmental Protection Committees are under the Department of Waste Management and Environmental Improvement of the Vietnam Environment Administration and have their branches in Departments of Natural Resources and Environment of provinces in the basin.

Most of the staffs of the Offices work on a part-time basis and very few of them are full-time staff. The operation regulations of the offices are approved by the Ministry of Agriculture and Rural Development and the Ministry of Natural Resources and Environment, respectively.

4) Operation budget

There are some financial sources as follows:

- Contributions of provinces and centrally-run cities in river basins (having representative in the management boards or management councils);
- Funds for regular expenditures of ministries;
- Funding from projects.

Although the statistical figures on the annual budgets are not available, the funding is generally limited, mainly from projects for regular meetings or for the activities under the framework of a grant projects, so many river basin organizations cease their operation after the project completed.

5) Shortcomings on organization and operation of river basin organizations[36]:

The establishment of river basin organizations in the past was the first step to implementing the principle of integrated water resources management in river basins in combination with administrative management. This is an advanced management model that many countries in the world have successfully applied to meet the aspirations and wishes to contribute to the management of water resources of relevant ministries and local authorities. However, the effectiveness of operation of the river basin organizations is still limited; they mainly organize meetings and conduct information sharing; the decisions issued by them have low enforcement effectiveness. Some more specific shortcomings in the activities of the river basin organizations are as follows:

[36] Letter No. 24 / TTr-BTNMT dated 30/05/2017.

a. For River Basin Management Boards and River Basin Management Councils:

- The River Basin Management Board is a non-business unit; The River Basin Management Council is an advisory and consulting organization so they do not meet the requirements on coordination of relevant agencies in activities of protecting, exploiting and using water resources, and preventing damages caused by water in river basins;
- The functions, tasks, powers and working regulations of the Boards or Councils do not clearly show their roles in participating in and solving issues related to water resources in the river basins, especially the inter-sectoral and inter-regional issues; the mechanisms and tools for monitoring the activities of protection, exploitation and use of water resources in river basins have not yet been established.
- The organizational system is week, lacking of necessary resources (staff, material conditions...) to ensure effective operation; Operation cost is still limited, depending on the contribution of provinces, projects and donors.
- These boards and councils are established and operated by the Ministry of Agriculture and Rural Development on the basis of the 1998 Law on Water Resources, before the issuance of the resolution of the National Assembly on the establishment and transfer of state management functions on water resources to the Ministry of Natural Resources and Environment.

b. For the River Basin Environmental Protection Committees:

- Regarding the organization and operation of the Committees, there is no strict requirement in coordination among provinces; the participation and cooperation between ministries and sectors in the activities of the Committees are limited;
- Major constraint for the committees is the lack of financial resources especially for the implementation of the River Basin Environmental Protection Projects; It is difficult for local authorities to identify funding sources for the implementation of the tasks of the environmental protection master projects in the river basin;
- There is a lack of legal basis for the implementation of the tasks set out, such as mechanisms, policies or overall solutions from the point of view of integrated management for the whole river basin in accordance with the Law on Water Resources;

From the current situation and legal bases, in meeting the urgent need for water resources management, coordination and supervision for river basin water resources, and prevention of water-related harms in river basins, and with the fact that environmental protection and protection of water resources in the river basins are becoming increasingly pressing issues in socio-economic life, the establishment of river basin committees to assist the Government and Ministry of Natural resources and Environment to manage water resources in river basins are essential.

2.2.3.4. Proposed establishment of river basin committees

On 30 May 2017, the Ministry of Natural Resources and Environment proposed the Prime Minister to set up river basin committees with the following contents[37]:

1) Model, name and number of the river basin organizations

a. About the model and name:

According to the provisions of Clause 1, Article 5 of Decree No. 201/2013/ND-CP, river basin committees are organized and operate according to regulations of inter-sectoral coordination organizations.

Name: River Basin Committee.

b. Number of river basin committees

Based on the distribution of river basins in Vietnam as mentioned in Section I.2, the

[37] Letter No. 24/TTr-BTNMT dated 30/5/2017 by MONRE on the establishment of river basin committees to submit to the Prime Minister.

Ministry of Natural Resources and Environment proposes the establishment of five river basin committees as follows:

- River Basin Committees are defined in accordance with the Decree 201/2013/ND-CP, which include the Red and Thai Binh River Basin Committee and the Mekong River Committee. However, the establishment of the Mekong River Committee will be considered later, in parallel with strengthening it to ensure full realization of Vietnam's obligations and commitments to the international Mekong River Commission, and effective coordination in water resources management, exploitation and utilization in the basin. On the other hand, it is to ensure the streamlining of focal inter-sectoral coordination in the river basin.
- There are 04 other River Basin Committees, including:
  + The North Central River Basin Committee, responsible for 09 river basins: Ma, Ca, Huong, Tong, Yen, Lach Bang, Gianh, Ben Hai and O Lau;
  + The Nam Trung River Basin Committee, responsible for 09 river basins: Vu Gia - Thu Bon, Ba, Tra Khuc, Kon - Ha Thanh, Lai Giang, Ky Lo, Cai Ninh Hoa and Cai Nha Trang;
  + The Sesan – Srepok River Basin Committee, responsible for the Se San and Srepok rivers basins;
  + The Dong Nai River Basin Committee, responsible for 08 river basins: Dong Nai- Sai Gon, Can, Trau, Cai Phan Rang, Luy, Cai Phan Thiet, Dinh, Du and Ray.

2) Functions and tasks of the river basin committee

a. Functions

The river basin committee has the function of assisting the Prime Minister in studying, directing and coordinating the settlement and distribution of water sources; supervising the exploitation, use and protection of water resources, and prevention and fight against and the overcoming of the harmful effects caused by water; and participating in solving inter-sectoral, inter-regional and inter-provincial issues in inter-provincial river basins within the scope of its responsibility.

For the river basin committee, the Chairman of which is Deputy Prime Minister, Chairman can use the seal of the Prime Minister in performing the assigned tasks. The Vice-Chairmen of the Committee use their respective agency's seal for implementing the relevant tasks.

For the river basin committee whose chairman is the Minister of Natural Resources and Environment, the seal of the Ministry can be used for implementing the assigned tasks. The Vice-Chairmen this Committee use their respective agency's seal to for implementing the relevant tasks.

b. Key tasks

Under the provisions of Article 6 of the Decision No. 34/2007/QD-TTg of March 12, 2007, promulgating the Regulation on the establishment, organization and operation of inter-sectoral coordination organizations, the tasks of the River Basin Committees include:

- To study and propose to the Prime Minister the orientations and solutions for solving important, inter-sectoral and inter-provincial issues related to exploiting, using and protecting water resources, protecting river basin environment, preventing and combating damage caused by activities of exploiting and using water, and discharging of waste water into water sources in inter-provincial river basins.
- Assisting the Prime Minister in directing, regulating and coordinating among ministries, sectors and provinces, as well as concerned organizations and individuals in implementing and supervising activities of exploitation, use and protection of water resources, protection of the river basin environment, prevention and overcoming of the harmful consequences, caused by activities of exploiting and using water and discharging waste water into water

sources in inter-provincial river basins.

- Assisting the Prime Minister in urging the ministries, sectors, provinces, as well as concerned organizations and individuals to implement the relevant approved plans, activities, projects and programs in the river basin.

c. Composition and number of members of river basin committee

- Composition of the Red - Thai Binh River Basin Committee
  + Chairman: Deputy Prime Minister;
  + Standing Vice Chairman: Minister of Natural Resources and Environment;
  + Vice Chairman: Vice Minister of Natural Resources and Environment;
  + Vice chairman: Chairman of People's Committee of one among provinces in the basin for a 2.5 years term;
  + Permanent members: Deputy Director of the Office of the Government; Ministers of Industry and Trade, Agriculture and Rural Development, Construction, Transport, Planning and Investment, Finance, Science and Technology, Culture, Sports and Tourism, Foreign Affairs, Defense and Police.
  + Members: Leaders of the Central Committee of Vietnam Fatherland Front, Vietnam Peasants' Association, Central Committee of Ho Chi Minh Communist Youth Union, Vietnam Women's Union; Representative of Northwest Steering Committee; Chairmen of People's Committees of provinces in the river basin; Director General of the Vietnam Environment Administration; Director of the Department for Water Resources Management; representatives of the Vietnam Electricity Corporation and a number of organizations exploiting and using water, and discharging waste water into water sources on a large scale or having great impacts on the water resources in the river basin, decided by the Chairman of the Committee.
- Composition of other river basin committees
  + Chairman: Minister of Natural Resources and Environment;
  + Standing Vice Chairman: ice Minister of Natural Resources and Environment;
  + Vice chairman: Chairman of People's Committee of one among provinces in the basin for a 2.5 years term;
  + Standing members compose of the Vice Ministers of the Ministries of Industry and Trade, Agriculture and Rural Development, Construction, Culture, Sports and Tourism and the Foreign Affairs, National Defense and Police (for the river basin committees of inter-state water basin).
  + Members: Leaders of the Central Committee of Vietnam Fatherland Front, Vietnam Peasants' Association, Central Committee of Ho Chi Minh Communist Youth Union, Vietnam Women's Union; Director of the Standing Office of the Vietnam National Mekong Committee (for the Se San River Basin Committee); Chairmen of People's Committees of provinces in river basins; Director General of the Vietnam Environment Administration; Director of the Department for Water Resources Management; representatives of the Vietnam Electricity Corporation and a number of organizations exploiting and using water, and discharging waste water into water sources on a large scale or having a great impacts on the water resources in the river basin, decided by the Chairman of the Committee.
- Establishment of sub-committee

Implementing the Politburo's Resolution No. 39-NQ/TW dated April 17, 2015 on streamlining and restructuring sources of cadres and civil servants, the 06 River Basin Committees were established to manage 33 inter-provincial river basins nationwide; therefore, one river basin committee may be responsible for many independent river basins or one river basin committee must manage very large and complicated river basin. In order to ensure the effective implementation of the functions and tasks of the committees, the establishment of sub-

committees is appropriate solution, when necessary. Based on the characteristics and requirements of implementing tasks during the operation, river basin committees may set up sub-committees for regions or for specialized areas. Sub-committees will work on a part-time basis.

+ The Minister of Natural Resources and Environment decides the establishment of specific sub-committees.
+ The Chairman of the River Basin Committee approves the list of members of the river basin sub-committees at the request of the Office of the River Basin Committee.

3) Assisting agency:

a. Office of the River Basin Committee

- The Office of the River Basin Committee is established under the Ministry of Natural Resources and Environment to assist the River Basin Committee. The Office of the River Basin Committee may have specialized units.
- Staffs of the Office are those from the Ministry of Natural Resources and Environment. Based on the requirements of the task and financial capability, the Director of the Office may sign labor contracts or consultancy contracts to perform the tasks, according to regulations.
- The Office of the River Basin Committee has its own seal and account. The operating budget of the Office is included in the annual budget of the Ministry of Natural Resources and Environment and other sources, such as: forest protection fund, environmental protection fund, water resource exploitation fee, wastewater discharge fee, and environmental care fund.

b. The Minister of Natural Resources and Environment defines the functions, tasks, powers and organizational structure of the Office of the River Basin Committee.

It is expected that the Office of the River Basin Committee will be headed by the Director of the Department of Water Resources Management; has one Vice Chief, being the Chief of the Administration Department of VEA, working on a part-time basis and a Vice-Chief of the Administration Department appointed by the Minister of Natural Resources and Environment, working on full time basis. The Office of the River Basin Committee may have specialized units.

The Sub-Departments under the Department for Water Resources Management and Sub-Departments for Environmental Protection of River Basin under the Department for Waste Management and Environmental Improvement are responsible for assisting the Offices of River Basin Committees to carry out the tasks of the river basin committees, in the respective basins.

4) Options for completing the existing river basin organizations

a. Dissolution of the river basin environmental protection committees, including:

- Cau River basin Environmental Protection Committee;
- Nhue-Day River basin Environmental Protection Committee;
- Dong Nai River basin Environmental Protection Committee.

b. Dissolution of River Basin Planning Management Boards and River Basin Management Councils:

- Red - Thai Binh River Basin Planning Management Board;
- Mekong River Basin Planning Management Board;
- Vu Gia - Thu Bon River Basin Planning Management Board;
- Dong Nai River Basin Planning Management Board;
- Ca River Basin Planning Management Board;
- Srepok River Basin Management Council.

c. The river basin organizations continue to carry out their assigned tasks until the establishment of the respective river basin committee.

- Transfer all functions, tasks, assets, records, documents and results of the river basin

organizations to the respective river basin committees.

5) Operation cost

The operating budget of the river basin committees and the offices of the committees is covered by the state budget allocating to the Ministry of Natural Resources and Environment and by other sources, including:

- Forest environment protection funds, environmental protection funds, fee on the right to exploit water resources, fee on wastewater discharge into water sources and state environment budget;
- Contributions from provinces and voluntary contributions from organizations and individuals.
- Funding from international and foreign organizations;
- Other sources as prescribed by law.

Measures proposed to the Prime Minister on the opinions of the ministries, sectors, provinces and socio-political organizations

1) In the immediate future, the Prime Minister will consider and decide the establishment of five river basin committees, including the Red River Basin Committee, North Central River Basin Committee, South Central River Basin Committee, Sesan-Srepok River Basin Committee and Dong Nai River Basin Committee.

2) The establishment of the Mekong River Committee in accordance with the Law on Water Resources 2012 will be considered in parallel with the strengthening of the Vietnam Mekong River Committee to ensure full performance of obligations and commitments of Vietnam to the Mekong River Commission.

3) Establishment of 01 Office of River Basin Committees under MONRE.

4) Consolidation of existing river organizations: dissolution or merging of 03 River Basin Environmental Protection Committees under MONRE management; dissolution of 04 River Basin Planning Management Boards and 02 River Basin Management Councils under the MARD management.

2.2.3.5. Consolidation of the Vietnam Mekong River Committee

1) Legal Basis for completing the Vietnam Mekong River Committee:

The Vietnam Mekong River Committee was established on September 18, 1978 at the Prime Minister's Decision No. 237-CP, for assisting the Government in coordinating the cooperation activities on the Mekong River in Vietnam. After the signing of the 1995 Mekong Agreement, in order to strengthen the activities of the Committee, the Prime Minister issued Decision No. 860/QD-TTg dated December 30, 1995 defining the functions, tasks power and organizational structure of Vietnam Mekong River Committee. On 15 January 2010, the Prime Minister issued a new Decision No. 114/QD-TTg replacing the Decision No. 860/QD-TTg.

2) On 08/02/2018, MONRE requested the Prime Minister to consolidate the Mekong River Committee[38]:

- On 12/9/2017, the Ministry of Natural Resources and Environment issued Official Letter No. 4787/BTNMT-TCCB to the Government Office, 12 ministries, 13 provinces and centrally-run cities in the Mekong Delta and 4 provinces in the Central Highlands requesting their comments on the draft master project on consolidation of Vietnam Mekong River Committee, with proposed operation regulation of the Commission.
- On 25/10/2017, the Party Central Committee of the XII term issued Resolution No. 18-NQ/TW on "reviewing and arranging in the direction of reduction the inter-agency coordination organizations, especially those having permanent specialized staff. In this context. MONRE recommends:

[38] Letter No. 13 / TTr-BTNMT

+ The Prime Minister will consider and allow the establishment of four river basin committees in replacement of the proposed five committees, including the Red - Thai Binh River Basin Committee, North Central River Basin Committee South Central River Basin Committee and Dong Nai River Basin Committee. The Prime Minister will decide to establish the Red – Thai Binh River Basin Committee and allows MONRE to establish three river basin committees, including the North Central Committee, the South-Central Committee, and Dong Nai River Basin Commission.
+ The Prime Minister will review and authorize the consolidation of the Mekong River Committee on the basis of incorporating the functions, tasks, powers and organizational structure of the Vietnam Mekong River Committee, the Mekong River Basin Committee and Sesan-Srepok River Basin Committee.

Specifically:

- Name: Vietnam Mekong River Committee.
- Function: The Vietnam Mekong River Committee is an inter-disciplinary coordinating organization, which helps the Prime Minister to study, direct and coordinate the handling of important, inter-disciplinary and inter-governmental matters on the use and protection of water resources of the Mekong River Basin and the Sesan-Srepok River Basin. The committee uses the national emblem seal and has its own account.
- Organizational structure of the Committee is as follows: Chairman: Deputy Prime Minister; Permanent Vice Chairman: Member of the International Mekong River Commission from MARD; Members: Deputy Chief of the Office of the Government, Deputy Ministers of relevant ministries; Chief of the Office of Vietnam Mekong River Committee; Director of the Department for Water Resources Management; General Director of VEA; Director General of Irrigation Department, representatives of 18 provinces and cities in the Mekong Delta.
- Assisting agency: The Standing Office of the is under MONRE and has its own staff.

Chapter 3. Main policy and implementation process of integrated water resource management in Vietnam

3.1. Water environmental management

3.1.1. Overview of water environmental management

At present, in Viet Nam, although the management authorities of different sectors and levels have made great efforts in implementing environmental protection policies and legislation, they are facing big challenge associated with water pollution. The high pace of industrialization and urbanization and the population growth have been posing pressure on water resources. The causes of water pollution are quite diverse, but mainly because that many industrial parks, industrial clusters and craft villages do not have waste water collection and treatment systems, so most of wastewater generated during the production process does not meet the standard before being discharged into the environment; and the use of pesticides and chemical fertilizers in agricultural production that pollute rivers, lakes, canals and ditches[39].

In the last 10 years, about 3-4 large-scale and hundreds of small-scale water pollution cases happened in all over the country. The very large-scale pollution cases have profound effects on the country's economic development, for instance those in the Thi Vai River (2008) and in the Central Coast (2016). Surface water quality is becoming degraded and the level of surface water pollution is getting heavier. In river basins, severe pollution and degradation of water quality can be seen in the middle and lower river reaches, such as Nhue - Day, Cau and Dong Nai rivers. The polluted areas are slowly treated and rehabilitated, leading to pollution of surface water and underground water. According to the Prime Minister's Decision No. 1788/QĐ-TTg dated 01/10/2013, in the 2016 - 2020 period, 222 establishments causing serious pollution shall be strictly handled.

According to experts, if Vietnam increases 1% of GDP, it would have to pay 3% of the damages caused by environmental pollution. Each year, the farming of pangasius, lobster, tilapia and clam catfish is subjected to an additional 1,400 billion VND due to water pollution. From 2010 to 2016, the mass death of shrimp due to epidemic disease generated from the low water quality caused damage of more than 1,000 billion VND. Water pollution also causes severe crop damage. In addition, according to WHO and UNICEF statistics, in 2011, the number of deaths due to water related and sanitation issues reached the figure 14,500. Polluted water is the cause of dangerous chronic diseases.

Over the past years, the system of policies, legislation and the organizational structure of the State for environmental protection has been formed in a relatively uniform manner and step by step improved[40].

3.1.2. Brief history of water environmental management

Environmental management in Vietnam has attracted very early concern and became increasingly specialized through various activities, such as scientific researches, workshops, international cooperation, the promulgation of legal regulations and management organization improvement. It is possible to generalize the history of environmental management in general and water environment management in particular through milestones and highlighted events as follows:

- In 1962, Cuc Phuong National Park - the nature reserve in Ninh Binh, was established[41].

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[39] The opinion of Mr. Nguyen Minh Khuyen, Deputy Director of Department of Water Resources Management.

[40] According to statistics from the Ministry of Justice, there are currently about 300 legal documents on environmental protection to regulate the behavior of individuals, organizations, economic activities, technical procedures and the procedures of production materials utilization (Website of Institute of Legal Science, MOJ: http://khpl.moj.gov.vn/qt/tintuc/Pages/tin-tuc-phap-luat-bao-ve-moi-truong.aspx?ItemID=17).

[41] Decision No. 72/TTg of July 7, 1962.

- In 1982, the first scientific workshop on "Environmental issues in Vietnam" was organized. The workshop addressed the issues on environment, as well as land, mineral, forest, water, air and population issues.
- In 1983, the International Conference on Environmental Protection and Rational Use of Natural Resources was organized by the State Committee for Science and Technology (later Ministry of Science, Technology and Environment).
- In 1984, the review of basic surveys on natural resources and environment on a national scale was conducted by the Committee for Science, Technology and Environment.
- In 1986, Vietnam published the "National Strategy for Nature Protection". The strategy is the beginning of the process of managing natural resources and environment in Vietnam. Also, in 1986, within the National Program for Natural Resources and Environmental Studies in collaboration with IUCN, a national strategy for environmental protection was proposed to the Socialist Republic of Viet Nam.
- In 1987, the Scientific Workshop on "Environmental Protection by Law" was organized by the Committee for Science, Technology and Environment and the Ministry of Justice.
- In 1990, the International Conference "Environment and Sustainable Development" was organized in Hanoi by the Committee for Science, Technology and Environment and the United Nations Environment Program (UNEP).
- On June 12, 1991, the Council of Ministers of the Socialist Republic of Viet Nam adopted the "National Plan for Environment and Sustainable Development, period 1991-2000" and Directive 187-CT on implementing this plan. The National plan has set a major institutional and organizational goal of establishing an environmental regulatory body; development of environmental policy and legislation; establishment of environmental monitoring network; setting up a comprehensive plan on the use and development of natural resources; formulating long-term development strategies for sectors; conducting environmental impact assessment; drafting an environmental and sustainable development strategy. The National Plan also identifies seven action programs, including the program on water environment protection, which is a program on an integrated river basin management, pollution control and waste management; and protection of wetlands. The Directive 187 assigns the Chairman of the State Committee for Science to lead the implementation of the Plan.
- In 1993, there was an important event for the cause of environmental protection: the National Assembly of the Socialist Republic of Vietnam (at 9th Congress) approved the Law on Environmental Protection in December 1993; before that on 22 May, 1993, the Ministry of Science, Technology and Environment was established. Also in this year, the workshop on "Chemistry and Environmental Protection" was co-organized by Vietnam Association for Nature and Environment Protection and Vietnam Chemistry Association.
- In 1994, the Law on Environmental Protection was enacted.
- In 1995, the Government approved the National Action Plan for Biodiversity Protection.
- In 1996, the Government promulgated the Decree No. 26/CP dated April 26, 1996 on sanctioning administrative violations in the field of environmental protection.
- In 1998, the Political Bureau of the Party Central Committee promulgated the Directive No. 36/CT-TW dated June 25, 1998 on "Strengthening environmental protection in the period of national industrialization and modernization". The first national environmental conference was held this year.
- In 1999, the 10th National Assembly passed the Penal Code, which has Chapter XVII - Crimes on the Environment. Also in this year, a series of environmental management activities were organized such as the first ASEAN Environment Forum; 4 projects on implementing the Directive No. 36-CT/TW of the Politburo of the Party Central Committee

on "Strengthening the environmental protection in the period of industrialization and modernization of the country"; promulgation of the strategy on management of solid waste in urban centers and industrial parks of Vietnam and the Regulation on management of hazardous wastes by The Prime Minister; signing of Vietnam on the International Declaration on Cleaner Production; and Informal Meeting of the 5th ASEAN Environment Ministers and Launch of ASEAN Environment Year.

- In 2000, some activities were undertaken, such as handling and overcoming the consequences of chemical war on people and the environment; Vietnam signing the international manifesto on cleaner production; hosting the 5th ASEAN Ministerial Meeting on Environment and ASEAN Environment Day Launching Ceremony. In September 2000, completing and submitting the National Strategy on Environmental Protection in the 2001-2010 period to the Government; preparing GEF project development strategy); Establishment of environmental funds and drafting biosafety regulations.
- 2001 is the first year of systematic strengthening of environmental protection activities in ministries and sectors with scientific research funds in the spirit of the Law on Science and Technology; reviewing and enhancing cooperative activities in the field of environment (5 years of ASEAN cooperation, ASEAN Environment Year 2000, building of ASEAN gardens, signing bilateral cooperation agreements with countries ...) The First meeting of Environment Ministers of Vietnam, Laos and Cambodia on cooperation in the field of environment.
- In 2002: reviewing the results obtained after four years of implementation of the Political Bureau's Directive No. 36-CT/TW of June 25, 1998 on enhancing environmental protection in the period of industrialization and modernization of the country; 10 years implementation of the Environmental Protection Law 1993 and drafting a Resolution of the Politburo on environmental protection; approval of the Environmental Protection Strategy for 2001-2010 and the Action Plan 2001-2005; Establishing the National Environmental Protection Fund under the Prime Minister's Decision No. 82/2002/QD-TTg dated June 26, 2002; Formulating and implementing projects on integrated management of big river basins (Cau and Sai Gon - Dong Nai); The International Support Group for the Environment officially coming into operation; Organization of the first Ministerial Conference on Environment for three countries of Indochina.
- In 2003, the national environmental protection strategy to 2010 and orientation to 2020 was approved. The Prime Minister issued the Decision No. 64/2003/QD-TTg dated April 22, 2003 approving the plan on thoroughly handling establishments causing serious environmental pollution; The state management system on NR&E became stable and put into operation; Issuance of Decree on environmental protection fees for wastewater; Organization of Conference on environmental protection of Nhue River - Day River Basin; participation of Vietnam in the ASEAN Environment Year 2003 event.
- In 2004, the Politburo of the Party Central Committee promulgated Resolution No. 41/NQ-TW on environment protection in the period of accelerating national industrialization and modernization. The Government issued Resolution No. 121/2004/NQ-TTg dated 12/5/2004 regulating sanctions against administrative violations in environmental protection; Minister of MONRE signed the Decision 04/2004/QD-BTNMT dated 5 April 2004 approving the Action Plan on conservation and sustainable development of wetlands in the period 2004-2010; drafting of the Law on Environmental Protection (amended); setting up three sub-departments of environmental protection in the South West Region, the Central Region and the Central Highlands; signing the Resolution No. 01/2004-NQLT-MTTQ-BTNMT dated October 28, 2004 between the Vietnam Fatherland Front and MONRE on coordinating the implementation of the National Strategy for Environmental Protection.

- In 2005, the National Assembly passed the amended Environmental Protection Law 2005; The Prime Minister promulgated a number of important documents on environment protection, such as Decision No. 34/2005/QD-TTg promulgating the Government's program of action for the implementation of Resolution No. 41-NQ-TW; Decision No. 328/2005/QD-TTg approving the national plan for environmental pollution control up to 2010; the 2nd National Environment Conference and the Saigon River Basin Environmental Summit were organized; Report on the current state of the environment was publicized; Some joint resolutions on environment protection were signed.
- In 2006, the Environmental Protection Law came into effect on July 1, 2006; the system of legal documents on environmental protection has been improved for example by the issuance of Resolution 80/2006/ND-CP dated 09/8/2006 detailing and guiding the implementation of some articles of the Law on Environmental Protection 2005; Preliminary review of 3 years of implementing the National Environmental Protection Strategy and Decision 64/2003/QD-TTg was conducted; The Government approves the project on protection and sustainable development of the ecological landscape of the Cau River basin; Vietnam ratified the National Plan for Implementation of the Stockholm Convention.
- In 2007, the Prime Minister approved the master plan for the national natural resources and environment monitoring network.
- In 2008, the Government issued Decree No. 25/2008/ND-CP regulating the functions, tasks, powers and organizational structure of MONRE; The Interdisciplinary Inspectorate of MONRE in collaboration with the Environmental Police Department investigated the act of dumping the sewage into the Thi Vai River of Vedan Vietnam Limited.
- In 2009, the Secretariat of the Party Central Committee promulgated Directive No. 29-CT/TW dated 21/1/2009 on further accelerating the implementation of Resolution No. 41-NQ/TW of the Politburo; The Government issued Resolution No. 27/NQ-CP on some urgent solutions for the state management of natural resources and environment. Important legal documents on environment were amended, supplemented and passed; Preliminary review on the 5-year implementation of the joint resolution between Vietnam Fatherland Front and MONRE was conducted; Vietnam participated in the 15th United Nations Climate Change Conference (COP 15).
- In 2010, the 3rd National Environment Conference and related events were organized; Reviews of the implementation of Decision No. 64/QD-TTg and five years of implementation of the report on the current state of the environment were conducted; The Prime Minister signed the Decision No. 1583/QD-TTg dated 23 August 2010 on the establishment of the University of Natural Resources and Environment.
- In 2011, the National Assembly issued the Resolution on monitoring the implementation of environmental policies and laws in economic zones and craft villages and the launched for the implementation of the National Target Program on Reinforcing and Improving Environmental Pollution, period 2011-2015; Vietnam joined the 17th Commission Meeting of the MRC (25-26 January 2011).
- In 2012, the Prime Minister signed Decision No. 1216/QD-TTg dated 5 September 2012 approving the National Environmental Protection Strategy up to 2020 with a vision to 2030 and the National Target Program on Remediation pollution and environmental improvement.
- In 2013, the Prime Minister approved the Strategy for sustainable exploitation and use of natural resources and marine environmental protection until 2020 with a vision to 2030; The Government issued Resolution No. 35/NQ-CP on some urgent issues in environmental protection.
- In 2014, the National Assembly adopted the Environmental Protection Law 2014; The

system of policies and laws in environmental protection became improved; The Prime Minister issued Decision No. 25/2014/QD-TTg on the functions, tasks, powers and organizational structure of VEA; The National Environment Report was published.

- In 2015, the Government promulgated a series of legal documents relating to environmental protection, such as Decree No. 43/2015/ND-CP on the establishment and management of water resource protection corridors. In addition, many activities related to environmental protection took place; for instance, the Vietnamese delegation led by the Prime Minister attended the 21st United Nations Framework Convention on Climate Change (COP21) Conference, contributing to reaching the Paris Agreement; The 13th ASEAN Environment Ministers Meeting, 4th National Environment Conference and related events were organized tin Hanoi; special report of Vietnam on disaster risk and extreme events management to promote climate change adaptation (SREX Vietnam) was launched; The 4th National Environment Conference was organized.
- From 2016 until now, Vietnam further improves the legal system on environment by issuing documents guiding the implementation of the Law on Environmental Protection 2014, and other specialized laws related to water environment protection, such as those on maritime traffic, waterway navigation, chemicals, minerals, fisheries, etc. and most recently the Law on Irrigation promulgated in 2017 and entered to effect from 01/7/2018.

Organizational system of water environmental management:

1) Before 1992, there was no separate environmental management system; the environment was managed by scientific and technical agencies, specifically:

- Period 1959-1965: by State Committee of Science. This committee was established under the Decree No 016-SL of March 4, 1959 of the President of the Democratic Republic of Vietnam.
- Period 1965 - 1975: The State Committee of Science was divided into 2 agencies: the State Committee for Science and Technology and the Vietnam Academy of Social Sciences. The State Committee for Science and Technology is responsible for the unified management of science and technology in the North.
- Period 1975 - 1985: The Research sector was separated from the State Committee for Science and Technology to become the Vietnam Academy of Sciences. The State Committee for Science and Technology is responsible for state management of science and technology in the whole country.
- Period from 1985 - 1992: In 1990, the State Committee of Science and Technology was renamed to the State Committee for Science, performing the function of state management in the fields of natural sciences, technology and social sciences.

2) The 1992 - 2002 period with the Ministry of Science, Technology and Environment

In 1992, the organization of environmental management was formulated, with the Ministry of Science, Technology and Environment being established. The Ministry performed state management functions in the field of scientific research, technological development, standardization, industrial property and environmental protection throughout the country. Later, the Departments of Science-Industry-Environment of provinces were established with the function of State management of environment in the provinces.

According to the Law on Environmental Protection 1993 (Article 38[42]) and Decree 175/CP dated December 27, 1993 guiding the implementation of the Law on Environmental Protection 1993:

- The Government exercises unified State management of environmental protection throughout the country.

[42] Order No. 29-L/CTN dated December 27, 1993.

- The Ministry of Science, Technology and Environment is responsible to the Government for exercising the function of State management of environmental protection.
- Ministries, ministerial-level agencies and agencies under the Government shall, according to their respective functions, tasks and powers, cooperate with the Ministry of Science, Technology and Environment in protecting the environment in the respective sectors and establishments under their direct management.
- People's committees of provinces and cities under central authority shall perform the function of State management of environmental protection in the provinces.
- The Department of Science, Technology and Environment is responsible to the people's committee of the province or city directly under the Central Government for the protection of the environment in the province/city.

Thus, at this stage, the environmental management system in Vietnam combined management by sector and by territory.

3) From 2002 to now with the Ministry of Natural Resources and Environment.

In 2002, due to the requirements of the task of managing natural resources and environmental protection in accordance with the development trend of the country in the new period, at the first session, the National Assembly of the Socialist Republic of Vietnam, on August 5, 2002, decided to establish the Ministry of Natural Resources and Environment on the basis of merging three main existing units, namely the Environment Agency; General Department of Land and General Department of Hydro-Meteorology.

On November 11, 2002, the Government issued Decree No. 91/2002/ND-CP regulating the functions, tasks, powers and organizational structure of the Ministry of Natural Resources and Environment[43]:

"The Ministry of Natural Resources and Environment is a governmental agency which performs the function of State management of land resources, water resources, mineral resources, environment, hydrometeorology, geodesy and cartography throughout the country; performs the State management over public services and acts as representative of the owners of state capital portions at state capital-contributing enterprises in the domain of land and water resources, mineral resources, environment, hydro-meteorology, measuring and mapping in accordance with the law".

Article 3 of Decree 91 clearly stipulates that the organizational structure of the Ministry is composed of two basic components: Firstly, the organizations assisting the Minister in performing the state management function which include 16 divisions and secondly the non-business organizations which consist of 6 divisions.

The organizations assisting the Minister in performing the state management function, include the Land Management Department; Department of land registration and statistics; Department of Environment management; Department of Environmental Appraisal and Impact Assessment; Hydro-Meteorological Department; Department of science and technology; Financial planning Department; Department of International Cooperation; Legal Department; Department of Personnel; Department of Water Resources Management; Department of Geology and Minerals of Vietnam; Department of Environmental Protection; Mapping Department; Inspection and Administration units.

Non-business organizations under the Ministry include the National Hydro-meteorological Center; Center for land investigation and planning; Remote sensing center; Information centre; Journal of Natural Resources and Environment; Resource and environment Magazine.

In 2017, the Government issued Decree No. 36/2017/ND-CP dated 04/04/2017 defining the functions, tasks, powers and organizational structure of the Ministry of Natural Resources and Environment. According to the provisions of this Decree:

[43] Article 1.

The Ministry of Natural Resources and Environment is a governmental agency performing the function of state management of land; hydrometeorology; climate change; survey and cartography; marine and island environmental management and protection; remote sensing; and public services in the field under its management[44].

- Regarding the water resources:

a) To guide, examine and organize the implementation of policies, laws and decided or approved strategies, master plans, plans, programs, schemes and projects on prevention and control of water source pollution, deterioration and depletion, restoration of deteriorated or depleted water sources and response to and remediation of water source pollution incidents;

b) To classify inter-provincial water sources by degree of pollution and depletion; to elaborate plans on the regulation and distribution of water resources to restore inter-provincial water sources already polluted, deteriorated or depleted and organize the implementation of such plans after they are approved by competent authorities; to guide and examine the implementation of plans on the regulation and distribution of water resources and plans on prevention and control of water source deterioration and depletion in construction, production, business and service activities in accordance with law;

c) To guide the implementation of regulations on discharge of wastewater into water sources of river basins

- Regarding the environment:

a) To guide, examine and organize the implementation of policies, laws, inter-sectoral, inter-provincial, inter-regional and national strategies, master plans, plans, programs, schemes, projects and tasks on environmental protection and security and cross-border environmental issues after they are decided and approved by competent authorities;

b) To formulate and submit to competent agencies for promulgation national environment indicators and the system of environmental statistical indicators in accordance with law;

c) To guide and examine the elaboration and appraisal of environmental protection master plans; to elaborate and appraise national environmental protection master plans in accordance with law;

d) To guide and examine the appraisal of strategic environmental assessment reports, appraise and approve environmental impact assessment reports and certify environmental protection plans; to provide technical instructions on strategic environmental impact assessment and elaboration of specialized environmental impact assessment reports; to organize according to its competence the appraisal of strategic environmental assessment reports, appraise and approve environmental protection schemes, environmental impact assessment reports;

đ) To guide, examine and organize control of polluting sources from production, business and service activities of economic zones, industrial parks, export processing zones, hi-tech parks, industrial clusters and craft villages in accordance with law; to guide environmental protection regarding chemicals, pesticides, veterinary drugs, import of discarded materials to be used as production materials and dismantlement of used seagoing ships; to elaborate a list of bioproducts used for pollution prevention and mitigation and waste treatment; the list of polluting bioproducts banned from import, the list of scraps permitted for import; to prevent and respond to environmental incidents in accordance with law;

e) To guide, examine and organize the management of environmental quality of water, river basins in accordance with law;

h) To guide, examine and organize the implementation of environment monitoring nationwide in accordance with law; to organize the implementation of the national environmental monitoring program; to build and manage the national environmental monitoring system; to manage the quality of and inspect, calibrate and test environmental monitoring devices in accordance with law; to manage environmental monitoring data and

[44] Article 1.

develop a national environmental monitoring database; to publicize national environmental observation results, to provide professional guidance and technical assistance for the management of environmental monitoring data;

i) To guide and examine the making and announcement of environmental status reports; to make and publicize environmental status reports, national environmental topical reports, publicize and provide environmental information and data in accordance with law;

k) To guide and appraise, examine and assess environmental pollution treatment and waste disposal works, equipment, models and technologies; to guide and examine environmental verification in accordance with law; to conduct researches and apply scientific and technological advances in environmental protection and develop environmental technologies; to formulate and implement trial programs and models on sustainable and environment-friendly production and consumption;

l) To guide, examine and organize the registration, certification, grant, re-grant, modification and revocation of environmental licenses, certificates and practice certificates in accordance with law;

m) To guide, examine and organize the determination of environmental damage and identification of responsibilities to pay compensation for environmental damage, payment of deposits for environmental improvement and rehabilitation and environment insurance in accordance with law; to manage the Vietnam Environmental Protection Fund; to guide the organization and operation of sectoral and local environmental protection funds; to act as the national focal point of the Global Environment Facility;

n) To assume the prime responsibility for organizing the negotiation, signing and implementation of treaties and participating in international environmental organizations; to mobilize international resources; to coordinate and implement international schemes, projects and tasks on environmental cooperation as assigned by the Government.

Environmental monitoring

Environmental monitoring in Vietnam is mainly carried out in two forms: periodic environmental monitoring and automatic continuous environmental monitoring.

Periodic environmental monitoring

Since 2007, the Vietnam Environmental Protection Agency (now the Vietnam Environment Administration) under the Ministry of Natural Resources and Environment has developed, approved and implemented 12 programs on monitoring air and surface water in many provinces of the country. There are 7 river basin environmental monitoring programs and 3 key economic area monitoring programs, 1 impact monitoring program for hydropower and 1 operational monitoring program on bauxite exploitation and transport. In 2015, the Ministry of Natural Resources and Environment reviewed, adjusted and added a number of contents and fields in environmental monitoring, reflected in the National Natural Resources and Environment Monitoring Plan for the period 2016 - 2025 with a vision to 2030 (approved at the Prime Minister's Decision No. 90/QD-TTg dated January 12, 2016). Many legal documents in the field of environmental monitoring have been developed; the environmental monitoring network has constantly strengthened in terms of number of stations, environmental components and monitoring parameters. So far, the periodic environmental monitoring programs have been implementing in the whole country, all provinces and river basins.

Department of Water Resources Management is assigned to monitor surface water resources of rivers. The National Meteorological and Hydrographic Center is assigned to manage the meteorological monitoring stations, many of which are equipped with air quality monitoring facilities; these stations provide the results of monitoring of some environmental parameters, such as SO_2, NO, NO_2, CO, dust, etc. Groundwater is surveyed by the Center for Water Resources Planning and Monitoring, started in three economic zones: The Northern

Delta, the Southern delta and the Central Highlands. The General Department of Geology and Minerals of Vietnam implements monitoring at radioactive mines.

Ministries are responsible for implementing monitoring activities for their respective sectors and areas, in addition to cooperating with the Ministry of Natural Resources and Environment to carry out monitoring activities within the national environmental monitoring network.

- The Ministry of Health: with the focal unit of the Health Environment Management Department, is assigned to monitor the waste from the system of hospitals throughout the country.
- Ministry of Agriculture and Rural Development: in charge of water monitoring for aquaculture purposes and irrigation works; soil and acid rain monitoring in the south[45].
- Ministry of Science and Technology: management of radiation monitoring and warning network; monitoring and analyzing acid rain in the north and surface water and sediments in the upstream areas of Red River and Lo River[46].
- Ministry of Defense: carrying out radioactive and chemical warning monitoring.

At the provincial level, environmental monitoring is implemented on the basis of local environmental management requirements. Provinces and centrally run cities have established environmental monitoring centers under different names under the Department of Natural Resources and Environment or the Environmental Protection Agencies. Many provinces have developed and submitted to the provincial People's Committee for approval the environmental monitoring network as regulated in Article 96 of the Law on Environmental Protection. However, some provinces have not yet completed this task or are in the process of developing an environmental monitoring network to submit to PPC for approval. For most provinces, the Center for Environmental Monitoring has developed and implemented an overall environmental monitoring program, with environmental elements being air, water (surface water, sea water, ground water) and soil; Other provinces are developing and waiting for the approval of the overall environmental monitoring program.

Along with the development of the environmental monitoring centers, the number of staffs working in the field of environmental monitoring management in the provinces also increased in terms of quantity and quality.

Automatic and continuous environmental monitoring

There is a total of 81 surface water stations and 44 ambient air stations installed and operating in 25 provinces/cities (including An Giang, Vung Tau, Bac Ninh, Binh Duong, Ca Mau, Can Tho, Da Nang, Dak Lak, Dong Nai, Ha Giang, Ha Noi, Hai Phong, Hau Giang, Khanh Hoa, Nam Dinh; Nghe An, Phu Tho, Quang Ninh, Tay Ninh, Thai Nguyen, Thanh Hoa, Thua Thien Hue and Vinh Phuc). Some provinces have the station systems regularly and stably operated, such as Hanoi (08 water stations, 14 air stations), Quang Ninh (08 water stations, 11 gas stations), Dong Nai (11 water stations, 03 gas stations), Binh Duong (07 water stations), etc.

Nationwide, there are a total of 422 automatic waste water monitoring stations and 158 automatic exhausted gas monitoring stations in operation. It is typical for the provinces having many industrial activities and waste treatment activities, such as Ba Ria Vung Tau (21 wastewater stations, 13 waste gas stations); Bac Ninh (18 wastewater stations); Binh Duong (39 wastewater stations, 01 waste gas station); Binh Thuan (12 wastewater stations, 08 waste gas stations); Dong Nai (59 wastewater stations, 09 waste gas stations); Hanoi (22 wastewater stations, 01 waste gas station).

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[45] Ministry of Agriculture and Rural Development. Report summarizing the results of the implementation of the 2017 environmental plan, the first 6 months of 2018 environmental plan implementation and the proposed environmental plan for 2019 in the dispatch to MONRE 5017 / BNN-KHCN dated 2 July 2018.

[46] Ministry of Science and technology. Report on the implementation of environmental tasks in the period 2016-2018, plan for 2019 and budget estimates for the period 2019-2021.

At local level, emission monitoring is mainly done by periodic sampling method; however, in the coming time, the trend will be to enhance automatic monitoring (waste water and air emission).

Management and reporting of environmental monitoring data

Along with the improvement of the environmental monitoring system, the results of environmental monitoring from the central to the local level are also better managed. Basically, the monitoring data are managed by the agencies directly carrying out the monitoring program, in the form of consolidated reports, data sheets or database.

The Ministry of Natural Resources and Environment uniformly manages the environmental monitoring data. Specifically, VEA manages the results of monitoring programs it implements; receives and stores monitoring data from the monitoring programs of the national environmental monitoring network. All these data are stored in the form of paper reports and database; The National Hydrometeorology Center manages and stores environmental monitoring data of automatic and continuous air monitoring stations; The General Department of Geology and Minerals of Vietnam manages and stores monitoring data of radioactive mines and mines containing radioactivity; The Department of Water Resources Management manages and maintains monitoring data for surface water resources of rivers and groundwater. Thus, the monitoring data are managed and stored at different monitoring units and reported and shared upon request from the higher level.

In other Ministries, the results of environmental monitoring mainly serve the management requirements of the ministries. Particularly for monitoring stations belonging to the national environment monitoring network managed by the ministries and branches, apart from being kept at the ministries and branches, these data must be reported annually to the Ministry of Natural Resources and Environment.

At the local level, environmental monitoring data which include the monitoring results from periodic environmental monitoring programs and from automatic continuous environmental monitoring stations, are mainly managed by the Environmental Monitoring Center of the local governments; for some provinces this responsibility is assigned to the Information Centers or Environmental Protection Agencies. Main forms of data storage are paper reports and data files on the computer, only a few provinces have environmental monitoring database.

The data connectivity and transfer are in progress[47]. According to the reported data, 29 among 50 provinces (46%) carry out data transfer from automatic monitoring station to Department of Natural Resources and Environment.

As at the central level, due to the lack of legal documents regulating the management of monitoring data, the regular reporting of provinces to the Ministry of Natural Resources and Environment has almost not been implemented. Only a few provinces make the data transfers but not often or share data within the framework of tasks and programs having cooperation between central and local levels. Data provision is available only upon the request from the higher-level agencies. The transfer of data from the Department of Natural Resources and Environment to the Ministry of Natural Resources and Environment has almost not been implemented. Up to now, only two provinces (Ca Mau and Quang Ninh) have been transmitting data to the Ministry (the receiving unit is the Northern Environmental Monitoring Center).

Difficulties and shortcomings

Despite of many efforts, the management and implementation of environmental

[47] Stipulates at the Article 22 and Article 23 of Circular No. 43/2015/TT-BTNMT of the Ministry of Natural Resources and Environment's dated September 29, 2015 on the report on the current environmental status, the set of environmental indicators and the management of environmental monitoring data; Article 56 and Article 57 of the Circular No. 24/2017/TT-BTNMT of Ministry of Natural Resources and Environment's dated 01/9/2007 regulating the environmental monitoring techniques.

monitoring also have some inadequacies. Specifically:

- The current network of natural resources and environment monitoring has not met the demand for socio-economic development, especially in key economic areas, urban areas and craft villages; limitation in number of stations and low monitoring frequency are not enough for comprehensive assessment of the quality of environmental components in space and time. The number of automatic water and air pollution control stations is still limited, not meeting the needs of monitoring and warning. Hardware systems (automated stations) and software (management, connection and data transmission) have not been synchronously invested. Data quality of some monitoring programs is not guaranteed.
- There is still a lack of regulations on technical procedures, methods of environmental monitoring, regulations on limit of the concentration of parameters for some environmental components and production fields.
- Lack of regular coordination and cooperation in environmental monitoring between agencies inside and outside the Ministry of Natural Resources and Environment.
- The professional staffs (especially the technical staff) who conduct monitoring and analysis in general are still lacking and have limited qualifications and professional skills, that makes them difficult to approach the high monitoring technology.
- The results of environmental monitoring are still scattered in many agencies and organizations, which have not been synthesized and stored in the database, even within the Ministry of Natural Resources and Environment.
- Information and monitoring data are rarely shared; the implementation of the reporting regime is not complete; there is a lack of regulations on the exchange of monitoring data among agencies within the Ministry of Natural Resources and Environment, as well as with other ministries and agencies. Data transfer requirements under Circular 24/2017 / TT-BTNMT have not been fully implemented and are currently in the process of upgrading or replacing the equipment.
- The information dissemination to the community is limited, not yet exploiting new but quite popular communication channels in the current period, such as smart phones, social networks, etc.
- The capital from enterprises and other sources of social mobilization in environmental monitoring has not been utilized.

Existing legal documents related to the management of the environment and water environment

1) Party Congress documents

These documents have strategic implications for the overall management of environmental protection in Vietnam. Recognizing the importance of environmental protection, the Party and the National Assembly have issued many resolutions and directives on pollution prevention and environmental protection as reflected in Resolution No. 41-NQ/TW of the Party Central Committee enhancing environmental protection in the period of industrialization and modernization of the country; Resolution No. 24-NQ/TW of the Party Central Committee on active response to climate change, and strengthening management of natural resources and environmental protection.

Directive No. 36/CT-TW dated 25/6/1998 on enhancing environmental protection in the period of industrialization and modernization.

- The Directive evaluates the status of environmental pollution in Vietnam, such as increase of environmental incidents; surface water and groundwater are increasingly polluted and exhausted; water quality in large rivers decreases.
- There are many causes of the shortcomings, including: the Government, ministries, provinces are delayed and ineffective in implementing the Law on Environmental Protection 1993 and "National Plan on Environment and Sustainable Development 1991 - 2000"; Legal documents

on environmental protection are both inadequate and overlapping, not asynchronous; and Low environmental investment.

- The Directive requires the implementation of a number of specific measures, including: Strengthening integrated water resources management in river basins, urgently researching options for dealing with the risk of water shortage in the coming years; Enhancing and diversifying investment in environmental protection activities, such as adopting policies and mechanisms to mobilize to the utmost all resources from various economic sectors and people to protect the environment; Encouraging all organizations and individuals inside and outside the country to invest in environmental protection for Vietnam.

Official Dispatch No. 375-CV.KG/TW dated 11/8/1998 guiding the implementation of Directive No. 36 requests:

- In the program of action for the implementation of the Directive No. 36, attention should be paid to the contents: regular propaganda and education on the Law on Environmental Protection, National action program and the Directive on environmental protection throughout the Party and people; and measures to be taken to ensure strict compliance with the provisions of the Law on Environmental Protection.
- Some activities can be implemented immediately, such as: water source protection; inspecting and limiting pollution caused by production and business establishments; classification of polluting units and preparation of appropriate treatment plan; identifying specific time for treating the polluting establishments to reach the permitted environmental standards; relocating or suspending the establishments causing serious environmental pollution; only accepting the operation of newly built production and business establishments if they are complied with environmental standards. People's committees at all levels shall, within their responsibilities and powers, have to strictly handle cases of violation in accordance with current law. For urban centers, industrial parks and tourist resorts, centralized waste treatment plans, especially for hospital waste and hazardous waste should be developed. There should be plans on strengthening the State management, promoting scientific and technological research, training of experts as well as international cooperation on environmental protection. Solutions to mobilize and diversify resources for environmental protection activities should be identified.

***Resolution No. 41-NQ/TW dated 15/11/2004 of the Politburo on environmental protection in the period of promoting industrialization and modernization of the country*.**

- The Resolution emphasized that the 2001 - 2010 socio-economic development strategy adopted by the Ninth National Party Congress affirmed that the view of the country's development is "fast, effective and sustainable; economic growth coupled with progress, social equity and environmental protection". However, the country's environment continues to be degraded rapidly, reaching the alarming level at some places: the soil is eroded, degenerated; the quality of the water resources is drastically reduced.
- The Resolution requires:

+ To overcome environmental pollution and degradation, putting in priority the environmental restoration for severely polluted areas and severely degraded ecosystems. To basically settle the pollution of water sources, focusing on the management of wastes, especially hazardous wastes in industrial production, medical services and scientific research. To strictly control the use of chemical fertilizers, pesticides, food preserving chemicals and disease prevention drugs in aquaculture.

- Some specific tasks are:

+ For urban and suburban areas: To put an end to garbage dumping and discharge of untreated waste water into rivers, canals and lakes, first of all for Nhue River, Day River, Sai Gon River, Dong Nai River, Cau River, Huong River and Han River; To collect and treat all domestic and industrial waste by appropriate methods, with priority given to the reuse and recycling of waste, and minimizing the volume of buried waste, especially for the urban centers

lacking ground for burial sites; To thoroughly handle establishments which cause serious environmental pollution; To resolutely suspend the operation or force the relocation of establishments which cause serious pollution in residential areas but fail to work out effective solutions to handle;

+ For rural areas: To restrict the use of chemicals in agricultural and aquaculture production; collection and hygienic handling of packaging containing chemicals after use; To basically overcome environmental pollution in craft villages, industrial and handicraft establishments, in parallel with the formation of industrial clusters, ensuring environmental conditions; Take the initiative to plan the collection and treatment of the increasing volume of waste.

Resolution No. 24-NQ/TW dated 03/6/2013 on actively responding to climate change, enhancing resource management and environmental protection.

- By 2020, Vietnam will make fundamental changes in the exploitation and use of natural resources in a rational, effective and sustainable manner; restrain the increase of environmental pollution and decrease of biodiversity to ensure the quality of the living environment and ecological balance, supporting green and environmentally friendly economy; accelerate the national industrialization and modernization in association with the development of knowledgeable economy and the protection of natural resources and environment.
- Initiative will be taken in responding to climate change, and enhancing natural resource management and environmental protection based on integrated and unified inter-sectoral and inter-regional management. Meeting the immediate requirements, while ensuring long-term benefits, which are fundamental. Ensuring comprehensive implementation with focuses, taking appropriate steps in each stage; relying on internal resources, while promoting effective international supports and experience.
- Regarding environmental protection: preventing and thorough treating the establishments causing serious environmental pollution; 70% of the wastewater discharged into the river basins to be treated; more than 85% of hazardous wastes and 100% of medical wastes to be treated; over 65% of household waste to be reused or recycled.
- Targets to 2020: 95% of the urban population and 90% of the rural population will have access to clean and hygienic water; To control the safety and treatment of environmental pollution caused by war; To raise the quality of air environment in urban centers and densely populated areas; To significantly improve the environment of craft villages and rural areas.

  Specific tasks:

  + To establish and apply models of overall forecast of the impacts of climate change on socio-economic development, as well as on natural resources and environment; To apply the integrated and management of natural resources, environment and climate change adaptation in pilot river basins and coastal areas, then expand to the whole country.
  + To make and realize planning on exploitation and protection of water sources, intensifying the management of water sources in river basins and water regulation for socio-economic development; To intensify the control of polluting sources causing water pollution and closely control the exploitation and use of water in a thrifty, efficient and sustainable manner; To actively cooperate with other countries and international organizations in the protection of transnational water resources.

2) Legal documents on water environment

The Law on Environmental Protection and the Law on Water Resources and the relevant sub-law documents constitute the specialized legal framework for environmental protection. This includes regulations on the preparation and implementation of environmental impact

assessment reports (EIA), commitment to environmental protection; licenses for use and exploitation of water sources, permits for discharge of wastewater into water sources; National technical standards on environment for waste water, surface water and water used for other purposes; environmental protection charges for wastewater; sanction on administrative violations in the environmental protection field.

National Environmental Protection Strategy to 2020, vision to 2030

On December 2, 2003, the Prime Minister issued Decision No. 256/2003/QD-TTg approving the National Environmental Protection Strategy up to 2010 with a vision to 2020. The Strategy defines principles, objectives and solutions, including those related directly to protection and improvement of the river basin environment quality (bringing water quality in river basins up to the standards of water quality for agriculture and aquaculture), prevention and control of pollution, remediation of seriously polluted and degraded environment, protection and sustainable exploitation of natural resources (rational exploitation, protection and development of water resources), protection and improvement of the environment in key areas (river basins and wetlands). The strategy defines 36 national priority programs, plans and projects (on restoration of canals, ditches, rivers and lakes in urban areas which are severely degraded; on strengthening the state management capacity on environmental protection from the central to grassroots level; on improving the legal system on environmental protection; on Cau, Nhue-Day and Sai Gon-Dong Nai River Basin Environmental Protection; and on integrating environmental considerations into socio-economic development planning, etc.).

Decision No. 1216/QD-TTg dated 5 September 2012 of the Prime Minister approving of the National Environmental Protection Strategy up to 2020 and vision to 2030.

- The Strategy defines the guiding viewpoint, which confirming the priorities for pollution prevention and control, and the importance of efficiency and sustainability of the exploitation and use of natural resources. The target to 2020 is to control and substantially reduce the level of environmental pollution, resource depletion and biodiversity loss, to further improve the quality of living environment. The vision to 3030 is to prevent and reverse the tendency of increasing environmental pollution, resource depletion and biodiversity loss, etc., and to form the basic conditions for green economy of low waste and low carbon.
- The Environmental protection contents and measures include: prevention and control of sources of environmental pollution; reduce sources of pollution; basically addressing environmental issues in industrial parks, river basins and craft villages; assuring the safety of chemicals; reducing the environmental impact from mining; improving water use efficiency, reducing seasonal and regional water shortages by region (promoting integrated water resources management in river basins, combining the planning for the development of sectors and industries using much water and planning on water exploration and exploitation; enhancing pollution control, with emphasis on pollution control of river basins and cross-border water resources; Strictly controlling the establishments exploiting surface and underground water; carrying out research and application of underground water exploitation quotas for each area; reviewing and adjusting the socio-economic development plans; and development of industrial plants in conformity with the capacity of supplying surface water and underground water of each area, etc.).
- The Strategy outlines the implementing solutions, which include those on increasing and diversifying investment for environmental protection (increase the proportion of state budget for environment protection to 2% of the total national budget expenditure; promoting the rational and efficient use of environmental non-business funding sources, improving the mechanisms and policies of encouraging all economic sectors to invest in environmental protection; strongly implementing PPP; attracting and using effectively loans from international organizations and governments for environmental protection, especially in the remediation of pollution, and restoration and improvement of the environment, etc.).

- The Strategy defines indicators for monitoring and evaluating environmental protection results in the period up to 2020, such as: basic reduction of the sources of environmental pollution; overcoming and improving the environment of contaminated and degraded areas, and improving the living conditions of the people; mitigating the degradation, depletion of natural resources, and stopping the decline of biodiversity.

Law on Environmental Protection 2014

The first environmental protection law enacted in 1998 was the most important legal basis for environmental protection; it was amended by the 2004 and 2014 Laws. The LEP 2014 regulates that:

- Prohibited activities: Discharging wastes not treated up to environmental technical regulations; Discharging toxins, radioactive substances and other hazardous substances to land, water and air; Discharging to water sources toxic chemicals, wastes, not verified microorganisms and other toxic agents causing harms to human beings and bioorganisms.
- The environmental protection planning includes two levels: National environmental protection planning includes the contents: assessment of status of environment and environmental management; forecasting environmental changes and climate change; environment zoning; biodiversity and forest environment conservation; management of the marine, islands and river basin environment; waste management; technical infrastructure for environmental protection; and environmental monitoring system. The provincial-level environmental protection planning shall be made in conformity with the specific conditions of the respective province, either in a separate planning or in combining with the overall socio-economic development planning.

Law on Environmental Protection Tax 2010

According to statistics, the revenue from environmental protection tax continuously increased from 2012 to 2016 (11,160 billion VND in 2012, 11,512 billion VND in 2013, 11,970 billion VND in 2014, 27,020 billion VND in 2015, and about 42,393 billion VND 2016); it accounts for about 1.5% - 4.1% of total state budget revenue and accounts for about 0.3% - 0.9% of GDP annually.

Environmental protection taxes are different from environmental protection fees. Environmental protection fees are collected for the act of discharging waste into the environment, both in production and consumption (collected from the entities discharging wastes during the production process of and use of resources, such as domestic water price). The person liable to pay and the payer of the environmental protection fee shall be the person discharging waste into the environment (same entity). The environmental protection fee shall be determined on the principle of compensating environmental pollution treatment expenses. According to the Law on environmental protection, the environmental protection tax represents the orientation and regulation of the State for the consumption of some polluting products in order to limit the use of these products. Environmental protection taxes are applied to a number of products that, when used, will pollute the environment. The consumers are subject to the taxes, but the producers are the payers.

Decision No. 807/QD-TTg of the Prime Minister dated July 3, 2015, approving the target program of thoroughly handling seriously polluting establishments of the public interest, period 2016 - 2020.

- The program will is implemented from 2016 to 2020 with a total cost of 535 billion VND in provinces and centrally-run cities, having seriously polluted projects and establishments, which are subject to the support of the Program in accordance with the Decision No. 1788/QD-TTg dated 01/10/2013; No. 1946/QĐ-TTg dated 21/10/2010; No. 57/2008/QD-TTg dated 29/4/2008; No. 1435/QD-TTg dated 18/8/2014; No. 174/2006/QD-TTg dated 28/7/2006; and No. 187/2007/QD-TTg dated December 3, 2007, and provinces and centrally-run cities with newly emerging pesticide residues, causing serious and extremely serious environmental pollution, affecting on people's health and the socio-economic

development of the country.

- The overall objective of the Program is to remediate pollution, improve and restore the quality of the environment at public facilities and places, and the pesticide residue sites; to treat waste water in urban centers of grade II or higher, causing degradation and serious environmental pollution, in order to prevent and environmental pollution, ensure public health and contribute to the sustainable development of the country.
- Specific objectives to 2020 are to treat environmental pollution of 30 unhygienic landfills causing serious environmental pollution according to Decision No. 1788/QD-TTg dated 01/10/2013 of the Prime Minister, in order to overcome pollution, minimize degradation, improve and restore environmental pollution; Collect and destruct the residual plant protection chemicals, and restore environment for 70 sites which are seriously polluted by residual plant protection chemicals; Invest in the construction of 3 projects on treatment of domestic wastewater at sources of urban centers of grade IV or higher, directly discharged into 3 river basins of Nhue-Day, Cau and Dong Nai.
- The total budget for implementation of the Program is VND535 billion (adjusted and increased when the source is available, but not exceeding VND670 billion as stipulated in Resolution No. 73/NQ-CP dated 26 August) The environmental protection fund from the central budget is VND 493 billion (adjusted and increased when the source is available but not exceeding VND 548 billion as stipulated in Resolution No. 73/NQ-CP). ODA and other sources of funds shall be allocated when available, but not exceeding VND 3,430 billion as stipulated in Resolution 73/NQ-CP.

Law on Biology Diversity 2008 stipulates:

- The strategy on environmental protection is a basis for the national master plan for biodiversity conservation; Land and water areas are the contents of the projects on establishment of protected areas.
- Compensation for damage to biodiversity: Organizations and individuals that encroach on the conservation areas, biodiversity conservation facilities, plant varieties, animal breeds, microorganisms and fungi, the species on the list of endangered precious and rare species prioritized for protection, and biodiversity corridors, must pay compensations for damage according to the provisions of law. The compensation for environmental damage caused by pollution or degradation of biodiversity shall comply with the provisions of law. Compensation for biodiversity loss to the State shall be invested in the conservation and sustainable development of biodiversity in accordance with the provisions of this Law and other relevant legal regulations.
- Inland water protected areas established in accordance with the Law on Forest Protection and Development and the Law on Fisheries before This law takes effect, if meet the criteria for establishment of protected areas under the provisions of this Law, will not need to be re-established.

Decision No. 1478/QD-TTg of the Prime Minister issued on October 13, 2008, approving the planning of the inland water protected area system to 2020.

According to this Decision, there will be 45 inland water protected areas in all the river system of the country by 2020.

In addition to the above documents, related to the protection of the water environment, there are also sub-law documents, such as Decree 19/2015/ND-CP dated 14/02/2015 detailing and guiding some articles of Law on Environmental Protection; Decree No. 155/2016/ND-CP dated 18/11/2016 on sanctioning of administrative violations in environmental protection; Decree No. 154/2016/ND-CP dated 16/11/2016 on environmental protection fees for wastewater; Decree 80/2014/ND-CP dated 06/8/2014 on wastewater and wastewater treatment; Decree No. 03/2015/ND-CP dated 6 January 2015 on the determination of damage to the environment; Decree No. 18/2015/ND-CP dated 14/02/2015 on environmental protection

planning, strategic environmental assessment, environmental impact assessment and environmental protection plan; Decree No. 78/2014/ND-TTg dated 26/12/2014 on the organization and operation of the Environmental Protection Fund; Circular No. 65/2015/TT-BTNMT dated 21/12/2015 on the National Technical Regulation on the Environment - Surface Water Quality; Circular No. 66/2015/TT-BTNMT dated 21/12/2015 on the National Technical Regulation on the Environment - Groundwater quality; Circular No. 31/2017/TT-BTNMT dated September 27, 2017 promulgating the national technical standards on environment; Circular No. 31/2016/TT-BTNMT dated 14/10/2016 on the protection of the industrial environment, business and service centers, craft villages and production, business and service establishments; Circular No. 47/2017/TT-BTNMT dated 07/11/2017 on supervision of water resources exploitation and use; Circular 64/1027/TT-BTNMT dated 22/12/2017 regulating the minimum flow in rivers and streams; and other documents on economic and technical norms on the environment.

3) Other specialized legal documents related to water environment management

As water sources are used by different stakeholders and different stakeholders can cause pollution to the aquatic environment from their own activities, beside the specialized legislation on environment, there are other laws, ordinances and other sub-law documents also related to environmental protection, such as the Law on Chemicals, the Law on Natural Disaster Prevention and Control, the Law on Plant Protection and Quarantine, the Veterinary Law, the Irrigation Law, The Code on Maritime Affairs, the Law on Inland Waterway Traffic, the Law on Fisheries, the Law on Minerals ... These legal documents together with the specialized legislations on environmental protection form the legal framework on environmental protection in general, and water environment protection in particular.

4) Legal documents on sanctions against violations

In addition to the specialized legislation on environmental management and other areas related to environmental management, there are also regulations on sanctions for violations of environment and water environment.

Criminal Code 2915 (No. 100/2015/QH14)**, amended and supplemented in 2017**

The first 1985 Penal Code, revised in 1989, 1991, 1992, 1997, 1999, 2009, 2015, 2017, contains provisions on environmental crimes.

The 1999 Penal Code, which came into force on 1 July 2000, contains a separate provision on water pollution (Art. 183). The current Criminal Code is enacted in 2015, amended in 2017, effective January 1, 1818, has a chapter on environmental crimes (Chapter XIX), in which crimes of contamination Water environment includes:

- Article 235. Polluting the environment.
- Article 236. Violating regulations on waste management.
- Article 237. Violating the regulations on prevention, response and remedy of environmental incidents.
- Article 238. Violating regulations on safety of irrigation works, dykes and natural disaster prevention and combat; on protection of river banks.

Law on Handling Administrative Violations 2012 (No. 15/2012/QH13 dated 20/8/2012)

The Law on Handling Administrative Violations regulates administrative sanctions and measures for administrative handling. According to the provisions of this Law, the maximum fine level for violations in the field of environmental protection is VND 1 billion. On the basis of the provisions of the Law, the Government shall specify the acts, levels and competence of sanctioning.

Decree on sanctioning administrative violations in the field of environmental protection (No. 155/2016/NĐ-CP dated 18/11/2016)

This Decree deals with violations, penalties, fines, remedial measures against administrative violations, the power to make administrative violation notices and the power to

impose penalties against administrative violations; responsibilities and mechanism for cooperation in inspecting and imposing penalties against administrative violations on environmental protection.

The administrative violations against regulations on environmental protection prescribed in this Decree consist of: Violations against regulations on environmental protection plans, environmental impact assessment and environmental protection projects; Acts of violation causing environmental pollution; Violations against regulations on waste management; Violations against regulations on environmental protection committed by production, business and service establishments and industrial parks, export processing zones, high-tech parks, industrial complexes and centers of businesses and service providers; Violations against regulations on environmental protection in the fields of import of machinery, equipment, means of transport, materials, fuels, scraps, bio-preparations; import of used seagoing ships for dismantlement; festival and tourism activities, and mineral mining; Violations against regulations on prevention and control of environmental pollution and degradation, and environmental emergencies; Administrative violations related to biodiversity, including: Conservation and sustainable development of natural ecosystems; conservation and sustainable development of living resources; conservation and sustainable development of genetic resources; Acts causing obstruction of state management, inspection and imposition of penalties for administrative violations.

Other administrative violations against regulations on environmental protection which are not prescribed in this Decree shall be governed by other relevant Government's decrees on penalties for administrative violations against regulations on state management.

5) International treaties

Vietnam has entered into many international treaties related to water environment protection, such as UN Convention on Environmental Change (signed on 26/8/1990); International Convention on the Prevention of Environmental Pollution from Vessels (MARPOL Convention, signed on 29 August 1991); United Nations Framework Convention on Climate Change (signed November 16, 1994); Convention on the Use of Interstate Watercourses for Non-Traffic Purposes (Decision No. 818/2014/QD-CTN dated 15 April 2014).

Conclusions:

Through analysis and synthesis of the above data/information, it is clear that:

- *The system of policies and laws on environmental protection in general and water environment in particular is basically sufficient and can regulate all aspects of water environment protection activities, from the orientations of the Party, laws promulgated by the National Assembly to a series of documents issued by the Government and Ministries.*
- *State management organizational system for environmental protection in general and water environment protection in particular has been synchronously set up at both central and local levels and has been gradually improved.*
- *Participation of Vietnam in international treaties related to water environment management is the basis for implementing the management of the water environment in Vietnam, contributing to enhancing participation in international economic integration.*

3.1.3. Difficulties and challenges

Vietnam is facing four major environmental challenges: residues of Agent Orange left over from war; increasing environmental pollution and limitation in environmental management; more and more complicated increasing climate change, negatively affecting the ecological environment and sustainable development[48].

1) Grest challenge on water pollution.

[48] Statement by Minister Tran Hong Ha at the 3rd International Conference on Pollution, Environment Recovery and Environmental Management on March 8, 1977 in Binh Dinh Province.

Water pollution continues to increase in terms of scope and intensity; in many sites, water cannot be used due to pollution. Surface water in most urban areas, industrial parks and craft villages are polluted. In some places, the pollution level is high, such as in Nhue-Day, Cau and Dong Nai rivers[49]. Most of the wastewater containing oil and grease, chemical detergents and dyestuffs ... not appropriately treated is directly discharged into rivers and lakes. An example is the case of Thi Vai River pollution by the chemicals discharged from Vedan's factory for 14 continuous years. Therefore, in the past years, the Prime Minister has issued a number of programs and plans to deal with establishments seriously polluting environment, for example, the Decision 174 in 2006, Decision 187 in 2007, Decision 57 in 2008, Decision 1946 in 2010, Decision No. 64 in 2013, Decision No. 1788 in 2013 and most recently Decision No. 807 dated July 3, 2018. It can be seen that every plan targets the treatment of establishments polluting environment, especially those causing the water pollution in river basins and considerable funding source has been allocated for this; anyhow there are still many establishments causing severe environmental pollution that in July 2018, the Prime Minister directed to thoroughly dealt with the establishments of public interests in the 2016 - 2020 period.

There are many objective and subjective causes of water pollution, such as population increase, negative effects of industrialization and modernization process, poor and backward infrastructure; low people's awareness on environmental issues. In large cities, untreated waste water from hundreds of industrial establishments discharged directly into the environment is the main cause of pollution of the water environment. In rural areas, the infrastructure is outdated, most human and animal wastes are not treated and discharged to the soil or washed away, resulting in organic and microbial pollution. In addition, the abuse of plant protection substances in agricultural production leads to serious pollution in rivers, lakes, canals and ditches, which directly affects human health.

For the Mekong Delta, the Resolution No 120/NQ-CP dated 17/11/2017 of the Government identifies: “In the context of globalization and international integration, the Mekong Delta has a great opportunity for development but also faces a big challenge because it is vulnerable to natural changes. Climate change and sea level rise are occurring much faster than expected, causing extreme weather events and affecting people’s livelihood. The use of water from upstream area of the delta, especially the construction of hydroelectric power plants, cause a change in flow, reduction in sediments and fisheries resources, deeper salinization, which exerts negative impacts on the region’s socio-economic development. The intra-regional economic development in high intensity has led to harmful consequences, such as environmental pollution, serious ecological imbalance, land subsidence, groundwater level decline, coastal encroachment and reduction in area of natural forests, especially mangrove forests, cajuput forests and protection forests, being destructed, changed in use purpose or severe degraded. Besides, the over-extraction of sand and construction of houses and infrastructure along river, canals and ditches increase the risk of erosion.”

Transboundary pollution. Vietnam is a country with abundant water resources with 3,450 rivers and streams of 10 km or more, distributed in 108 river basins. However, Vietnam's water resources are mainly dependent on foreign countries, because nearly two thirds of Vietnam's water coming from overseas. Although not the main cause, cross-border pollution has posed an increasing impact on Vietnam's ecological environment[50].

2) Limitation in environmental management:

The state management system, although been strengthened, has not effectively dealt with

[49] Deputy Minister Tran Quy Kien's speech at the workshop on "Research on water resources management" co-organized by MONRE with WB on 06/02/2018 in Hanoi.

[50] Statement by Minister Tran Hong Ha at the 3rd International Conference on Pollution, Environment Recovery and Environmental Management on March 8, 2017 in Binh Dinh Province.

inter-sectoral, inter-regional and transnational issues, and has not meet the requirements of the environmental protection in the period of industrialization and modernization of the country, in the context of climate change.

The staffs working on environmental are inadequate in quantity and weak in quality, which fail to meet the new requirements, especially at local level and in the establishments; the staff capacity is still low compared to that of other countries in the region.

The allocation of state management tasks of water environment protection is still inappropriate with overlaps.

Awareness at different levels of government, in management agencies and organizations, and of individuals, responsible for environmental protection tasks is low and insufficient. There is not full recognition that water pollution is a direct and everyday danger to the human life as well as the sustainable development of the country, and it is difficult to overcome.

There are no strategies and plans for exploitation, use and protection of water resources in river basins and in large areas.

Investment and regular expenditures from the state budget and mobilization of resources in society are limited, not meeting the requirements; the use of financial resources is spread, with no focus, that leads to the low efficiency. Regular expenditures for the environment have reached 1% of total state budget expenditure, but still with no focus. In some provinces, the use of regular expenditures for environment is not yet for the right purpose, so not effective. The rate of investment back to environmental protection from the revenues on environment is low. The ODA funding for environmental protection is also low, scattered and tending to decrease. There are no reasonable regulations on financial contribution to management and protection of the water environment that results in financial shortage for water environment protection. The principles "the polluter pays for the costs of environmental remediation" and "beneficiaries of natural resources and environment must pay" have not been fully applied, and the payments are not adequate.

3) Climate change is becoming increasingly complex and faster than forecast, negatively affecting the ecological environment and sustainable development of the country. According to Minister Tran Hong Ha, climate change has impacted the environment for many years and is becoming clearer, manifested in the natural disasters and extreme weather events. According to the scenarios of climate change and sea level rise, Vietnam is one of the countries which bear the most negative impact. In the future, climate change will make environmental pollution more complex in many fields, such as the pollution in river basins.

3.2. Water utilization management (Law on Irrigation)

3.2.1. Overview of water utilization management

As introduced in Chapter 1, for thousands of years, the feudal Vietnam state has interested in using water resources for irrigation. In order to compensate part of the costs of constructing irrigation works, the farmer must pay a fee in the form of direct contribution of the construction labor or some kind of tax. Since 1949, during the early days of the Democratic Republic of Vietnam, the President issued Decision No.149/SL of April 12, 1953 on the land-use policy which has regulations on “paying for irrigation development or contribution to increasing the land productivity”.

In 1962, the Council of Ministers (now the Government) issued Decree 66-CP dated June 5, 1962 on the Regulations on the collection of irrigation fees. The Decree regulates:

For all agro-irrigation systems newly invested or rehabilitated by the State, after normal operation, and when the output of irrigated or drained land has been increased, the people, commune or state-owned farms should pay the cost of management and repair - this is called irrigation fee.

The level of irrigation fees will be based on the benefits of watering the land and the costs

of management and repair of the farm system depending on its type. To implement the economic accounting regime in the agro-irrigation systems with the collection of irrigation charges is to serve well the agricultural production and transport.

The Regulations also provide for production incentives and exemptions for irrigation fees.

Irrigation fees are counted in rice amount; in special cases, they are collected in cash twice a year, after harvesting seasons, at the same time with agricultural taxes collection.

In 1984, after 22 years of implementation of Decree 66-CP, the Council of Ministers issued Decree 112-HDBT on the collection of irrigation fees in replacement of the Decree 66-CP. The Decree stipulates:

All organizations and individuals benefiting from irrigation, drainage or other services from irrigation works managed by the State must pay irrigation fees to irrigation enterprises.

Irrigation charges include basic depreciation, depreciation of regular and large repair of machinery, equipment, workshops, warehouses, means of transport and other means used for maintenance, exploitation and management of irrigation works, excluding the depreciation of large pumps; Expenses for major repair and regular repairs of foundry sand works and earthworks, in addition to labor contributed by the people; Costs of electricity and petrol; Salary for staff, and management costs of irrigation factories. Irrigation fee is calculated in rice amount.

In order to reduce irrigation fees, the State temporarily does not calculate the basic depreciation of the foundry sand works and earthworks and basic depreciation of large pumps, considering them as State subsidy for agriculture. When it is necessary to add or replace large pumps, the National budget will be allocated directly to the Irrigation sector through the annual basic construction investment plans.

Law on Water Resources promulgated in 1998.

The Law includes a chapter regulating water resources exploitation and use, including[51]: harmonizing and distributing water resources; transferring water from one river basin to another; rights and obligations of organizations and individuals exploiting and using water resources; licensing the exploitation and use of water resources; exploiting and using water resources for daily-life activities, agricultural production, aquaculture, industrial production, mining, hydropower, navigation and other purposes; right of having water flowing through; exploring and exploiting underground water.

The Law also has a chapter on the exploitation of irrigation works, which stipulates that organizations and individuals using water or providing services for water from irrigation works for agricultural production must pay irrigation fee; those using water or providing services from irrigation works for purposes other than agricultural production, must pay water price; those discharging of waste water into irrigation works must pay waste water-discharging fee. State enterprises exploiting irrigation works or cooperative organizations for water consumption shall collect irrigation fee, water-consuming fee and waste water-discharging fee according to the provisions of law.

The Government shall stipulate the tariff of irrigation fee, water price and waste water discharge fee for each type of irrigation works, each type of water users, and each type of service provision from irrigation works in accordance with actual situation of each region in the country. The Ministry of Agriculture and Rural Development shall specify the level of irrigation fee, water-consuming fee and waste water-discharging fee for irrigation work-exploiting State enterprises under their respective management. The People's Committees of the provinces and centrally-run cities shall specify the levels of irrigation fee, water-consuming fee and waste water-discharging fee for irrigation work-exploiting State enterprises and cooperative organizations for water use under the province’s management.

[51] Chapter 3.

On the basis of the Water Resources Law 1998, the National Assembly Standing Committee issued the Ordinance on Exploitation and Protection of Irrigation Works (No. 32/2001/PL-UBTVQH10 dated 04/4/2001). The Ordinance expired on July 1, 2018 and was replaced by the Water Law of 2017.

The Ordinance is applicable to the hydraulic works already built and put into operation. The exploitation and protection of irrigation works related to dykes, flood and storm prevention and combat works, hydropower works, and urban water supply and drainage works, must comply with the provisions of this Ordinance and the provisions of the law on dykes, on the prevention and combat of floods and storms, on hydropower projects, on water supply and drainage for urban centers, and on water resources.

The Ordinance specifies a number of terms, such as "Irrigation Fee" meaning the service charge for water collected from organizations and individuals using water or providing services from irrigation works for agricultural production purposes; "Water price" meaning the price in the service contract on water, collected from organizations or individuals that use water or make services from irrigation works, except those for agricultural production; "Waste water discharge fee" meaning the fee collected from organizations and individuals discharging wastewater into irrigation works in order to contribute to water quality protection. "Water user cooperative organization" is a form of cooperation between people sharing benefits from irrigation works in their exploitation and protection of constructions for serving production and people's life.

Law on Water Resource 2012 (merged in 2017) replacing the Law on Water Resources 1998.

The Law includes a chapter regulating water resources exploitation and use, which includes 3 sections with regulations on economical and efficient water use; exploitation and use of water resources; and water distribution and harmonization[52]. The Law has no more chapter on the exploitation and protection of irrigation works, as it is regulated in the 1998 Law on Water Resources. So, the Ordinance on the exploitation and protection of irrigation works remains in force; only the provisions of the Ordinance, not complied with the Law on Water Resources, will be abolished.

On the economical and efficient use of water, the Law defines the responsibilities of organizations and individuals that exploit and use water to take measures to use water economically and efficiently, limiting water losses in water supply systems.

Regarding the water exploitation and use, like the Law on Water Resources 1998, this Law stipulates the rights and obligations of organizations and individuals exploiting and using water; the users which must be registered and licensed for water exploitation; the exploitation and use of water for different purposes; and regulations on the construction, exploitation and use of water reservoirs.

Regarding the harmonization and distribution of water resources, the Law regulates harmonizing and distributing water, and water transfer from a river basin to another.

On the basis of the Law on Water Resources 2912, some guiding documents have been issued, such as **Decree No. 201/2013/ND-CP dated November 27, 2013 detailing the implementation of a number of articles of the Law on Water Resources:**

The Decree has a separate chapter regulating the protection, exploitation and use of water, including provisions on the order, procedures and responsibilities of agencies, organizations and individuals in obtaining opinions of representatives of communities, organizations and individuals involved in the exploitation and use of water resources; and on the management of water exploitation and use for the users, subject to control through the grant of water resource permits. Water resource permits include: permits for underground water exploration; permits for surface water exploitation and use; permits for underground water exploitation and use; permits for exploitation and use of sea water; and Permit for discharge of wastewater into water

[52] Chapter 4.

sources. The water resource license has the following main contents: Name and address of the organization or individual licensed; Name and location of works for water exploration and exploitation, or discharge of wastewater into water sources; Water sources for exploration and exploitation, water sources for receiving wastewater; Scale, capacity, water flow and main parameters of water exploration, exploitation and wastewater discharge projects; Purpose of use of the permit for water exploitation and use; Mode of exploitation and use of water, or discharge of waste water; Duration of the permit; Specific requirements and conditions for each case of water resource exploration, exploitation and use, and discharge of wastewater into water sources, prescribed by the permit-granting agencies for the purposes of protection of water source and the legitimate interests of other concerned organizations and individuals; and Rights and obligations of the permit holder.

The decree also specifies the principles, conditions, order, procedures and competence to issue licenses; and transfer of the right to exploit water resources.

The financial regulation on water resources includes provisions on the grant of rights to exploit water resources: Organizations and individuals must pay for the right to exploit water resources in following cases where they have to have certificates: Water exploitation and use for commercial electricity generation; Exploiting surface water, ground water and sea water for business, service and non-agricultural production activities; Underground water exploitation with the scale of 20 m^3/day or more to grow industrial crops, cattle breeding and aquaculture.

In order to further guide the provisions of the Law on Water Resources and Decree 201, the Government has issued Decree No. 82/2017/ND-CP stipulating the method of calculation and level of charge of granting the right to exploit water resources; Decree No. 54/2015/ND-CP on incentives for economical and efficient use of water; Decree No. 33/2017/ND-CP on sanctioning administrative violations in the field of water and mineral resources; Decree No. 43/2015/ND-CP regulating the corridor for water source protection. The Ministry of Natural Resources and Environment also has issued some circulars: Circular No. 27/2014/TT-BTNMT dated 30 May 2014 regulating the registration of underground water exploitation, and form of dossier for grant, extension adjustment and re-issuance of water resource permits; Circular No. 47/2017/TT-BTNMT dated 07/11/2017 regulating the monitoring of water resources exploitation and use; Circular No. 75/2017/TT-BTNMT dated 29/12/2017 regulating the protection of underground water in drilling, exploration and exploitation of underground water; Circular No. 16/2017/TT-BTNMT dated July 25, 1977 stipulating technical and economic-technical norms for investigation and assessment of current status of water resource exploitation and use; Circular No. 44/2017/TT-BTC dated 12/5/2017 regulating the tariff of price on natural resource tax for the natural resource groups of the same phisico-chemical nature.

Law on irrigation 2017 (No. 08/2017/QH 14 dated 19/6/2017).

With respect to water exploitation and use, the Law on Irrigation stipulates:

- The irrigation activities must comply with the principle of integrated management of water resources, river basin, irrigation system, in combining management by administrative unit and for multi-purpose use; Ensuring national interests, national defense and security; environmental protection, climate change adaptation; contributing to ensuring water security and sustainable socio-economic development. Taking initiative in creating water sources, storing, regulating, transferring, distributing, supplying, irrigating, and draining water between seasons and areas; Meeting the requirements of production and daily-life activities in the system of irrigation works, river basins, regions and the whole country; Using water economically, safely and efficiently for the right purposes; Ensuring the quantity and quality of water in irrigation works.
- Water saving in irrigation: The use of water economically and effectively in irrigation activities must comply with the provisions of law on water resources and other regulations: In planning and investment to construction of irrigation works, solutions should be

proposed and selected on water source, water drainage, local water use, water reuse and inter-regional irrigation system; In the water management and exploitation, it needs make water source inventory and water demands in order to plan and implement the proper harmonization, distribution and use of water, and combating water loss; The production of water-using economic sectors should be organized in accordance with seasons, crops, plants and animals, and in line with the water source conditions, with having plan for water economical and efficient use; The use of irrigation water for crops should be economical and effective, encouraging the application of advanced irrigation technology; Organizations and individuals shall have to use water efficiently and economically for the right purposes.

- Applying advanced technologies for raising the capacity of forecasting and warning of changes in water sources, quantity and quality of water, drought, water shortage, salinity intrusion, desertification, floods, inundations, sedimentation, erosion of irrigation works, river banks, coastal areas, and impacts of climate change and from the development in river basins in service of irrigation works; saving and reusing water; enhancing the efficiency of the management and exploitation of irrigation works, prevention and combat against natural disasters, adaptation to climate change and protection of natural resources and ecosystems; ensuring the safety of dams and reservoirs.
- Irrigation planning must include contents related to water exploitation and use such as: analysis and assessment of natural conditions and water sources; Forecasting the development trends and development scenarios, water resources in the context of the impact of climate change, natural disasters, and development of river basins; Reviewing the sectoral and regional linkages; Analyzing, calculating and elaborating irrigation projects according to development scenarios nationwide, and for regions, river basins, irrigation work systems and administrative units; Ensuring the generation, storage, balance, harmonization and distribution of water sources, minimizing the risk of droughts, water shortages, saline intrusion, desertification, floods, inundation, water pollution and degradation, and other disasters related to water.
- Regulations on the operation of irrigation works, reservoirs for hydropower generation, irrigation and agricultural production; drought, water shortage, salinity intrusion; operation of dams and reservoirs; operation of reservoirs for hydropower generation and inter-reservoir operation for irrigation.
- The State invests in the construction of specially important irrigation works, large irrigation works and irrigation works with difficult mobilization of social resources and water reservoirs in water scarcity areas; irrigation works in service of national defense and security, and for natural disaster prevention and combat; irrigation works in areas inhabited by ethnic minority people, in mountainous and island areas, the areas with particularly difficult socio-economic conditions and the areas heavily affected by climate change. Organizations and individuals using irrigation products and services shall have to invest to the construction of small irrigation works and inland irrigation works. The State encourages and creates conditions for organizations and individuals to invest in the construction or investment to the construction of irrigation works in the form of public-private partnerships. The construction of irrigation works must take into account the ability to harmonize, transfer, distribute and use water between irrigation works and other water sources.
- Irrigation products and services include public and other irrigation products and services. Public irrigation products and services include: Tree watering and water supply for salt production, aquaculture and husbandry; Water drainage in service of agricultural production, rural and urban areas, except for inner cities; Flood drainage, flood prevention, tide prevention, salinity prevention, saline washing, alum washing. Other irrigation works and services include: Water supply for domestic and industrial use; Water drainage for

industrial parks, export processing zones, economic zones and hi-tech parks; Combining power generation; Business, tourism and other entertainment activities; Aquaculture in reservoirs; Combining waterway navigation.

- Provisions on principles and basis of pricing and competence to decide on irrigation products and services, and support to the use of irrigation water products and services. The change from irrigation fee to irrigation price is the newest point of the Irrigation Law, that supports to capitalize on investment from the community to build and maintain irrigation works, while ensuring essential activities for the people, and step by step approaching the market mechanism. It is important to determine the price of water, but Vietnam has little experience as well as the scientific basis in the pricing of water to ensure proper market mechanisms, reflecting the reality of the irrigation works[53].
- Regulations on small irrigation, in-field irrigation, infrastructure for small irrigation and in-field irrigation in meeting the requirements of modern and synchronous irrigation and drainage, serving for diversified water use in agriculture; Taking initiative in water consumption for production and people's life; Applying advanced technology and solutions, saving water, combating water loss in construction investment, management and exploitation.
- MARD is the focal point to assist the Government in performing state management of irrigation and other relevant agencies are responsible for formulating and promulgating the irrigation works operating procedures, and options for disaster response and emergency response.

Based on the Law on Irrigation 2017, some guiding documents related to water use management have been issued, such as: Decree No. 67/2018/ND-CP dated 14/5/2018, detailing some articles of the Law on Irrigation; Decree No. 77/2018/ND-CP dated 16/5/2018 on development on small irrigation, in-field irrigation and advanced economical watering; Decree No. 63/2018/ND-CP dated 2 May 2018 of the Government providing for funding support to irrigation works; Decree No. 96/2018/ND-CP dated 30/6/2018 regulating in detail the price of irrigation products and services and supporting the use of irrigation water products and services; Circular No. 05/2018/TT-BNNPTNT dated 15/5/2018 detailing some articles of the Law on Irrigation.

On dam and reservoir safety, the Decree No. 114/2018/ND-CP of the Government dated on 04 September 2018, on management of dam and reservoir safety stipulates that dam and reservoir safety management should base on the principles:

- Dam and reservoir safety assurance is the top priority in investment in construction, management and operation of dams and reservoirs.
- Dam and reservoir safety management must be performed regularly and continuously during the process of surveying, designing, constructing, managing, operating and protecting dams and dam reservoirs.
- Dam and reservoir owners shall take charge of safety of their own dams and reservoirs.
- Dam and reservoir operators shall take responsibility to manage, operate and ensure safety and efficiency of dams and reservoirs.

On the contents of Dam and reservoir safety management during construction (articles 5-9):

[53] Speech of Mr. Tinh, the Director General of the Directorate of Water Resources on June 28, 2018 at the meeting with some media and press agencies about the implementation of the Law of Irrigation 2017. He said that to do this, Directorate of Irrigation is coordinating and instructing provinces to implement the water price calculation in accordance with the regulation on irrigation price in the Law on Irrigation, and with the support of Australia and the Netherlands it was deployed in Bac Ninh, Lam Dong ... Besides, it is socialization in irrigation works with the aim of maximizing resources from the private sector, strengthening the fight against violations of irrigation works, especially discharge wastewater into irrigation works.

- Requirements for design and construction of dams and reservoirs
- Contents of natural disaster response plans applied to works and dam lowlands during construction
- Appraising and approving the natural disaster response plan applied to works and dam lowlands during construction
- Checking dam and reservoir acceptance
- Dossier retention

On the contents of Dam and reservoir safety management during operation (articles 10-30):

- Declaration and registration of dam and reservoir safety
- Reservoir operation procedures
- Appraising, approving, adjusting and publishing reservoir operation procedures
- Reservoir operation procedure adoption
- Dam and reservoir monitoring
- Dedicated hydrometeorology monitoring
- Checking dams and reservoirs
- Responsibilities for checking and assessing dam and reservoir safety before and after annual rain season
- Dam and reservoir safety testing
- Appraising and approving the outline and result of irrigational dam and reservoir safety testing
- Maintenance, repair, improvement and modernization of dams and reservoirs and installation of operation surveillance system and devices for warning of safety for dams and dam lowlands
- Protected zone of dams and reservoirs
- Activities carried out within the protected zone of dams and reservoirs requiring license
- Dam and reservoir protection
- Marking of boundary of the protected zone of hydroelectric dams
- Natural disaster response plans and emergency response plans
- Appraising and approving emergency response plans
- Flood map of dam lowlands
- Dam and reservoir rescue
- Dam and reservoir database system
- Funding for dam and reservoir safety management

On the responsibilities of ministries, sectors and agencies, the Decree stipulates that

1. The Ministry of Agriculture and Rural Development shall:

- issue, as authorized, or submit the proposal to competent regulatory agencies for them to issue and implement plans, policies and legislative document regarding management of irrigational dam and reservoir safety;
- establish national standards and issue national technical regulations and technical-economic restrictions on management of irrigational dam and reservoir safety;
- comply with provisions of the law on management of irrigational dam and reservoir safety and instruct local authorities to comply with provisions of the law on management of irrigational dams and reservoirs;
- organize the declaration and registration of dam and reservoir safety, retain dam and reservoir dossiers, establish, approve and adopt reservoir operation procedures, install dam and reservoir monitoring device and dedicated hydrometeorology monitoring device, check and assess dam and reservoir safety, test dam and reservoir safety, maintain and establish maintenance procedures for dams and reservoirs, install operation surveillance system and device for warning of safety for dams and dam

lowlands; mark the boundary of the protected zone of dams and reservoirs, prepare and implement protection plans, natural disaster response plans and emergency response plans and set up a dam and reservoir database system for specially-important irrigational dams and reservoirs and irrigational dams and reservoirs of which the operation and protection relate to 2 or more than 2 provinces;

- make a statistical review of irrigational dams and reservoirs and establish and manage irrigational dam and reservoir database;
- conduct scientific research and apply advanced technologies for management of irrigational dam and reservoir safety and reinforce the agency in charge of management of irrigational dam and reservoir safety, provide training courses in professional skills for persons involved in management of irrigational dam and reservoir safety;
- organize dissemination and provide education in order to raise people's awareness of irrigational dam and reservoir safety;
- inspect and handle violations against laws and complaints on management of irrigational dam and reservoir safety;
- provide guidelines for testing irrigational dam and reservoir safety;
- include the estimate of funding for assurance of safety for irrigational dams and reservoirs under management in the estimate of annual state budget expenditure made by the Ministry of Agriculture and Rural Development which is sent to the Ministry of Finance and Ministry of Planning and Investment;
- send the proposal for giving monetary assistance from central government budget to local authorities with the aim of ensuring irrigational dam and reservoir safety to the Prime Minister for ratification purpose.

2. The Ministry of Industry and Trade shall take charge of state management for safety of hydroelectric dams and reservoir. To be specific:

- Issue, as authorized, or submit the proposal to competent regulatory agencies for them to issue and implement plans, policies and legislative document regarding management of hydroelectric dams and reservoirs;
- Investigate and establish a database of hydroelectric dams and reservoirs;
- organize dissemination and provide education in order to raise people's awareness of hydroelectric dam and reservoir safety;
- inspect and handle violations against laws and complaints on management of hydroelectric dam and reservoir safety;
- perform other tasks related to state management for safety of hydroelectric dams and reservoirs.

3. The Ministry of Planning and Investment shall preside over and cooperate with the Ministry of Finance and relevant agencies in balancing and allocating funding for 5-year midterm public investment, annually settle high-priority and mandatory irrigational dams and reservoirs and perform tasks involved in management of dam and reservoir safety in accordance with provisions of the Law on Public Investment, Law on State Management and relevant law provisions.

4. The Ministry of Finance shall preside over and cooperate with the Ministry of Agriculture and Rural Development in balancing and allocating annual state funding for management of dam and reservoir safety from central government budget, funding for rescue and handling of incidents related to irrigational dams and reservoirs and funding for other tasks as prescribed in the law on management of irrigational dam and reservoir safety in compliance with provisions of the Law on State Budget and relevant law provisions.

5. Relevant ministries and ministerial agencies, as authorized and assigned, shall cooperate with the Ministry of Agriculture and Rural Development and Ministry of Industry and Trade in performing duties involved in the state management for dam and reservoir safety.

The provincial People's Committees have the following responsibilities:

1. Provide guidelines and disseminate, and follow legislative documents on management of safety for dams and reservoirs in provinces.
2. Take responsibility for safety of dams and reservoirs in provinces.
3. Carry out inspection and handling of administrative violations relating to management of provincial dam and reservoir safety.
4. Assign responsibilities for performing duties involved in state management for safety of dams and reservoirs under provincial management to management agencies and government authorities of various levels.
5. Allocate annual funding from local government budget to cover expenditure on management of safety for dams and reservoirs under provincial management as per regulations herein and relevant law provisions.
6. Reinforce agencies in charge of management of dam and reservoir safety and provide training courses in professional skills for persons involved in management of provincial dam and reservoir safety.
7. Perform other state management duties relating to safety of dams and reservoirs under management.

Conclusions:

- *Institutional frameworks related to water use management have been established very early and continuously adjusted and supplemented in a way that is consistent with the market mechanism, encouraging participation of the private sector and increasing international cooperation. To date, the institutional framework for water use management has been substantially and fully regulated by the two specialized laws, the Water Resources Law 2012 and the Irrigation Law of 2017, and other relevant laws and sub-law documents.*
- *The State management agencies assisting and responsible to the Government for the management of the use of water resources assigned are the two ministries, MONRE and MARD: MONRE is responsible for the Law on Water Resources, while MARD is responsible for the Law on Irrigation.*
- *Thus, the exploitation and use of water resources are governed by two different water use law (Water Resource Law and Irrigation Law), and managed by two different ministries (MONRE and MARD); besides, there are other specialized laws (on waterway navigation, tourism, electricity development, minerals, etc.), other Ministries involved (Ministry of Transport, Industry, etc.) and local governments involved. There is no a competent "conductor" and the management of water resource use is not yet effective.*
- *Transfer of irrigation fees to prices of irrigation products and services is a very new policy, which is the most important provision of the Irrigation Law of 2017.*

3.2.2. Core issues of water management

Different types of tools can be used to implement water resources management. Tools can be classified according to their function or nature. By nature, the tools can be classified into policy, legal, economic and technical tools. In order to manage water use efficiently, fairly and sustainably, Vietnam has implemented a number of management tools based on market access, such as water tariffs; charges and fees in water exploitation and use; environmental protection charges for wastewater (going to apply wastewater tariffs); Irrigation fees (from July 1, 2015) converted into prices of irrigation product and services, and environmental protection fees (which are gradually changing to drainage prices).

As mentioned above, sustainable water use management in Vietnam is becoming more urgent than ever when only less than 30% of total water resources of Vietnam are generated in the country and nearly 70% of it generated outside[54] the country territory. Meanwhile, water

[54] Water resources management for sustainable development, 21/04/2015. Website of the Department of Water Resources Management, MONRE, (http://dwrm.gov.vn/index.php?language=vi&nv=news&op=Hoat-dong- cua-Cuc-Tin-lien-quan/

from outside the country tends to decrease due to hydropower development by upstream countries. In addition, the inefficient use of water, continuous decline of water resources in both quantity and quality, and the effects of natural disasters and climate change have been impacting to the human life and economic growth of the country. Therefore, the management of water use based on market access is needed, following some principles, in which the basic principle is supply-demand. Water management managers must use economic tools to regulate the behavior of economic actors in the use of water resources by affecting their costs and benefits[55]. This tool will bring revenue to the budget or financial resources for water supply and drainage, pollution treatment and water quality rehabilitation.

In Vietnam, to date there exist taxes, charges, fees and prices for management of water resources:

1) Tax on water extraction for hydropower development.

- Environmental Protection Tax 2010
- Circular No. 44/2017/TT-BTC dated 12/5/2017 on the tariff frame on natural resource tax calculation for groups of natural resources of the same phisico-chemical nature, including the tax tariff framework for natural water used for hydropower generation.

2) Charges and fees on granting permits for exploitation and use of water resources and discharge of wastewater into water sources; Environmental protection fee/Drainage charge.

- Decree No. 152/2015/TT-BTC dated 02 October 2015 guiding resource taxes on natural water, including surface water and groundwater, excluding natural water used for agriculture and forestry, fishery, salt making and the sea water used for cooling purpose.
- Decree No. 82/2017/ND-CP dated 17/7/2017 regulating the method of calculating, the fee for the grant of the right to exploit water resources (for surface water and underground water).
- Decree No. 80/2014/ND-CP dated 06/8/2014 on water drainage and waste water treatment (which stipulates the price of water drainage and wastewater treatment services). According to the provisions of this Decree, the local government already collected water drainage charge and waste water fee will not collect environmental protection fees. Up to now, many provinces have collected water drainage charge and waste water treatment fee.
- Decree No. 154/2016/ND-CP dated 16/11/2016 on environmental protection fee for wastewater.
- Decree No. 164/2016/ND-CP dated 24/12/2016 on EP fees for mineral exploitation.
- Circular No. 270/2016/TT-BTC dated 14/11/2016 regulating the rates, regime of collection, remittance, management and use of fees for evaluation of water resource exploration, exploitation and use; discharge of water into the water source and practice of underground water drilling by national agencies.

3) Irrigation fee/Irrigation price.

- The Law on Charges and Fees (No. 97/2015/QH13), effective from 01/01/2017, stipulates that irrigation fee are one of 17 kinds of fee to be converted into the price mechanism set by the State Law of Price 2012. The Law on Price does not stipulate the entities benefiting exemption or support in using irrigation products and services.
- The Irrigation Law regulates the price of irrigation products and services (Article 30), effective from July 1. The law stipulates policies to support the use of irrigation water products and services (Article 36).
- Decree No. 96/2018/ND-CP dated 30 June 2018 regulating in details the price of irrigation products and services and support for the use of public irrigation water products and services.

QUAN-LY-TAI-NGUYEN-NUOC-DE-PHAT-TRIEN-BEN-VUNG-4173).

[55] Nguyen The Chinh.

In fact, the core issue of water resource management is the issue of water pricing. This is because:

The rate of water resource taxes, charges and fees related to the exploitation and use of water resources are low and incomplete and does not correspond to the economic value of using water[56]. According to the Ministry of Finance's budget estimates, the amount of land and water rents accounts for only 0.6 to 1.5 percent of the total revenue. This shows that the economic sectors are using water almost free. In addition, due to the fact that the investigation and assessment of water resources still face many difficulties, with not adequate concern at local level, with nor close cooperation between water resource management agencies and the tax authorities, and with inadequate information system on reserve and quality of water resources at local level, that leads to difficulties in collecting water resource tax. In addition, there is Decree 154 on EP fees for wastewater tariffs from livestock and poultry production establishments, but it is difficult to determine the scale of the establishments which requires paying the fee[57].

In order to overcome these constraints, it is necessary to address water use management based on market access, in particular it needs to determine the viewpoint of water pricing on the economic value of water with the objective of competition for the water users for domestic purposes, agriculture, industry, water transport and aquaculture. At the same time, it is important to understand the nature of the water as a commodity; so, the price of water must meet the costs of supplying water to the user; subsidies for irrigation and clean water need to be reduced to encourage efficient and economical use of water. However, it is important to set water prices, but Vietnam has little experience as well as the scientific basis in pricing water to ensure proper market mechanisms[58].

Conclusions:

The key issue in the management of water resources use is the need to determine the water price immediately according to the nature of the water as the good. However, in order to do this, it is necessary to have support and learn experience from international organization and foreign countries[59].

3.2.3. Water utilization and water environmental management

Utilization of water generates waste water, which must be collected and treated for before being discharged into the receiving water. Water is used for various purposes, so wastewater can come from a variety of sources including domestic consumption, industrial production, agricultural production, aquaculture, water transport, underground water exploitation and mineral exploitation. With the linkage between water use and wastewater, the water use management and water environment management are two areas of one management field, in other words, regarding the water/wastewater management there are regulations on environmental protection in both areas.

Water use management and water environment management are implemented through some measures, such as licensing for exploration and exploitation of surface water, underground

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[56] According to data from Nguyen The Chinh: In implementing Decision 59/2006 / QD-TTg of the Ministry of Finance, the amount collected from the units of MONRE is only 2.96 billion VND. The amount of taxes collected from mining activities for hydropower development is about VND2,900 billion, while the country is currently exploiting millions of cubic meters of water for production and domestic use.

[57] Nguyen The Chinh.

[58] New points of the Law on Irrigation - meeting with some media and press agencies about the implementation of the Law on Irrigation, June 28, 2018.

[59] According to the information at the above-mentioned meeting, the General Department of Water Resources is coordinating, instructing provinces to implement the water price calculation in accordance with the regulation on irrigation price in the Law on Irrigation, and with the support of Australia and the Netherlands it was deployed in Bac Ninh, Lam Dong ...

water, discharge of wastewater into water sources and underwater drilling[60]; environmental impact assessment for water use programs and projects; evaluating the water source's receiving capacity; monitoring of water resource exploitation and use[61], and discharge of wastewater into water sources; operation of inter-reservoir system; compensation for damages caused by water pollution and the costs of treatment and rehabilitation of polluted water source . As discussed above, these measures are institutionalized by legislation.

Water use management and water environment management can be implemented using various tools and one of them which have been applied in many countries and also in Vietnam is economic tool, the tool of the market economy. With the recent new regulations (as mentioned above), water is considered a commodity[62] and the exploitation and use of water is subject to natural resource tax, environmental taxes and environmental fees. There is also responsibility on compensation for damage caused by environmental pollution.

1) Natural resource tax: is collected according to the Law on Natural resource (No. 45/2009/QH12 dated November 25, 2009) and Circular No. 152/2015 / TT-BTC guiding on the Natural resource tax, particularly the tax is collected for the natural water including surface water and ground water (except for natural water used for agriculture, forestry, fishery and salt production). Environmental taxes are collected under the Law on Environmental Protection 2010 and its guiding documents.

2) Environmental fees: include the following:

- Environmental protection fee for mineral exploitation (Decree 164/2016/ND-CP);
- Fee on the right to exploit surface and underground water for production, business and services (Decree No. 82/2017/ND-CP). Payers are the organizations and individuals that are licensed to exploit and use surface and underground water. The level of fee on water resource exploitation right (m) is regulated based on the purpose of water exploitation, ranging from 0.1% to 2.0% depending on the type of activity.
- Environmental protection fee for domestic wastewater. The payer is the user of the water that generates the wastewater. The environmental protection fee is calculated as a percentage of the selling price of 1m3 of clean water, not including VAT (Decree No. 154/2016/ND-CP) or the fee on water drainage and of wastewater treatment (Decree No. 80/2014 / ND-CP). For industrial wastewater, the environmental protection fees depend on the pollutants in the wastewater.

3) Damage compensation: determined in accordance with Decree 03/2015/ND-CP.

Thus, management of water resources use and environmental management always go hand in hand; the water use organizations and individuals are responsible for paying water use taxes and paying fees and charges for environmental protection and waste water treatment.

3.3. Flood control

3.3.1. Overview of flood control

As introduced in Chapter 1, irrigation and flood control have been concerned since ancient times. After the successful August Revolution in 1945, in May 1945, President Ho Chi Minh sent messages to the provinces having dikes: “no flood - no crop loss; floods are as dangerous as invaders; to fight hunger, we have to fight against floods; to combat flood, it is necessary to protect dyke in time”. Only 10 days after the establishment of the Provisional Government, on January 10, 1946, President Ho Chi Minh went to inspect the dyke

[60] From 2013 to the end of January 2017, the provinces have granted about 14,600 permits, while the national government: 630 permits.

[61] For example, Circular 47/2017 / TT-BTNMT dated 07/11/2017 on monitoring of water exploitation and use stipulates that water quality parameters must be monitored during the process of water resources exploitation and use.

[62] The Law on Irrigation of 2017 regulates irrigation price that was previously stipulated as irrigation fee.

embankment work against floods and on May 22, 1946, signed Decree No. 70 on establishing the Central Committee for Dyke Protection in the North (the forerunner of the Steering Committee for Flood Prevention and Combat) having the task of studying and recommending all flood control plans and controlling dike protection; At the same time, he assigned the Chairman of the Northern Administrative Committee to organize and demonstrate clearly the responsibility of the state for one of the most important areas related to irrigation and water management in an agricultural country. Moreover, in the letters to people in the provinces having dyke on 15/6/1950 and on 12/6/1952; the article “Flood prevention "(16/7/1953); letter to all compatriots, soldiers and cadres on the prevention and combat against floods and storms" (June 10, 1957) ... he pointed out the damages of natural disasters, on one hand, and encouraged people in the country in general and people in the provinces with dyke systems in particular to pay attention to the prevention of natural disasters, on the other hand. President Ho Chi Minh also pointed out: "flood is the pioneer of the poverty, the ally of the invader; it makes our people hungry and decreases the resistance ability of our people. He emphasized: "During the rainy season, the work of dyke maintenance, flood and storm prevention and combat are extremely important tasks” and “flood and drought prevention and combat are as difficult as fighting the enemy. President Ho Chi Minh said that to combat droughts and floods, it is necessary to do well in irrigation and control well the deforestation[63].

Beside the dike systems, there are hydropower reservoirs with a total capacity of about 56 billion m3, accounting for 86% of the total capacity of the reservoirs throughout the country; in addition to electricity generation they also contribute significantly to cut / reduce / slow down flood during rainy season. According to the plan approved by competent authorities, by 2018, the country has 818 hydropower projects with a total capacity of 23,182 MW, of which 385 projects have been put into operation with the capacity of 18,564 MW, 143 projects are being implemented with a total capacity of 1,848 MW and 290 projects are under investment with a total capacity of 2,770 MW[64]. Major hydropower projects are located in large, major river basins. The list of irrigational and hydropower reservoirs in the river basin which need inter-reservoir operation procedure is approved by the Prime Minister. The Ministry of Natural Resources and Environment developed inter-reservoir operation procedure for 11 river basins, including those of Ma, Ca, Huong, Vu Gia-Thu Bon, Tra Khuc, Koon-Ha Thanh, Ba, Se San, Srepok and the Dong Nai) with 68 hydropower reservoirs.

Documents related to flood control:

- Ordinance on the Prevention and Combat of Flood and Storm on March 20, 1993 and Ordinance on Amending, a supplement of Articles of the Ordinance on Prevention and Combat of Flood and Storm dated August 24, 2000). It has been expired and replaced by the Law on Irrigation of 2017.
- Law on Water Resources (1998): expired, replaced by the Law of Water Resources 2012.
- Ordinance on Exploitation and Protection of Irrigation Works dated April 04, 2001: expired, replaced by the Law of Irrigation.
- Law on Dykes 79/2006/QH11 dated 29/11/2006: expired partially.
- Decision No. 285/2006/QD-TTg dated 25/12/2006: expired, replaced by Decree No. 114.
- Decree No. 72/2007/ND-CP dated 07/5/2007 on Decree on Dam Safety Management: expired, replaced by Decree No. 114.
- Decision No. 172/2007/QD-TTg dated 16/11/2007 approving the National Strategy on Natural Disaster Prevention, Response and Mitigation to 2020.
- Decision No. 92/2007/QD-TTg dated June 21, 2007 approving the planning on flood

[63]Trinh Thi Hong Thanh - "President Ho Chi Minh and the work of flood prevention and dyke maintenance". 05/10/2013

[64] Ministry of Industry and Trade. Planning, construction, management and operation of hydropower projects, 08/08/2018.

prevention in the Red and Thai Binh river system: expired, replaced by Decision No. 257/QD-TTg.

- Decree No. 112/2007/ND-CP dated October 20, 2008 on integrated management, protection and exploitation of natural resources and environment of hydropower reservoirs.
- Circular No. 34/2010/TT-BCT dated 07/10/2010 regulating dam safety management of hydropower projects.
- Decision No. 1397/QD-TTg dated 25 September 2012 approving the irrigation planning of the Mekong Delta for the period 2012-2020, orientation to 2050 in the context of climate change and sea level rise.
- Law on Water Resources 2012.
- Law on Environment Protection 2014.
- Decision No. 257/QD-TTg dated 18/02/2016 approving the planning on flood prevention and dike planning in the Red and Thai Binh river system.
- Law on Irrigation 2017.
- Decree No. 67/2018/ND-CP dated 14/6/2018 detailing some articles of the Law on Irrigation. Clauses 1, 2, 3, 4 and 11 of Article 4 shall cease to be effective and replaced by Decree No. 114.
- Decree No. 114/2018/ND-CP dated 04/9/2018 on management of dam and reservoir safety.
- Circular No. 05/2018/TT-BNNPTNT dated 15/5/2018 detailing some articles of the Law on Irrigation.
- Resolution No. 76/NQ-CP dated 18/6/2018 on natural disaster prevention and control.

Law on Irrigation 2017 regulates:

- The State shall provide support to organizations and individuals providing irrigation products and services in serving flood prevention and combat. Advanced science should be applied to improve the capacity of forecasting and warning the evolutions of water sources, floods, inundation and climate change.
- Regarding the operation of irrigation works in case of floods/inundation, the irrigation work managers shall have to organize the development of plans on response to floods/inundation occurring in the locality; In case of floods/inundation, the operation must ensure the safety of the works, and at the same time, other measures must be taken to minimize the damage to people and property.
- Operation of dams and reservoirs: when floods/inundations occur, the reservoir or inter-reservoir operation shall comply with the decisions of competent state agencies on irrigation.

Decree No. 114/2018 / ND-CP dated 04/9/2018 on management of dam and reservoir safety

- The decree regulates the safety management of dams and reservoirs for the dams with a height of 5 meters or more or a reservoir of 50,000 m^2 or more, and safety for the downstream areas. Dams are works built to raise water level or together with other related works to create water reservoirs. Water Reservoir is a structure formed by the dam and related works for water storage, whose main task is to regulate the flow, cut, reduce the flood, and provide water for industrial and agricultural production. The downstream area is the flooded area when the reservoir discharges water according to the procedure, flood release takes place in case of emergency or dam breakage occurs. An emergency situation is the case of rain or flood over the design frequency; earthquake that exceeds design standards in the reservoir or other damaging effects.
- Dam and reservoir safely shall be managed from the design stage to the exploitation stage. In the design stage, there must be a disaster response plan for the project and the downstream area during construction. In the exploitation stage, some works must be carried out, such as: developing the operation procedures, the operating the reservoir; monitoring dams and reservoirs; inspecting dams and reservoirs; checking and assessing dams and

reservoirs' safety before the annual rainy season; developing disaster response plan and emergency response plan, appropriate response plans for each flood situation in the downstream areas, and floodplain maps.

- Establishment of the council for assessment of safety of dams and reservoirs: The Ministry of Agriculture and Rural Development shall decide to set up the councils for assessment of safety of dam and reservoir under the Ministry's management; The Ministry of Industry and Trade shall decide to set up an advisory council for assessing the safety of dams and reservoirs of important hydropower plants and the hydropower dams and reservoirs built in two or more provinces. The council for assessment of safety of dams and reservoirs at provincial level shall be set up by provincial-level People's Committees for the dams and reservoirs under the province management.
- Fund for development of flood/inundation map in the downstream area of the dam affected by floods from many dams in two or more provinces, is allocated by the National budget to the Ministry of Agriculture and Rural Development.

Resolution No. 76 / NQ-CP dated 18/6/2018 on natural disaster prevention and combat

- Direction viewpoint: Natural disaster prevention and control shall be implemented in the way of integrated risk management in the basin, inter-regional and inter-sectoral; For developing plans and investment projects, it must fully assess the impacts of natural disasters.
- Investment, capacity building, resistance of infrastructure, consolidation and upgrading of river dykes, sea dykes and reservoirs promptly repairing and overcoming dike and dam reservoirs, improving drainage capacity; Promoting the socialization, encouraging and facilitating the private sector to participate in providing services related to meteorological and hydrological activities.
- For some regions, such as the Northern Delta and the North Central Region: ensuring the dike safety and strictly controlling flood prevention planning, dyke planning and land use planning, especially the use of area on river banks to protect the flood drainage space. Raising the level of assurance of flood safety for the system of river dykes and reservoirs. For the Northern and Central Coastal Areas: focusing on raising the capacity to cope with big floods; Preparing integrated flood management plans for river basins; Handling infrastructure works (architectures, traffic roads), thus obstructing flood drainage and flooding. For the Tay Nguyen Region: Constructing water supply and water storage facilities to ensure water supply for production and daily life; Strengthening monitoring and forecasting of water sources; Organizing the efficient operation of irrigation systems for storing fresh water; Promoting the use of advanced irrigation solutions, saving water for rice and upland crops. For Mekong Delta: effectively implementing the Government's Resolution No. 120/NQ-CP of November 17, 2017 on sustainable development of the Mekong River delta in response to climate change.
- Responsibilities of ministries and sectors: MARD: study and propose mechanisms and policies to promote the socialization in investment, management and exploitation of dykes, dams and natural disaster prevention and combat works in the linkage with socio-economic development, and submit to competent authorities for consideration and decision making; review standards and technical regulations in the construction of dykes, dam reservoirs and natural disaster prevention works in order to ensure safety toward natural calamities. MONRE: review, adjust and supplement regulations on forecast, warning and communication of natural disasters in accordance with the level of disaster risk, appropriate to the reality, and submit to the Prime Minister in 2020; update and announce detailed scenarios of climate change and sea level rise, as a basis for developing a response plan; intensify the inspection and strict control of the exploitation of natural resources and minerals, especially the management of river and coastal sand and gravel exploitation in

areas prone to increasing risks of natural disasters; inspect, supervise and promptly propose the adjustment and supplementation of inter-reservoir operation procedures in river basins, ensuring safe operation, meeting practical requirements and efficient exploitation of water resources; direct implementation of measures to automatically update reservoir operation data before 2020.

Conclusions:

- *The legal basis for flood control is relatively adequate.*
- *The mechanism of flood control which relies on integrated management has been stipulated in the documents on natural disaster prevention and combat, such as the National Strategy on Disaster Prevention and Combat, the Law on Disaster Prevention and Combat and most recent Resolution 76 of the Government.*

3.3.2. Relevant agencies and functions

- Ministry of Agriculture and Rural Development is the focal point to assist the Government in performing state management of agriculture (mainly responsible for irrigation and natural disaster prevention and control), specifically: directing, guiding and inspecting the implementation of prevention and combat and overcoming consequences of floods/inundations; organizing hydrological and meteorological monitoring, forecasting and warning floods/inundations; be responsible for the state management of irrigation dams and reservoirs.
- MONRE: plays a key role in hydro-meteorological forecasting activities.
- Ministry of Industry and Trade: responsible for state management of dam and reservoir safety.
- Ministry of Planning and Investment shall assume the prime responsibility for, and coordinate with the Ministry of Finance and concerned agencies in, balancing and allocating funds for medium-term of 05 years and each year investments to handling failure dams and reservoirs and management of dam and reservoir safety in accordance with the provisions of the Law on Public Investment, the Law on the State Budget and other relevant laws.
- Ministry of Finance shall assume the prime responsibility for, and coordinate with the Ministry of Agriculture and Rural Development in, balancing and allocating annual non-business expenditures to management of dams and reservoirs safely under the central budget tasks; the cost of salvage and repair of dams and reservoirs; funds for the implementation of other law provisions on the management of dam and irrigational reservoirs' safety according to the provisions of the State Budget Law and relevant laws.
- Ministry of Construction: responsible for urban drainage system and public works.
- Other ministries and ministerial-level agencies shall, within their authority have to coordinate with the Ministry of Agriculture and Rural Development and the Ministry of Industry and Trade in performing the State management over dam and reservoir safety.
- Provincial People's Committees: guide, disseminate and organize the implementation of legal documents on the management of dams and reservoirs in their respective localities; be responsible for the safety of dams and reservoirs in the area.

3.3.3. Strengths and weaknesses of IWRM (flood management)

3.3.3.1. Strengths

- Flood management has been attracting the attention of the Party and State of Vietnam. Therefore, the Party's resolutions always emphasize the importance and requirements of flood control; strategies, policies and legislation on flood control has been gradually improved with some major laws, such as the Law on Water Resources, the Law on Irrigation and a series of sub-law documents and guidelines on flood management, such as

the reservoir operation procedure and flood drainage. The state management system on water resources management in general and flood control in particular have been gradually upgraded and improved by the establishment of specialized general departments, such as General Department of Water Resources, General Department of Disaster Management and General Department of Hydrology.

- There have been flood control mechanisms in the direction of integrated flood management, initially implemented by research in some river basins. Integrated flood management maximizes the capacity of floodplains and minimizes the damage caused by floods[65]. Flood management requires a balanced approach between structural and non-structural methods, such as flood transfer, flood storing, deployment of drainage systems and flood prevention works, and groundwater management.
- In recent years, with the support of international organizations, especially JICA, flood management has been studied and implemented at central and local levels. Specifically:
  - The project "Building flood management framework for some typical river basins in Central Vietnam" implemented by the Institute of Water Resources Planning, Ministry of Agriculture (completed).
  - Integrated Flood Management Plans implemented by some provinces such as: Thua Thien Hue Province (Integrated Flood Management Plan for Huong river basin); Binh Dinh province (the Provincial People's Committee issued Decision No. 1546/QĐ-UBND dated 11/5/2018 approving the task of developing the integrated flood management plan for Kon river; Quang Binh province (the Provincial People's Committee has approved the detailed flood management plan for the Gianh and Nhat Le river basins in the period 2016-2020, with orientation to 2030.

3.3.3.2. Some difficulties and obstacles:

1) Regarding the legislation:

a. There are no specific regulations on integrated flood management. Although the principle of flood management is use of integrated management approach, there is no specific regulation and guidance on integrated flood management and planning; there is only implementation in some provinces.

b. Regulations on reservoir operation and hydropower dam safety management[66]:

Regarding the legal corridor, the operation of reservoir and management of dam safety are governed by the laws on Natural Disaster Prevention, Electricity, Construction and Irrigation. However, there are some difficulties as follows:

- There is a legal gap on the operation of reservoirs and management of dam safety of the hydropower reservoirs. Technically, the requirements related to reservoir operation and dam safety management are the same as for irrigation reservoirs, but the Law on Irrigation does not regulate the operation and safety management of hydropower dams.
- Some regulations are not clear or not detailed enough for implementation, such as the regulations on development of disaster response plans according to the law on natural disaster prevention; installation of specialized hydrometeological monitoring systems in accordance with the regulation on hydrometeorology; identification of downstream areas and development of floodplains map in accordance with the Law on Irrigation.
- Some overlapping regulations, such as the setting up disaster response plans according to regulations on natural disaster prevention and response with the natural disasters response scenarios for constructions and downstream areas under the Law on Irrigation; reporting on hydrometeological monitoring and operation of reservoirs is not in accordance with the

[65] Concept of the World Meteorological Organization.

[66] Report of the Ministry of Industry and Trade dated 08/08/2018 on the planning, construction, management and operation of hydropower projects.

regulations on hydrometeorology and dam safety management.

2) Human resources for the state management of natural calamities in general and flood control in particular are limited; there is a lack of qualified staffs to meet the requirements of work[67].

3) Hydrometeological monitoring plays an important role in the safe and efficient operation of the reservoir and assuring the safety of the downstream area. However, there is a big difference between the hydrometeological forecasting report and what occurs in reality, that creates difficulty for hydropower dam owners in operating the hydropower reservoir safely and effectively. The hydrometeorological forecasting is limited with not applicable forecast of the flow to the reservoir within 24 hours, prior to the flooding threshold achieved.

4) At present, there are no regulations on the definition and management of flood drainage corridors, so many households have constructed works and organized agricultural production in flood drainage corridors. Some flood drainage works can only meet about 30-50% of the design discharge, that impacts on safety for the downstream areas[68].

5) On flood control plans for downstream areas, every year, the relevant agencies/organizations set up flood control plans for downstream areas. However, in the case of emergency of flood drainage or dam breakdown they are not synchronously implemented. The preparation of flood control plans for the downstream area is still difficult: there is a lack of topographic maps and data on distribution of people in downstream area; it is difficult to determine the impact boundary in downstream area of the dam; there is no synchronization in the overall coordination between the dam owners when the flood discharge is implemented with all reservoirs in one basin.

6) Despite the regulations on integrated flood management regulations, the integrated flood control mechanisms have not been developed yet.

3.4. Challenges on IWRM

3.4.1. Core issues of IWRM

Integrated water resources management plays an important role in the protection of the water environment and the sustainable use of water resources. With the characteristics of water as analyzed in Chapter 2 and with particular characteristics in each river basin, there are different needs for water use, such as water consumption for domestic purpose, irrigation, agriculture, aquaculture fisheries, hydropower, tourism and recreation, and water transport. In addition, the river is also the final destination of used water from urban areas, industrial parks ... including wastewater from sand, gravel and mineral exploitation activities in rivers and streams. In addition, with the characteristics of the river to flow from upstream to downstream areas of the river basin, conflicts can occur at the local, national and even international level.

Integrated water resources management in the river basin has been applied very early in Vietnam and has been as effectively applied for example for the Red River Basin in the 1950s through the Red River Basin Planning and the establishment of the Red River Committee.

Experiences of the Red River Basin Management in Vietnam show that the core areas of integrated water resources management are river basin planning and river basin coordination.

a. River basin planning:

As river basin is characterized by many users and many provinces involved in water use, to manage it effectively and sustainably, a strategy and planning are needed.

This has been identified and regulated in different laws:

- Law on Water Resources 1998: regulating the water resources management by the integrated management approach and based on the river basin planning.
- Law on Water Resources 2012 regulating water resources planning for inter-provincial river basins and inter-provincial water resources.

[67] Comments at the regular Government's Meeting on July 2018.

[68] Ministry of Industry and Trade. Planning, construction, management and operation of hydropower projects.

- With the characteristics of the river basin, river basin planning under the 1998 Law on Water Resources is more appropriate than inter-provincial water resources planning because related to the river basin is not only water resource, but also irrigation works, hydropower stations, and navigation facilities (as under the Law on Water Resources, water resources are only understood as surface water, ground water, rain water, etc.).
- Law on Irrigation 2017 regulates irrigation planning.
- Law on Planning 2017 regulates the types of planning[69]:
  + Natural disaster prevention and irrigation planning.
  + Water resources planning.
  + Irrigation planning (in Law on Irrigation 2017).
  + Anti-flood planning for rivers with dikes (Laws on Dyke - validity expired).
  + Waterway ports (river ports, seaports) planning in rivers.

In addition, the Planning Law 2017 regulates the concept of "region" and "regional planning":

- "Region" means a part of a national territory that includes some neighboring provinces and centrally-affiliated cities that are adjacent to some river basins or have similarities in natural and socio-economic conditions, history, population and infrastructure, and have an interrelationship that makes a strong connection.
- "Regional planning" means the planning that aims at realizing the national planning at regional level in terms of spaces used for socio-economic, national defense and security activities, urban development and rural population development, infrastructure, water resources of river basins, use of natural resources and environmental protection on the basis of provincial interconnection.

According to this definition, the river basin planning or inter-provincial river basin water planning shall fall under the category of regional planning and only the Prime Minister has power to formulate, appraise and approve the planning tasks. The Planning Law also specifies the relationship between different types of planning in the national planning system: regional planning must be in line with national planning (including national sector planning such as the master plan on water resources); provincial planning must be in line with the regional planning; in cases, where the provincial planning contradicts the regional planning, it must be adjusted according to the regional planning. Thus, the development of river basin planning or river basin water planning must be in line with national sectoral planning, such as waterway transport planning (port, infrastructure), electricity development planning (including reservoirs, hydropower projects), and water resources planning. This rule in principle will not be entirely appropriate because the regional planning is based on integrating relevant planning, and thus in the context of the whole region, some sectors will have priority toward others. Therefore, when developing the river basin planning, it is necessary to implement an integrated approach.

b. River basin coordination organization

- According to the Law on Water Resources 2012, river basin coordination organization can be the National Water Resources Council, Vietnam Mekong River Commission and river basin organizations.
  + For the National Council for Water Resources, the Chairman is Deputy Prime Minister Trinh Dinh Dung.
  + For Mekong River Commission, the Chairman is Minister of Natural Resources and Environment, Tran Hong Ha.
  + The River basin organizations have not yet been established.
- According to Decision No. 593/QĐ-TTg dated 06/4/2016 of the Prime Minister on the Piloting Regulation on linkages for socio-economic development in the Mekong Delta, Resolution No. 120/NQ-CP dated 17/11/2017 on Sustainable Development of the Mekong

[69] Annexes I and II.

Delta and Decision No. 64/QD-TTg dated 18/7/2017 on the establishment of the Inter-sectoral Steering Committee for the Mekong Delta region, 2016-2020[70]:

+ Inter-sectoral steering group: the leader is the Minister of Planning and Investment, Nguyen Chi Dung.
+ Mekong Delta Coordinating Council: not yet established.

Thus, in relation to river basin coordination, besides coordinating organizations in accordance with the laws on water resources and irrigation, there is a coordinating organization in the Mekong Delta (coordinating different fields in the Region, including river basin, water resources and flood control).

3.4.2. New advances in IWRM and challenges

The integrated water resource management has achieved progresses in the two main areas: water resources planning and river basin organization.

1) On water resources planning:

As introduced in Chapter 1, the river basin planning has been regulated in the Law on Water Resources from 1998 but has not yet been developed until now. The Water Resources Law 2012 no longer regulates river basin planning but turns into water resources planning. In the period 2012 - 2017, attention was paid to water resources planning (such as the Mekong Basin Water Resources Planning, the Sesan-Srepok Basin Water Resource Planning, guidance on Water resources planning for provinces). Most recently, MONRE issued Decision No. 2301/QD-BTNMT dated 29/9/2017 approving the task of planning water resources in the whole country in the two years 2017-2019 and the Prime Minister issued the Decision No. 3399/QD-TTg dated 22/01/2018 approving the task of planning the water resources of the Red Thai Binh river basin up to 2030 with a vision to 2050.

***The national water resources planning set out the objectives and tasks, includes*:**

- Taking initiative in water resources, ensuring water source security; ensuring fairness and rationality and raise the efficiency in the exploitation and use of water sources among water basins and administrative regions; ensuring the balance between the amount of water that can be extracted and the demand for water, taking into account the natural variation of water resources, considering the regulation of water resources between basins / areas, the impacts from upstream countries to water source and the climate change impact in order to avoid frequent water shortages. Improving the efficiency of existing water sources; protecting water resources, minimizing the risk of pollution, protecting the aquatic ecosystems and the important functions of the water resources, restoring the depleted water sources; preventing and mitigating harms caused by water. Prioritizing water sources, ensuring the strategic development and stabilization of social welfare, serving as a basis for international cooperation and socio-economic development in all regions of the country.
- 8 main tasks: (1) Reviewing the natural, socio-economic and environmental conditions; (2) Assessing the current state of water resources including surface water and groundwater. Analyzing and assessing water resources fluctuations by year and season, forecasting the possibility of fluctuation of water resources in the context of climate change and sea level rise up to 2030, with vision to 2050; fully identifying impacts to water resources and adverse impacts of water resources; (3) Forecasting water demand and total wastewater from economic sectors by 2030, with a vision to 2050; Forecasting the types of damage caused by water; (4) Developing water resource scenarios; studying and developing solutions to exploit and use water resources economically and efficiently; protecting water resources for purposes of exploitation and use; preventing, combating and overcoming the harmful effects caused by water; (5) Building water resources targets up to 2030 with a vision to 2050; defining the

[70] Including provinces and centrally-run cities: Long An, Tien Giang, Ben Tre, Dong Thap, Vinh Long, Tra Vinh, Soc Trang, Hau Giang, An Giang, Kien Giang, Bac Lieu, Ca Mau and Can Tho.

objectives and tasks of managing, regulating, distributing, exploiting, using and protecting water resources, preventing and overcoming the consequences of harms caused by water; (6) Determining the requirements for water transfer between river basins, identifying the regulating works, exploiting and using large-scale water sources; (7) Prioritization of planning for river basins and water sources; (8) Developing solutions, budget and plan and for the planning implementation.

- Scope of planning study includes river basins and rivers belonging to economic regions nationwide including: Northern Midlands and Mountains, Red River Delta, North Central, Central Coast, Central Highlands, South East and Mekong Delta with the river groups of Quang Ninh, Quang Binh, Quang Tri, Southeast, with a total natural area of 330,972 km^2.
- The subjects of the master plan include surface water and groundwater throughout the country.

Apart from the collection and processing of information and data, and analysis of natural and socio-economic characteristics, the planning will focus on analyzing and evaluating the current status of water resources; at the same time, analyzing and identifying water resource fluctuation trends, in order to identify and forecast the water demand of each sector or field; preliminarily calculating water balance, water transfer requirements and water quantity to be exploited. Other important issues will be addressed in the planning, such as the total volume of wastewater and the trend and the types of damage caused by water; from this, the scenarios for water resources (for water sources from outside, and exploitation and use of water resources for management) will be developed and priority tasks of implementation will be identified.

- The Department of Water Resources is the lead agency in coordinating other agencies/organizations within and outside the MONRE to implement the planning.
- The Prime Minister will approve the planning.

The task on water resources planning for the Red River and Thai Binh River up to 2030 with a vision to 2050:

- The study scope of the task covers the entire Red River - Thai Binh river basin with a total area of 169,000 km^2. The scope of planning includes the basin area of the territory of Vietnam with the natural area of 88.680 km^2, including the following provinces and cities: Hanoi, Vinh Phuc, Bac Ninh, Quang Ninh, Hai Duong, Hai Phong, Hung Yen, Thai Binh, Ha Nam, Nam Dinh, Ninh Binh, Ha Giang, Cao Bang, Bac Kan, Tuyen Quang, Lao Cai, Yen Bai, Thai Nguyen, Lang Son, Bac Giang, Phu Tho, Dien Bien, Lai Chau, Son La and Hoa Binh.
- The objective of the task is to concretize the objectives of the National Water Resources Strategy; the Action plan to improve the effectiveness of management, exploitation, use, protection, prevention and mitigation of harm caused by water; Linking integrated water resources management requirements with economical and efficient exploitation and use and protection of water resources, and environmental protection in the context of climate change and sea level rise.
- Subjects of planning are surface water and underground water in the Red - Thai Binh river basin.
- The main tasks are identified in 4 different groups: allocation of water resources; protection of water resources; preventing, combating and overcoming the harmful effects caused by water.
- The outputs of the task are the report presenting the planning of water resources in the Red - Thai Binh river basin up to 2030 with a vision to 2050; maps of 1/200,000 scale; models on assessment and forecast of water flow, water balance; and other attached documents.
- Implementation time: 24 months from the date of approval.

2) On River Basin Coordination Organization: As discussed in Chapter 2.

Challenging issues:

While new developments have been made in building the basis for integrated water resources management as described above, the implementation of this approach is still challenging, because:

- Water resources planning by integrated approach, flood management planning by integrated approach and development of water prices according to market mechanism, etc. are areas that Vietnam lacks of experience and qualified source people.
- Regarding river basin coordination organization: MONRE has submitted to the Prime Minister the establishment of river basin management committee. However, this has to be considered in the current context, because there are many regional and sub-region coordination organizations, and as decided by the Government and the regions and sub regions can establish the organization under the voluntary mechanism.

In addition, the mechanism of integrated river basin management is inter-provincial and inter-regional, while according to the existing laws, such as the Constitution, Local Government Organization Law and Budget Law, the management is still by administrative boundary (this is a broad subject, which need to be addressed in another study).

Chapter 4. Water resources planning in Vietnam

4.1. Backgrounds

The studies in Chapter 2 analyzed aspects related to integrated river basin management, including an overview of integrated water resource management, irrigation management and water environment management. The analysis in Section 2.4 clearly points out the challenges of IWRM, core points and challenges of IWRM in Vietnam, including two main issues: (1) Management in accordance to water resource planning, integrated river basin planning and other plans related to water resource use and river basins (2) river basin coordination organization and its role.

From January 1, 2019, Act on planning will take effect, such as the Law on Planning 2017 and the Law on amendments and supplements to some articles of 37 laws related to planning. These laws have fundamentally changed the types of planning and planning processes, especially water resources planning and integrated inter-provincial river basin planning and inter-provincial water resources planning. These laws also stipulate a new approach to integrated management, which is planning-based management.

In order to manage water resources, inter-provincial river basins, inter-provincial water sources effectively in accordance to the planning, planning will be the basis for the local authorities to manage and use water. State management agencies, river basin management organizations will base on the planning to develop mechanisms and policies related to water resources and river basin management; monitor localities and subjects using water resources and river basins. Therefore, to have a basis to build a roadmap for integrated water resources management, inter-provincial river basin management, and inter-provincial water resources, it is recommended to consider the development process of these planning.

4.2. Legal provision and development procedure for water resources and intergrated river basin planning

4.2.1. Some concepts

In order to analyze the legal regulations on water resources planning and river basin integrated planning, it is necessary to know the relevant concepts in accordance with current law. According to provisions of the Law on Planning 2017, the Law amending and supplementing a number of articles of 37 Laws and Water Resources Law then:

1) Planning is the space arrangement and distribution for socio-economic, defense and security activities associated with the development of infrastructure, use of natural resources and environmental protection in the determined territory for effective use of the country's resources and for sustainable development goals in a defined period.

2) National overall plan is a national, strategic planning towards zoning and regional linkage of territory including land, islands, archipelagoes, seas and airspace; urban and rural systems; infrastructure; use of resources and environmental protection; Natural disaster prevention and control, response to climate change, national defense, security and international integration.

3) National sector planning is a national plan, detailing the national overall plan in each sector by connecting with other sectors and regions related to infrastructure, resource use and environmental protection and biodiversity conservation.

4) Provincial planning details the national overall plan, regional planning at the provincial level in term of socio- economic activities, defense, security, urban systems and distribution of rural population , infrastructure, land allocation, resource use and environmental protection by connecting national planning, regional planning, urban planning and rural planning.

5) The technical, specialized planning details national overall planning, regional planning and provincial planning. Planning with technical and specialized characteristics includes the planning specified in Appendix 2 of this Law.

6) Region is part of the national territory includes a number of neighboring provinces and cities associated with a number of river basins or have the similar natural conditions, economic - social, historically, residential, infrastructure characters, with interactive relationships that form sustainable links.

7) Regional planning is a plan to concretize the national master plan at the regional level on socio-economic activities, national defense, security, urban system and rural population distribution, construction of inter-provincial areas, infrastructure, water resources of river basins, use of natural resources and environmental by connecting provinces.[71]

8) River basin with inter-provincial river basin and intra-provincial river basin:

- The inter- provincial river basin is a river basin located in two or more provinces and centrally-run cities.
- Intra-provincial river basin is a river basin located in a province or a centrally-run city.

9) Water sources with inter-provincial water sources, intra-provincial water sources and inter-national water sources:

- Inter-provincial water source is a water source distributed in the area from two or more provinces and centrally-run cities.
- Intra-provincial water source is a water source distributed in a province or a centrally-run city.
- International water source is the water flowing from the territory of Vietnam to the territory of another country or from the territory of another country into the territory of Vietnam or the water source located on the border between Vietnam and the neighboring country.[72]

4.2.2. Type of planning related to water resources and river basins

4.2.2.1. Water resources planning

Under the provisions of Article 15 of the Law on Water Resources 2012, water resources planning includes:

a) Water resources Planning of the whole country;

b) Water resources planning in inter-provincial and inter-provincial water basins;

c) Water resources of provinces and centrally-run cities.

However, from January 01, 2019, according to provisions of the Law amending and supplementing some articles of 37 Laws relating to Planning Law (hereinafter referred to as the Law amending and supplementing 37 Laws),[73] amending and supplementing a number of articles of the Law on Water Resources 2012 then:

- The national planning system includes: National planning (including national master plan, national marine spatial planning, national land use planning, national sector planning); Regional planning ; Provincial planning ; Special administrative and economic unit Planning (Planning of special administrative and economic units is approved by the National Assembly); Urban planning, rural planning.
- Planning on water resources including water resources planning; integrated planning of inter-provincial water sources and inter-provincial river basins; and planning for protection,

[71] Article 3, Law on Planning 2017.

[72] Article 3, Law on Water Resources 2012.

[73] Law No. 35/2018/QH14 dated 20th November 2018.

exploitation and use of international water sources[74] and specified as follows:

a. Water resource planning is the national sector planning;
b. Integrated planning of inter-provincial water sources and inter-provincial river basins[75] are technical, specialized planning which detail the overall national planning, water resources planning, regional planning and are prepared for the period of 10 years, with vision from 20 years to 30 year;
c. The planning on the protection, exploitation and use of inter-national water sources is a technical and specialized planning made when there is cooperation between countries sharing the same water source and the planning contents must follow agreements between countries sharing the same water source.

The Law amending and supplementing 37 Laws also stipulates: "Relevant planning associated with the law on planning of planning, plans, programs and projects of socio-economic development, national security and defense must consider the ability of water sources and protection of water resources; To maintain a minimum flow in the river, exploitation threshold of aquifers, and implement measures to ensure residents' life".[76]

Therefore:

1) According to provisions of the Law amending and supplementing the 37 Laws:

- General planning of water resources of the nation will be named water resources planning; ***The water resources planning in the inter-provincial river basin is no longer available*** *but replaced by* ***Integrated inter-provincial water sources and inter-provincial river basins planning****; water resources planning of provinces and centrally-run cities is no longer available, Provincial People's Committees direct professional agencies on water resources, based on national planning, regional planning, integrated inter-provincial water sources and inter-provincial river basin planning , to develop plans to exploit, use and protect water resources and remedy harmful effects caused by water, and add into the provincial planning.[77] Essentially, the change is a return to the provisions of the 1998 Law on Water Resources and is consistent with the requirements of integrated river basin management, which is integrated planning for the river basin, not only the planning for water resources in river basin.*

- Water resources planning is the national, sectoral planning under the provisions of the Law on Planning 2017, the planning period of the national planning system is 10 years , vision from 30 years to 50 years . Thus, water resource planning is made for the period of 10 years, but the vision is not the 20 years but from 30 years to 50 years.

- General planning of inter-provincial river basin, inter-provincial water source is established for 10-year period, the vision from 20 years to 30 years.

- Law on amending and supplementing 37 Laws stipulates the relationship between water resources planning and integrated interprovincial river basins, Inter-provincial water sources planning. This provision is the basis for making and adjusting planning types, overcoming previous shortcomings in the selection of planning when there is a contradiction between plans on the same content.

2) According to the Law on Water Resources 2012: Planning period for water resource planning is 10 years, vision to 20 years. Thus, this provision on the period of water resource planning is in accordance with the Law amending, supplementing 37 Laws, but these two Laws stipulate differently about vision period. However, according to regulations, when there are differences, they must comply with the Law on amendments and supplements to 37 Laws.

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[74] Amending and supplementing Article 15 of the Law on Water Resources 2012.

[75] According to the amended law, add 37 Laws: Replace the phrase "planning of water resources in the inter-provincial river basin" with the phrase "integrated planning of inter-provincial river basin and inter-provincial water sources".

[76] Article 5.

[77] Amending and supplementing Article 16 of the Law on Water Resources 2012.

4.2.2.2. Types of sector planning associated to integrated inter-provincial river basin and inter-provincial water resources planning

On an inter-provincial basin, many economic sectors and many localities jointly exploit and use water resources, therefore according to the provisions of the Law amending and supplementing 37 laws, one of the principles in water resources planning is to ensure harmony of interests in water use between localities and departments, between upstream and downstream. And one of the foundations for the general planning of inter-provincial river basin and inter-provincial water sources is the demand for water exploitation and use by sectors and localities. Thus, when setting up water resources and integrated planning of inter-provincial river basins, it is necessary to consider the planning of the provinces and the water resource exploitation and use planning of sectors.

Under the provisions of the Law on Water Resources 2012, sectors which use water resources in river basin include : agricultural production; hydroelectric; aquaculture; industrial production, mineral exploitation and processing; Waterway transport (river ports, seaports, transport, other).

Under the provisions of the Law amending and supplementing 37 laws, besides the water resources planning which is the national sectoral planning, integrated inter-provincial water resources, inter-provincial river basin planning is technical, specialized planning and above water exploitation and use sectors also have sectoral planning, including the national sector planning and technical, specialized planning namely:

a) National sectoral planning[78]:

In addition to Water Resources Planning which is a national sectoral planning, there are other national sectoral planning, namely:

- Overall seaport system development Planning (including the sea ports located on the river basins).[79]
- Planning of inland waterway infrastructure.[80]
- Master plan of energy.
- Fishing ports and storm shelters for fishing ships system planning.
- Planning to protect and exploit aquatic resources.
- Planning on exploration, exploitation, processing and use of minerals.
- Environmental protection planning.

b) Planning with technical and specialized characteristics[81]:

Apart from integrated inter-provincial water sources and inter-provincial river basins is a technical and specialized planning, and following types are also specialized technical planning:

- Master plan for basic water resources survey.
- Planning for protection, exploitation and use of international water sources.
- Irrigation planning.
- Planning on flood prevention and control of dyke rivers.
- Dyke planning.
- Detailed planning on seaports, docks, piers, buoys, water parks, water bodies.

Thus, when implementing water resources planning and inter-provincial river basin integrated planning, inter-provincial water sources planning, it is required to consider the water use and river basin planning of the relevant sectors mentioned above.

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[78] Appendix 1 "List of national sector plans" Law on Planning 2012.

[79] In fact, in Vietnam, most seaports are located in the river basin.

[80] According to Clause 4, Article 1 of the Law amending and supplementing a number of articles of the Law on Inland Waterway Traffic in 2014: "Inland waterway infrastructure includes inland waterways; channel protection corridor; inland ports and wharves; anchorage area outside the port; embankments, traffic dams, inland waterway signs and other auxiliary works".

[81] Appendix II "List of technical and specialized plans" Law on Planning 2017; The amended law 37 laws.

4.2.2.3. Planning on protection, exploitation and use of international water sources

According to the Law on amendments and supplements to 37 laws, the planning of protection, exploitation and use of inter-national water sources is a technical and specialized planning. This planning is established when there is cooperation between countries sharing the same water source and the planning content must be based on the agreement between the countries sharing the same water source.

4.2.3. Relationship between types of planning

4.2.3.1. General relationship between types of planning

According to the provisions of the Law on Planning 2017[82]:

1) National master plan is the basis for establishing national marine spatial planning, national land use planning, national sector planning, regional planning, provincial planning, special administrative – economy unit planning, urban planning, rural planning across the country.

2) National sector planning must be in line with national master plans, national maritime spatial planning and national land use planning.

a national sector plan contradicts national maritime spatial planning, national land use planning or other national sector plans, it is necessary to adjust and follow the marine space planning, national land use planning and national master plan.

3) Regional planning must be in line with national planning; Provincial planning must conform to regional planning and national planning.

If regional planning, Provincial planning conflict with national sector planning, it is required to comply with national sector planning and overall national planning.

In case the regional planning contradicts each other, the provincial planning contradicts each other, it is required to follow the higher planning; In case the provincial planning contradicts the regional planning, it must be adjusted and implemented according to regional planning and national planning.

4.2.3.2. The relationship between water resources planning and integrated inter-provincial river basin planning

Law to amend and supplement 37 law regulates as bellows:

In case the content of water resource exploitation and use in water resource planning contradicts the approved general inter-provincial water sources and inter-provincial river basin planning, it is required to adjust and implement in accordance to Water resource planning.[83]

Thus, based on the above provisions:

- National master plan is the basis for water resource planning and water resource planning must be in line with the national master plan.

- Regional and provincial planning must be in line with water resource planning. If regional and provincial planning conflict with the water resources planning, it is required to adjust according to the water resources planning.

- When there is a conflict between the water resource planning and the overall inter-provincial water sources and inter-provincial river basin planning, it is required to adjust according to the water resources planning.

- However, there are no regulations on the relationship between planning within the same national level or between technical and specialized planning. This leads to the determination of the relationship between water resource planning and other specialized planning at the national level, the relationship between the inter-provincial water sources and inter-provincial river basin planning and the integrated inter-provincial river basin and inter-provincial water source planning with other sectoral technical, specialized planning.

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[82] Article 6.

[83] Article 16.

4.2.3.3. The relationship between domestic planning and inter-national planning

Under the provisions of the International Treaty Law: In case of legal documents and international treaties of which the Socialist Republic of Vietnam is a member having different provisions on the same issue, it shall apply provisions of such international treaties, except the Constitution.

Therefore, when there are different regulations for the same content between the planning of protection, exploitation and use of inter-national water sources with the planning of water resources, the overall inter-provincial river basin and water sources planning. and other related planning, it is required to follow the plan of protection, exploitation and use of inter-national water sources.

4.3. Development and approval process of water resources planning

4.3.1. Sequence in planning activities

According to provisions of Article 7 Law on Planning 2017, the procedure of water resource planning includes the following steps:

1) Planning: Including the following tasks: Establishing, appraising and approving planning tasks; Organize planning.
2) Planning appraisal
3) Decision or approval of planning;
4) Planning announcement;
5) Implement planning.

4.3.2. Water resources planning

1) Authority to organize water resource planning:

Under the provisions of the Law on planning 2017 and Law amending, supplementing 37 laws, ministries, ministerial-level agencies shall organize national sector planning. Water resource planning is a national sector plan, *based on the functions and tasks of the ministries, the Ministry of Natural Resources and Environment will be the agency to organize the planning of water resources.*

2) Competence to appraise and approve planning tasks:

Under the provisions of the Law on Planning 2017, the Prime Minister organizes the appraisal and approval of the tasks of national planning.

Therefore, the Prime Minister is competent to organize the appraisal and approval of the task of planning water resources.

3) Planning process:

Based on the planning scheme specified at the Law on Planning 2017 and the Law amending 37 Laws, the process of making water resource planning include the following steps:

- The Ministry of Natural Resources and Environment shall assume the prime responsibility for, and coordinate with concerned ministries and ministerial-level agencies in elaborating planning tasks and submitting to the Prime Minister for approval;
- Planning –developed agencies shall select planning consultancy organizations; develop planning and collect comments, according to regulations;
- Planning –developed agencies shall receive, explain comments and finalize the planning, then submit to Planning Appraisal Council;
- Planning –developed agencies shall complete the planning according to the conclusions of the Planning Appraisal Council and report to the Minister for consideration and submission to the Prime Minister for approval.

4) Competence to appraise tasks of planning, to appraise and approve water resources planning:

- The Prime Minister organizes the appraisal and approval of planning tasks.[84]
- The Prime Minister organizes the appraisal and approval of national sector planning. In order to carry out the appraisal, the Prime Minister established a Planning Appraisal Council to evaluate water resources planning.[85]

5) Content of national sectoral planning:

- The content of the national sector planning defines the direction for development, distribution and organization of space and resources for inter-sectoral, inter-regional and inter-provincial sectors.
- According to the Law on Planning regarding the National Natural Resources Exploitation Planning, the Water Resources Planning shall include the following main contents:[86]

+ Analyzing and assessing natural conditions, investigation, survey and exploration of the current state of exploitation and use of water resources;

+ Assessing the impact of water resources exploitation and use;

+ Analyzing, assessing guidelines and orientation of socio-economic development relating to the exploitation and use of national water resources, environmental protection and other concerned planning;

+ Forecast of scientific, technological progress and socio-economic development affecting the protection, exploitation and use of water resources during the planning period;

+ Viewpoints and objectives of water resource exploitation and use for socio-economic development;

+ Determining prohibited areas, restricted areas and areas to encourage the exploitation and use of water resources;

+ Orientation of environmental protection, disaster prevention and control, and climate change response;

+ Solutions and resources for implementing water resources planning.

According to the draft Decree guiding the Law on Planning attached with Submission Note of January 5, 2019 by Minister of Planning and Investment to the Government: to formulate a national sector planning, it is required to set up planning components to add into the national sector planning.[87] Thus, to formulate water resources planning, it is necessary to have planning components of water resource-users to integrate into water resources planning. Besides, according to the provisions of the Law on Planning 2017, planning in general and planning of water resources in particular must be based on: Socio-economic development strategy, sector and field development strategy in the same stage of development; Higher planning; and previous planning.[88]

Thereby, the development of water resources planning must follow the steps stipulated in the Law on Planning; At the same time, it must be based on higher planning and must integrate planning components of water-using industries. This requires not only time but also the orientation of other relevant national sectoral planning to ensure the feasibility of the planning.

6) Announcement of planning and implementation of planning

- Under the provisions of the Law on Planning, the ministries and ministerial-level agencies shall organize the announcement of the national sectoral planning under the organizational authority.[89] Thus, water resources planning will be announced by the Ministry of Natural Resources and Environment after being approved by the Prime Minister.

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[84] Article 29, Law on Planning 2017.
[85] Article 14, Law on Planning 2017.
[86] Article 25, Law on Planning 2017.
[87] Clause 1 Article 3 Draft Decree stipulates: The planning component is a content of the national master plan, national industry planning ... to integrate into the planning.
[88] Article 20.
[89] Article 39.

- To implement the Planning, it is necessary to develop and issue an implementation plan.[90] The implementation plan is issued after the planning is decided or approved. The implementation plan includes the following main contents : Public investment projects; Investment projects using capital sources other than public investment capital; Land use plan; Determine resources and the use of resources to implement the plan.

Thus, in order to implement water resources planning, the Ministry of Natural Resources and Environment shall develop an implementation plan and submit it to the Prime Minister for approval.

4.3.3. Integrated inter-provincial water sources and inter-provincial river basins planning

4.3.3.1. Foundation of the planning

The development of integrated inter-provincial water sources and inter-provincial river basins planning shall base on the following factors:

1) Water resources strategy, water resource planning.

2) Characteristics of natural, economic - social and specific conditions of the river basin, of each region, potential of water resources and forecast the impact of climate change on water resources.

3) Demand for water exploitation and use by sectors, localities and environmental protection.

4) Results of basic water resources survey.

5) Norms, standards and technical regulations issued by competent authorities.

6) The provisions of international treaties to which the Socialist Republic of Vietnam is a member in the case of inter-national water resources.

7) Approved planning tasks.[91]

Thus, when making integrated inter-provincial water sources and inter-provincial river basin planning, in addition to the above factors, one of the important factors is to be built on water resources planning.

4.3.3.2. Competence in planning and approving integrated inter-provincial river basin and inter-provincial water sources planning

1) Competence to organize the establishment and approval of integrated inter-provincial river basin and inter-provincial water sources planning

Under the Law amending 37 laws:

- Ministry of Natural Resources and Environment, in collaboration with the Ministry of Agriculture and Development, the Ministry of Industry and Trade, the Ministry of Construction and other ministries, ministerial-level agencies, and concerned Provincial People's Committees to organize the development of integrated inter-provincial river basin and inter-provincial water sources planning, and submit it to the Prime Minister for approval.
- Agencies which are competent for developing integrated inter-provincial river basin and inter-provincial water sources planning is responsible for approving planning tasks.
- State agencies which are competent to approve integrated inter-provincial river basin and inter-provincial water sources planning shall decide the modification of approved planning.

Therefore:

[90] Article 45.

[91] Clause 7, Article 5, Law of 37 Law - Amending and supplementing a number of articles of the Law on Water Resources.

- The Ministry of Natural Resources and Environment has the authority to organize the planning and approve planning tasks for the integrated inter-provincial water sources and inter-provincial river basin planning.
- The Prime Minister has the right to approve the planning, adjust the integrated inter-provincial water sources and inter-provincial river basin planning.
2) The development of the integrated inter-provincial water sources and inter-provincial river basin planning.
- The development of the integrated inter-provincial water sources and inter-provincial river basin planning includes the following contents:

a) Overall reviewing natural, economic - social characteristics, status of water resources, water resource protection, exploitation and use, prevention, control and remedy of harms caused by water;

b) Preliminary determining of functions of water sources, water demand and drainage, issues to be addressed in the protection, exploitation and use of water resources, prevention, control and remedy of consequences caused by water;

c) Determining the objects, scope and contents of the planning in order to ensure the function of the water source, solve the problems identified at Point b;

d) Determining solutions, funding, progress and schedule for planning.

3) Contents of integrated inter-provincial water sources and inter-provincial river basin planning
- According to Article 19 of the Law on Water Resources and the Law on Amendment of 37 Laws, the integrated inter-provincial water sources and inter-provincial river basin planning includes the following contents:

a) Water resource allocation: Assessing the quantity and quality of water sources, the current state of water resource exploitation and use; forecasting the trend of flow fluctuations, water levels of aquifers, water demand; Functional zoning of water sources; Determining the proportion of water resource allocation to the subjects of water exploitation, use, priority order and allocation rate in case of drought and water shortage; identify reserve water sources for domestic water supply in case of occurrence of water pollution incidents; Identify water resource monitoring system, monitor water exploitation and use; Determine the demand for water transfer among sub-basins in the river basin, the need to transfer water to other river basins; Identify constructions regulating, exploiting, using and developing water resources; Solutions, funding, plans and implementation schedule;

b) Protection of water resources: Determination of water resource protection requirements for exploiting, using water and aquatic ecosystems; Identify contaminated, degraded, exhausted areas; assessing changes in water quality, water quality zoning; Determining constructions, non-constructions measures to protect water sources, recover polluted or degraded water sources to ensure the function of water sources; Determination of water quality monitoring system, monitoring of wastewater discharge into water sources; Solutions, funding, plans and implementation schedule;

c) Preventing, controlling, and overcoming consequences caused by water: Determining areas where river banks are collapsed or landslides or at risk of landslides, landslides or land subsidence or at risk of landslides, subsidence, saline intrusion due to underground water exploration and exploitation; assess the situation, happenings, identify the causes and zoning effects of water; Overall assessment of the effectiveness and impacts of works and non-construction measures to prevent, combat and overcome the harmful consequences defined at Point a of this Clause; Determining solutions to improve the quality and efficiency of the activities of preventing, combating and remedying the harmful effects caused by water, and solutions to improve the quality and efficiency of water warning and forecasting systems cause;

Determining non-structural works and measures to minimize harms caused by water; Solutions, funding, plans and implementation schedule;

d) In case of necessity, the planning contents also propose the adjustment of tasks and operation processes of exploitation, use and protection of water resources, prevention and combat of consequences caused by water to implement the contents specified in this Article.

4) Adjustment of integrated inter-provincial water sources and inter-provincial river basin planning

a. The integrated inter-provincial water sources and inter-provincial river basin planning is adjusted in the following cases:

- Adjustment of socio-economic development strategies, plans, national defense, security, national planning, regional planning, water resource strategy to change the objectives of the approved planning;
- Planning has been approved does not adhere to the guidelines under the rules;
- New national key projects are formed, which greatly affect water resources;
- There is a fluctuation in natural conditions that greatly affects water resources.

b. Modified contents in the integrated inter-provincial water sources and inter-provincial river basin planning must conform to water resources planning, regional planning, and should be based on the results of the analysis and evaluation of implementation status of approved planning, factors affecting the planning adjustment, ensuring inheritance and adjusting only the changes.

c. The formulation, consultation and appraisal of the adjustment of integrated inter-provincial water sources and inter-provincial river basin planning is carried out like the planning of water resources.

5) Organize the implementation of integrated inter-provincial water sources and inter-provincial river basin planning

- Within 15 days from the approval date, the Ministry of Natural Resources and Environment organizes the announcement of the integrated inter-provincial water sources and inter-provincial river basin planning. The planning announcement shall comply with the law on planning.
- Organizations, individuals and communities are facilitated to exercise their right to monitor and propose measures to implement integrated inter-provincial water sources and inter-provincial river basin planning.
- The Ministry of Natural Resources and Environment is responsible for guiding, inspecting and organizing the implementation of the integrated inter-provincial water sources and inter-provincial river basin planning
- For technical and specialized planning on water resource exploitation and use, the ministries and ministerial-level agencies must obtain the written approval of the Ministry of Natural Resources and Environment.

Thus, the approved integrated inter-provincial water sources and inter-provincial river basin planning is the basis for the river basin organization to supervise the implementation and propose, recommend to competent state agencies to issue mechanisms and policies to ensure the implementation of the plan; propose solutions to problems arising in the process of organizing the implementation of the integrated inter-provincial water sources and inter-provincial river basin planning.

The Law amending and supplementing 37 laws also stipulates clearly the responsibilities of sectors related to the use of water resources in compliance with planning laws such as:

- Exploitation and use of water resources must comply with relevant planning in accordance with the law on planning; If the function of water sources is reduced, causing landslides, pollution, salinization of water sources, it is necessary to overcome the consequences. If causing damage, compensation must be made according to the

provisions of law.[92]

- The construction of hydropower projects must comply with the relevant planning according to the law on planning.[93]
- Organizations and individuals can only use water that meets the standards and technical regulations on water quality for aquaculture. The exploitation and use of water resources for aquaculture must comply with the relevant planning according to the planning law, must not pollute, degrade and exhaust water sources, obstruct the flow. flowing, damaging buildings on the river, obstructing water traffic and not polluting water sources.[94]
- The construction of works and waterway transport works must comply with the relevant planning according to the law on planning.[95]
- The granting of underground water exploitation permits must be based on the water resources planning and the integrated inter-provincial water sources and inter-provincial river basin planning, the provincial planning and the results of basic surveys and underground water exploration, potential, underground water reserves.
- The planning in accordance with the law on planning has a plan to build reservoirs on rivers and streams must be consistent with water resources planning, integrated planning of inter-provincial river basin, inter-provincial water source and right with content like: the need to build reservoirs compared solutions c cells other programs to perform the tasks of planning; Determine the maintenance flow in rivers and streams by the time of downstream reservoir proposed in the plan; Identify and arrange tasks in order of priority for each reservoir proposed in the plan and the level of water supply assurance for each task set out; Reservoir capacity is used to carry out each reservoir's tasks in normal weather conditions and unusual weather conditions taking into account climate change factors; The role of existing reservoirs in the river basin in ensuring the implementation of each proposed reservoir task; In the planning process, it is necessary to consult with beneficiaries and objects at risk in the exploitation and use of water resources due to the construction of the reservoir in the planning. All comments must be explained and received in the report and sent to the competent state agency for appraisal of the planning.
- Project to build reservoirs on rivers and streams shall be suitable with the planning of integrated water resources and river basin, provincial planning and other planning related according law of planning.
- The project on water transfer shall base on planning of water resources, integrated inter-provincial water resources and inter-provincial river basin planning, provincial planning, and other planning related under the provisions of law planning, economic development plans – of provinces and industries related to water exploitation and use in the river basin.

Thereby, there is a change in the way of water resources management and integrated management of river basins and river basin water sources, which is plan –based management. This approach is very suitable for integrated, interdisciplinary and multidisciplinary management. When all subjects using water resources, exploiting and using river basins have agreed on the plan of water use through planning, it is important to monitor, manage and transparency in implementation. zoning.

4.4. Tasks of river basin organizations

[92] Clause 13, Article 5, Law amending and supplementing 37 Laws.
[93] Clause 14, Article 5, Law amending and supplementing 37 Laws.
[94] Clause 15, Article 5, Law amending and supplementing 37 Laws.
[95] Clause 16, Article 5, Law amending and supplementing 37 Laws.

Law amending and supplementing 37 Laws regulating the responsibilities of river basin organizations in the implementation of integrated inter-provincial river and inter-provincial water sources planning:

"The river basin organization is responsible for proposing to competent state agencies measures to ensure the implementation of the integrated inter-provincial river and inter-provincial water sources planning; proposals addressing the issues arising in the process of implementing integrated inter-provincial river and inter-provincial water sources planning".[96] This is the highest legal basis for the task of river basin organization as well as the highest legal basis for the establishment of river basin organization.

Therefore, on the mission of the river basin coordination organization: Comparing with the functions and tasks of the river basin organization proposed by the Ministry of Natural Resources and Environment to the Prime Minister based on Decree No. 34/2007/ND-CP dated March 12, 2007 of the Prime Minister promulgating the regulations on establishment, organization and operation of inter-agency coordination organizations, but not yet defined in the Law on amendments and supplements of 37 Laws. Therefore, in the functions and tasks of the planned river basin organization, there must be this function and task.

Regarding the establishment of river basin organization: It is necessary to soon establish this organization to implement the Law on Planning, ensuring the feasibility of the Law. However, this organizational model needs to ensure a connection between central and local levels, between sectors and between sectors and localities subject to adjustment of the inter-provincial river basin integrated planning. and inter-provincial water sources.

4.5. Conclusions and recommendations

4.5.1. Conclusions

1) The 2017 Planning Law and the Law amending, supplementing 37 Laws have opened a new direction and created a legal basis for integrated management of inter-provincial water sources and inter-provincial river basins. If the planning is approved under the provisions of the Law on Planning and obtain strong consensus of the local watershed, industries using the river basin and community, it will be the basis for the local, concerned agencies, branches and subjects to comply with the management, exploitation and use of inter-provincial water sources and inter-provincial river basins.

2) However, the implementation of water resource planning and integrated inter-provincial river and inter-provincial water sources planning according to the procedures of the 2017 Planning Law and the Law amending, adding 37 Laws is a new movement to Vietnam, so it takes time, human resources, planning consultancy organizations to fully meet the conditions of professional capacity to make the planning, which is not easy. Besides, there are other difficulties such as: Planning while there is no higher planning or same level planning to integrate into the integrated inter-provincial river and inter-provincial water sources planning. For example, one of the bases for making integrated inter-provincial river and inter-provincial water sources planning is water resource planning; or without the specialized, technical planning, it is difficult to integrate concerned contents into integrated inter-provincial river and inter-provincial water sources planning.

4.5.2. Recommendations

With the above analysis, the roadmap for water resources management, inter-provincial river basin management and inter-provincial water sources management needs to be divided into two phases:

[96] Clause 12, Article 5, Law amending and supplementing 37 Laws.

1) Phase 1. When there is no water resource planning and integrated inter-provincial river and inter-provincial water sources planning. Thus, in this period, it is necessary to make planning and improve mechanisms and policies to implement the plan. For these activities to take at least 2 years, this period will be from 2019-2021.
2) Phase 2 (from 2022). This period has water resources planning and integrated inter-provincial river and inter-provincial water sources planning. Water resource management and inter-provincial river basin and inter-provincial water resources management will be more convenient because management will be implemented according to the approved planning.

In these two periods, it is also necessary to divide into a period of not establishing river basin organization and the period of establishment of the river basin organization. If the planning is approved and the river basin organization has been established, the inter-provincial river basin management and inter-provincial water sources management will be very convenient.

Chapter 5. Road map for integrated water resource management in Vietnam

5.1. Key issues and activities needed for IWRM

5.1.1. Main issues related to state management

How is the concept of integrated water resource management (IWRM) introduced into Vietnam?

Before approaching the concept of IWRM, Vietnam was very familiar with the concept of integrated use of water resources. Because Vietnam is a country with typical tropical monsoon climate, natural disasters and storms occur frequently. Water management in the past prioritized on flood protection measures, and irrigation water for rice cultivation in the major plains of the country. Therefore, the two systems gradually formed (i) dyke system along rivers in the Northern Delta and (ii) drainage system along Red River to irrigate water for Red River Delta, and later the in the Central and the South deltas. At that time, construction of large reservoirs were multi-purposes (flood prevention, power generation, water supply, and facilitating waterway traffics) such as Hoa Binh hydropower (1920Mw), and Thac Ba hydropower (108Mw); and later Son La hydropower (2400Mw), Tuyen Quang hydropower (342Mw), and Lai Chau hydropower (1200Mw) were built. Large irrigation systems (irrigation and drainage) such as Bac Hung Hai (184,000ha), Suoi Hai (7000ha), Nui Coc 12,800ha), Bac Duong (41,000ha) were gradually formed. The period from 1985-1998 was a period of strong hydropower development. All irrigation/hydropower projects focused on economic development goals, ecological and environmental goals were not being considered at that stage.

By the year 1998-2000, the concept of Integrated Management of Water Resources (IWRM) was introduced in Viet Nam through the activities of Global Water Partnership (Global Water Partnership - GWP) and Vietnam Water Partnership. However, due to the absence of a water management state organization, dissemination and propaganda of the concept and experiences in IWRM have not been paid attention. There was quite common confusion between IWRM and integrated use (multi-purpose). In 2002, with the establishment of the Ministry of Natural Resources and Environment, and the efforts of many non-governmental organizations, gradually the concept of IWRM and state management tools became more popularized. However, the state management of water resources still faced many shortcomings.

Status of water resource in Vietnam

Vietnam is a country where most rivers flow from the West to the East and into the East Sea (except the Bang Giang - Ky Cung River which flows from East to West and discharges into the Ta Giang River of China). Thus, most of the plains of Vietnam belong to downstream of these rivers (Vietnam is also called the downstream country). Vietnam has the ability and the right to use 63% of originally foreign water, but this utilization is very passive due to no or very limited ability to control both the quantity and quality of this water originally from foreign country. Apart from disadvantaged geographical location, climatic condition has an extreme high gap between wet and dry season. On average, the dry season in Vietnam lasts 7-8 months, some of the areas in central region have 9 months of dry weather, while others in the South have about 6 months of dry season, with rainfall amount of only 25% -30% of the average annual rainfall. With a coastline of over 3200km, the impact of climate change and sea water level rise is significant. Water exploitation and utilization on an average river basin is about 35 - 40% of its water availability. Some basins have a high level of water utilization in dry season, such as Ma river basin (>70%), Huong river (48%), Ba River (53%)[97]. This leads to scarcity of dry season water.

As an agricultural country, the exploitation of water resources for agricultural production

[97] Source: Việt Nam Water Sector Review

has been concerned very early, the amount of water used for irrigation and livestock accounts for 75-80% of the total water demand of all agricultural sectors. The construction of irrigation water supply facilities has been developed early, such as river water intake culverts, dams, and pumping stations. Up to now, 6871 hydropower-irrigation reservoirs have been built, including 6648 irrigation reservoirs, 24,493 dams, 13,347 large electric pump stations, 5,500 large drains, 254,815 km of various kinds of canals[98]. In terms of the amount of water storage in the useful reservoir capacity, total reservoir storage is nearly 63 billion m^3, of which hydropower reservoirs contain more than 50 billion m^3 of nearly 80% of useful capacity, and irrigation reservoirs contain about 14 billion m^3. These projects have provided the necessary water for irrigation, flood control, electricity generation, and living and creating favourable conditions for inland waterway traffic in the dry season. Now, construction of reservoirs for sectoral uses has met its basic requirement. The future is to focus on improving efficiency of the whole system, to swift the purpose to multi-purpose reservoirs or water storage work. All large reservoirs are hydroelectric or multi-purpose projects. Up to now, the industry for construction of large and medium hydropower have been fully exploited. Now, now it is time to aim at small-scale projects under 30Mw and charged hydroelectricity.

Socio-economic development in the long-term with the lack of attention to the environment has led to widespread of water pollution and serious pollution in industrial development places (Cau river - Thai Nguyen city, and Thi Vai port), craft villages (eg. Bac Ninh - Ngu Huyen Khe river), areas receiving wastewater from large urban centres, such as Hanoi, Phu Ly, etc. (eg. Nhue - Day River). In addition, the improvement of pollution is limited, due to poor current capacity, including human capacity, and financial capacity.

The two major plains of Vietnam, the Mekong River Delta, and the Red River Delta, are located downstream of the major rivers of the Mekong River and the Red River. Control of activities and response to mitigation of negative impacts from upstream are challenging (including China, Thailand, Laos, Cambodia and Myanmar - Mekong River; and China - Red River). Facing with foreign countries requires Vietnam to have appropriate and sensitive solutions, including diplomatic solutions. Upstream of the Mekong River, China has built six large hydropower plants with a total useful reservoir capacity of 24 billion m^3. This has had a great impact to the flow regulation of Mekong River. In the middle section of the current Great Mekong River, Laos and Cambodia are planning to build 11 hydropower projects[99] (4 projects have been built). This has also caused great impacts on the flow regime, sediment movement, and aquatic resources for the downstream - mainly Vietnam. On the upper Red River (China called Nguyen River), China has also built many irrigation and hydropower projects but Vietnam has very little information about the operation of these works.

Regarding institutions: Vietnam has still many difficulties in this regard. Although Ministry of Natural Resources and Environment (MONRE) has been in charge in general, but the management role is still scattered, being confused between resource management, and state management of water use. The concept of the National Water Industry has not yet entered Vietnam's legal documents and institutions. Although many river basin organizations have been established, they have not been successful - they have not yet institutionalized management in accordance with the law of nature, which is management by river basin.

Awareness of water resources, knowledge of water resources in state agencies and society in general shall be improved.

Understanding of IWRM in Vietnam.

[98] Sourcec: General Department of irrigation 2018
[99] Source: Vietnam National Mekong Committee

Inadequate awareness of IWRM, water resource status and location of water and river basin management.

Awareness of IWRM: Although the concept of IWRM has been brought into Vietnam from the 2000s but understanding on this aspect is still very limited. The Ministry of Natural Resources and Environment was formed in 2002, so the delivery of messages on IWRM is quite slow, many concepts are misunderstood, there is confusion between Integrated Water Resources Management (IWRM) and Multi-purpose Water Uses; mistakenly, IWRM is the management target; also consider water management only the responsibility of the Ministry of Natural Resources and Environment.

Misunderstanding the IWRM is the state management of water resources is solely role of MONRE, while it shall be the responsibility of all sectors, all levels, and whole communities. Partly because each ministry has state management functions on different subjects (for example, the Ministry of Agriculture and Rural Development has the function of state management on water use for agriculture; the Ministry of Construction has the function of water use in urban areas, residential areas, etc.). With state management functions on water resources, MONRE has a central position in implementation of IWRM, but it is not the Ministry with responsibility, others shall be responsible for IWRM in the scope of their own industry.

Misunderstanding the implementation of IWRM is only the responsibility of the state management. In fact, implementing IWRM is also the responsibility of water service organizations and users. Water users are responsible for using water economically, efficiently and reasonably. In addition, socio-economic scientific and professional organizations implement IWRM in research, social mobilization, raising knowledge, raising awareness on IWRM.

Awareness of water resources: There is now awareness of the current state of degraded and depleted water resources and the need for integrated management of water resources and river basins. The Law on Water Resources 2012 has been developed, although the understanding of IWRM was incomplete, and this awareness has not really been transformed into life. Implementation of the Law on Water Resources still faces many difficulties, and focuses on the management of water resources, rather than river basin management. Previously, the water was used mostly for agricultural development and disaster prevention. Nowadays, the issue of water use is diverse for many sectors, and the problem of water pollution due to over uses of water have been well recognized. There has been competition not only in the country but also internationally (Mekong River and Red River), on fair use of water both in quantity and quality. The functions of managing water resources with the function of irrigation have been clearly defined. Raising awareness, and division between management of water resources and management of usage of irrigation works have received concerned by all levels and sectors. The establishment of water service company, originated from the clean water provision activities was the driving force for other service activities. Today, MARD already have a navigation approach of integrated management of irrigation systems use water efficiently and economically. Evidences showed that many policies and strategies have been developed to promote the agricultural sector, to meet the trend of integrated water resources management. One of the important documents is (i) Decision 3367/QD-BNN-TT dated July 31, 2014 on Approving the plan of restructuring crops on rice field in the period of 2014-2020; (ii) Decree 77/2018/ND-CP dated May 16, 2018 on Regulations on support of small scale irrigation, on-field irrigation, advanced irrigation, and water saving; (iii) Decree 96/2018/ND-CP dated June 30, 2018 on detailed regulations on prices of irrigation products and services, and support the use of public services and irrigation products; (iv) Resolution 120/NQ-CP dated November 17, 2017 on Sustainable development of the Mekong Delta adapting to climate change; etc.

The subjects of management in the Law on Water Resources is not sufficient and unclear:

The 2012 Water Resources Law has clearly adjusted the water source, and the water management perspective must follow the river basin plan, but the Law does not mention natural water body (river), river and river basin. Recently, there have been documents under the Law stipulating "river corridor protection", but the determination of riverbeds, river creeks, river banks, and estuaries has not been fully mentioned.

The Law on Water Resources also mentioned water resources planning. Recently, the Law on Planning No. 21 - 2017 was passed by the National Assembly, while the Law No. 35-2018 amended and supplemented a number of Articles related to planning, under other 37 Laws, which require amendments of the Laws, and the guiding documents of those Laws, including the Law on Water resources planning. For reservoirs, they are managed and amended by different ministries (irrigation lakes, hydroelectric reservoirs, and waste reservoirs). When operating the inter-basin reservoir, it is required to follow the procedures for operating the procedures by the Ministry of Natural Resources and Environment, and approved by the Government. Operational procedures and legal documents must be followed by relevant parties. This is an important step in managing inter-provincial reservoirs. Although there are regulations on water corridor protection (Decree No. 43-2015), its implementation is still difficult, the situation of sand mining in river bed causing erosion and deformation of the river is still serious. In 2018, the country has 21 provinces and cities have made portfolio construction corridor protect water resources, of which 15 provinces have been approved by the PPC category, protected corridor of water resources. However, illegal sand mining still occurs are threatening the safety of the river and banks.

In short, although WRM in Vietnam has been managed by MONRE for over 15 years but still a lot of problems exist and shall be resolved prior to achieve sustainable development of water resources. In which, the need is for improvement of policies, and institutions. As the implementation capacity, especially the lacks of task force for planning, both quantity and experience, it is necessary to carefully develop a roadmap for planning and oversee the past experience before expanding the scope of application nationwide.

5.1.2. Essential activities for IWRM

According to the IWRM approach which was developed by GWP (Global Water Partner), and approved by countries around the world, the management of water resources is based on 3 main pillars. That is: A. Enabling Environment; B. Institutional Arrangement; C. Management tools. Each pillar has different content. These contents are used by managers based on the specific situation of each country to apply and combine with each other. In Vietnam, many contents have been selected and applied, though not quite successful. However, step by step, it has made the IWRM approach to the method of IWRM to be recognized by the world.

5.1.2.1 Create a favourable environment for policies, laws, investment finance for sustainable management and development of water resources

Creating an enabling environment of policy, law, financial investments in the water sector in general for sustainable development of natural resources by the Government, leading organization is MONRE. Policies show a change from each sectoral mechanism of development water resource, such as hydropower, irrigation, etc., to a new mechanism involving stakeholder management, and based on water demand as a core policy. Currently, the policy-making, planning, allocation, protection, supervision, enforcement agencies are also the highest dispute resolution body with the role of a regulator and controlling the operation. Currently, Governmental agencies have reduced the role of service provision due to an ineffective state service activity, benefit disputes, and lack of transparency management. Many state-owned service organizations have been equitized, the private sector participation in water resource sector is gradually increasing. Therefore, the role of state

agencies is responsible for regulating and developing policies and laws become more and more important and challenging.

5.1.2.1.1 Policies for natural water resource:

Water is the core factor, influencing and connecting with all activities in the society and economy. So, the policy on water resources must reflect the linkages in the usage process, and the protection of water resources, and the water resource policies also need to be consistent with socio-economic development policy, and policies of water-consuming industries. This is particularly important when Vietnam has connection with upstream countries in the exploitation and consumption of water in large rivers, such as the Mekong River and the Red River.

+ *1* ***National policies for water resources****:* National Policy for Water Resources set out goals and objectives for water management at the national scale, including policies for the region, basin area, international water resources, and water transfer inter-basin, within the framework of IWRM. Policies need to address both aspects of the water: quality and quantity, surface water and groundwater, and also to involve service providers. With IWRM approach, transition from planning involving the use of water only, to involving multi-sector and multi-purpose, and integrated planning of water resources with other resources through a multi-disciplinary approach. In this regard, based on Article 4 of the Law on Water Resources, 2012, the Governmental policy on water resources clearly states the following 5 points:

"1. Ensuring water resources are managed, protected, exploited, used reasonably, economically and effectively, meeting the requirements of sustainable socio-economic development, and ensuring national defence and security.

2. Investment and organization of basic surveys and water resource planning; development of monitoring and controlling system of water resources, information system, database of water resources; improvement of the ability to forecast water resources, water pollution, flood, drought, intrusion salinity, sea level rise, and other harms caused by water; support development of water sources, and infrastructure development on water resources.

3. To prioritize investment in searching, exploring and exploiting water sources, and to adopt preferential policies for investment projects on water exploitation for settlement of daily-life and production water for people in mountainous regions and ethnic minorities, border regions and islands, areas with disadvantaged socio-economic conditions, areas with exceptionally disadvantaged socio-economic conditions, and areas of water scarcity.

4. To invest and develop mechanisms to encourage organizations and individuals in doing research and application of advanced science and technology to manage, protect and develop water sources, to exploit and use water resources effective, treatment of wastewater to meet the technical standards for reuse, treatment of saline water, brackish water into fresh water, collection and use of rain water, artificially supplementing underground water, restore polluted, degraded, exhausted water sources, prevent, avoid, and mitigate harms caused by water.

5. Ensure a budget for basic investigation, water resource planning, water resource protection, prevention and control of harmful effects caused by water."

Although the management policy of water resources is clear but not comprehensive, there is a lack of important policies in managing the exploitation and use of water resources, one of which is the water service financial policy.

Basic policy in integrated water resource management/integrated river basin management: national or provincial policies related to water resource management including policies on land use, and environmental protection, sectoral economic development such as irrigation, hydropower, water transportation, environment. These policies have not been made clear if it refers only water resource planning as the Law on water resource, 2012 stated. However, Vietnam has promptly adjusted the planning through Law 35 -

2018. Article 15 of the Law on Water Resources 2012 was adjusted into 3 categories (i) Water resources planning is the national sector planning; (ii) Integrated planning of river basins (LVS), inter-provincial water sources; and (iii) Planning for the protection, exploitation and use of international water resources. In addition to types (i) and (iii), the IWRM plays an important role because the river basin is a unified form of water resources and environment, integrating and reflecting the socio-economic development activities of sectors and localities in the basin, expressing the connection between people and nature. In addition, there shall be an integrated planning for coastal areas, integration with the planning for development of residential areas, industrial zones, mitigation of flood by tide, and better manage the development of coastal and estuary areas.

Here are some specific policies on water resources that have been and are being implemented in Vietnam:

+ *2* ***Specific policies on water resource***:

Policies related to exploitation and use of water resources

- Develop national strategy on water resources in 2030 to replace "National Strategy for Water Resources 2020". Update the new situation on the exploitation and use of water upstream of the rivers that Vietnam is located in the downstream, at the face of climate change, and the development strategy of the water-use industries, they are big challenges, especially in agriculture and irrigation.
- *Integrated management by river basin:* The summary of the river basin plan is understood as: (i) synthesis in the natural system: being derived from the hydrological cycle of water, and river basin conditions (slope, vegetation cover, level of declaration) land use, ecosystems and coastal areas) are closely related. The study reviewed the same time both the surface and underground water, both in quantity and quality of water, balancing of interests between the upper and lower basin is the key element in the synthesis of the natural. (ii) In addition, the meaning of synthesis in the human system includes: cross-sectoral synthesis (inter-sectoral) must be studied carefully before making policies. The goal of IWRM is to develop sustainable water resources, which is the goal that the IWRM aims to, and is a decisive factor in developing policies on water resources. In order to be sustainable, participation is needed and mechanisms are needed for communities and stakeholders to participate in the decision-making process.
- *Ensuring organizations and individuals water user rights:* The 2012 Law stated quite clearly and clearly to ensure the right to exploit and use water of organizations and individuals. Implementing this right through the issuance of water exploitation license and implementation of Decree 82/2017 on the regulation of fee for providing water exploitation licenses. Conditions of water use are also fully stated in the license, conditions for treating water before discharge into water sources are also included in the permit. If the organization or individual fails to comply with the provisions of the license, it will be suspended, temporarily suspended or revoked under the provisions of the Law.
- *Management by demand:* is a requirement of IWRM, although the Law on Water Resources in 2012 was not specifically mentioned on this point but the ministries are implementing the principles of IWRM for the exploitation and use of water. The agricultural sector is the sector with the highest demand for water use, and is currently preparing for this activity through the Irrigation Sector Restructuring Scheme starting in 2016 (under the Agriculture Sector Restructuring Scheme), preparing facilities and people for the application of water tariffs for paddy rice irrigation by 2030. In addition, the agricultural sector is also taking steps to change agricultural structure, from prioritizing rice cultivation - aquaculture and upland crops, to aquaculture - upland crops - rice. This change aims to improve the efficiency of land use, water use, and increase the added value in agricultural production. The scheme of Agricultural Restructuring in general and Irrigation Restructuring in particular has initially

achieved very positive results. For rice production, the Nong - Lo – Phoi, or SRI process is being applied in some typical rice growing areas to save irrigation water and to improve rice production. The application of drip irrigation, sprinkler irrigation, or the application of shallow netting for upland crops in order to use water economically and effectively in area with difficult and inefficient water source. This is also assessed to have a significant advance in the agricultural sector. In addition to farming, the fishery sector is also applying scientific technologies and processes for water supply and discharge to improve the quality of livestock and to use water economically and efficiently.

- *Water resources allocation:* the issue of water resource allocation to water-using industries in each area is decided in the water resource planning (now integrated river basin planning). However, the results of water resources planning of some small basins have not clarified the rules of water allocation in control points. The process of licensing water exploitation and water use license is currently not officially and fully defined. Water licensing is supposed to take place after there are water allocation rules on the river/sector/region. But since these contents have not yet been implemented. After allocation of those rules, and the determination of the amount of water allocated to each area, the license to exploit and use water will have a real effect. In addition, the importance of determining the value of "minimum flow" should also be clarified. Circular No. 65 – 2017 of MONRE on "Guidelines for determining minimum flow" is very specific but inclined to hydrological calculations as mentioned in Article 9 of Circular 65. "*Analysis of river sections needs to maintain a minimum flow and a minimum flow proposal"* , this content does not fully reflect the "minimum flow" spirit stated in the 2012 Law, in Article 2, Clause 18 "*Minimum flow is the lowest flow level necessary in river or river section in order to ensure normal development of aquatic ecosystem, and ensure a minimum for water usage activities of the water users*. Article 18 stated minimum flow integrates all three conditions (i) to maintain the river flow (as outlined in Circular 65), (ii) to maintain aquatic ecosystem; (iii) to ensure the minimum for water exploitation and usage activities. The integration and identification of flow types (ii) and (iii) should be stated more specifically. Therefore, it is necessary to revise Circular 65 to fully reflect this requirement. The application of Circular 65 is extremely important (for example in the Mekong Delta, where it is necessary to determine the minimum flow in Tan Chau, and Chau Doc area, as a basis for negotiating with upstream countries in operating hydroelectric reservoirs). The minimum flow is the basis for determining the principle of water resource allocation and has important implications for integrated river basin management and is closely related to the identified "water source functions".
- *Harmonizing downstream interests and stakeholder interests:* harmonizing downstream and stakeholders interests plays a key role in IWR, especially when Vietnam has important areas located downstream. Se San River and Sre Pok River in Vietnam are conveniently located in the upper reaches. In order to ensure the interests of the downstream (Cambodia), Vietnam has issued Decision 707/QD-TTg in 2013 and Decision 1201/QD-TTg in 2014 on the process of inter-lake operation on the Se San and Sre Pok rivers to discharging 195m^3/s and 27 m^3/s during the dry season. These flows are not completely considering the actual needs of Cambodia downstream, and shall need to adjust these two operational procedures when the Central Highlands water source is increasingly scarce.
- *Surface water and groundwater exploitation thresholds*: regulating exploitation threshold is an effective management tool for each water source. Many water sources including surface water and groundwater currently have a level of exploitation exceeding the natural supply capacity of water sources. In order to reduce depletion of water resources, regulation of exploitation threshold is necessary. For groundwater, on 12.26.2018, the Government issued Decree No. 167/2018/ND-CP stipulating the limited exploitation of groundwater, and the Minister of Natural Resources and Environment issued the Circular No.

31/2018/TT-BTNMT regulating contents, forms, and reports in the field of water resources. And Circular 34/2018/TT-BTNMT regulating on water resource survey, and assessment underground water resource. However, for long-term management, it is necessary to develop a program to determine the true potential of surface water and groundwater. Currently, the exploitation of water by many water sources and rivers has exceeded 40 % of available water. Over exploitation of the river will quickly lead to degradation and depletion. Each basin has natural conditions and different socio-economic development situation. It is necessary to build a threshold for the exploitation of surface water (for river basins) or underground water (for aquifers), serving as a basis for licensing exploitation.

- *International cooperation*: Vietnam has two large rivers: Mekong River and Red River, which have upstream countries of China, Thailand, Laos, Myanmar and Cambodia (Mekong River) and China (Red River). For the Mekong River, an agreement on Sustainable Development Cooperation (referred to as the 1995 Agreement) is a legal basis signed by four countries (except China and Myanmar). In the framework of cooperation on the Mekong Basin, Mekong River Commission is the only organization that functions to build legal frameworks, including binding regulations for member countries on fair and reasonable sharing of water resources, and jointly protecting the environment river basin status as well as promoting joint development projects. Activities of the Commission not only do have important implications for the economic, social and environmental protection of the region but also contribute to strengthening friendly relations between countries in the region. Implementing the 1995 Agreement, now has 5 Procedures with 04 countries signed to implement effective water resources of the Mekong River. Mekong cooperation is developing very well, is a place to share data, experience and create many forums to exchange science and technology, and management of water resources of the Mekong River. With the Red River, the cooperation with China is still limited, but there are also positive signs through exchange of hydrological data on the flood season.
- *Water resources monitoring*: Monitoring the exploitation and use of water resources is the control of the exploitation and usage of water resources by competent state management agencies through monitoring monitoring data of water resource exploitation and usage. In order to carry out the monitoring, the Water Resource Department has collaborated with relevant units to build a network of monitoring stations to monitoring water resources, water exploitation and use of reservoirs according to regulations. These are submitted to the Government for approval. On November 7, 2017, MONRE issued Circular No. 47/2017 regulating the monitoring and exploitation of water use for central and local water management agencies. Water production service, and business establishments having used water, including: a) reservoir works for electricity generation with an installed capacity of more than 50 MW including irrigation works in combination with electricity generation; b) reservoirs for surface water exploitation with a scale of over 0.1 m^3/s for water supply for agricultural production and aquaculture, over 100 m^3/day for other projects; c) sewers and pumping stations with exploitation scale of over 0.1 m^3/s, in case of water supply for agricultural production and aquaculture; over 100 m^3/day for water supply for other purposes; d) underground water exploitation projects with a scale of over 10 m^3/day. The monitoring content focuses on controlling water exploitation and usage activities, ensuring the consistency of information in space and time, between the central and local levels according to each river basin, and monitoring the implementation according to a license issued by a competent authority. Currently, the monitoring of water resources is carried out in 3 forms (i) online automatic monitoring (monitoring measurement data, automatic monitoring, connecting and transferring directly to the water monitoring and exploitation system); (ii) monitoring by camera (monitoring images by cameras connected and transmitted directly to the water monitoring and exploitation system); (iii) periodic monitoring (as measured and measured data is periodically

updated to the monitoring system. This activity should be maintained regularly.

- *Inter-reservoir operation rules*: Operating procedures are designed to maintain the required flow at a certain control position, to ensure fairness and protection of stakeholders' interests, ecology and ecological environment. A number of inter-lake operation procedures have been built in this period also need to be adjusted: existing 03 Decisions of the Prime Minister on the process of inter-reservoir operation in the Ba, Kon - Ha Thanh river basins, Tra Khuc, was issued in Decision No. 878/QD-TTg dated July 25, 2018; Decision No. 936/QD-TTg dated July 30, 2018 and Decision No. 911/QD-TTg dated July 25, 2018. Up to now, there have been 14 approved inter-reservoir operation procedures. In the coming time, it is necessary to adjust 05 inter-reservoir operation procedures in river basins: Dong Nai, Huong, Vu Gia - Thu Bon, Ca, and Srepok.

Policies to protect and restore water sources:

- Evaluate the environmental, economic and social values of water
- Integrating water resources policy with ecosystem, economic and social policies: Waterway corridor protection
- Applying procedures and rules to determine the boundaries of water source protection
- Sand mining: The Water Resources Department should coordinate with the General Department of Geology and Minerals to develop a Decree on management of river-bed sand and gravel to protect riverbank banks
- Restore and protect the quality of surface water and groundwater
- Consider environmental and social issues in planning, design, construction and operation management of water resource exploitation works
- Discharge threshold: it is necessary to determine the threshold for receiving wastewater in some important water sources. Wastewater intake threshold is the basis for management agencies to issue discharge permits to water sources.
- Inspection, control, order to stop production, compensation for damages

The MONRE needs to have mechanisms and policies to build “intact rivers” to preserve the values of the river.

It is necessary to quickly assess the risk of surface water degradation as a basis for establishing water resource protection planning for priority river basins: Hong, Dong Nai and Cau rivers

Policy to prevent damage by water:

- Flood prevention: (i) Develop a reservoir operation procedure in flood season; (ii) MARD coordinates with MONRE, and local government, to apply community- based disaster management approach.
- Policies to adapt to climate change (CC): are prioritized activities and are closely coordinated by ministries, sectors, and localities. So far, a National Strategy on Climate Change has been developed and 10 priority programs have been issued for the period of 2016 - 2025.

- Approving the National Target Program to respond to climate change (Decision No. 158 dated December 2, 2008 of the Prime Minister)
- Developing and publishing climate change and sea level rise scenarios for Vietnam (June 2009), and announce the scenario update results (March 2012)
- Approving the National Strategy on Climate Change (Decision No. 2139 dated December 5, 2011 of the Prime Minister)
- Establishing the National Committee on Climate Change (Decision No. 43 dated January 9, 2012 of the Prime Minister)
- Since 2012, started to implement models to respond to climate change impacts, especially sea level rise. Priority for implementation in coastal provinces, especially in the

Mekong Delta provinces

- Policy on environmental protection: policies to overcome consequences after floods and droughts

+ ***3. Other policies related to water resource***

- *Land, forest and urban policies*: the implementation of land use and management policies to develop urban centers and townships is still very limited, due to the difficulty of Governmental budget, and the investors have less interested in projects related to community benefits (except for projects in building pagodas, temples). In the coming time, it is necessary to complete policies on management and use of land for embellishment and development of urban areas and rural residential areas in order to reduce inundation and contribute to the use of land resources for development, and improvement of living conditions for urban and rural residents.
- *Environmental protection policy:* MARD needs to cooperate with Ministry of Industry and Trade to manage pollution control in craft villages due to industrial, mining or mechanical activities
- *Forest development policy:* Forest development and protection have paid attention to watershed forests. However, there has not been paid attention to the selection of trees of diverse nature, able to keep rainwater, in favor of the forest economic goal. There should be coordination between MARD and MONRE on the formation of special-use forests to keep water sources for the dry season.

5.1.2.1.2. Legal framework on water resource:

The legal framework plays an important role in managing macro-water resources from national and local laws, on the use of water to international treaties of the governance of international water sources. Vietnam has built the LWR 1998 (emphasis on exploitation and development of water resources), and the Law on Water Resources 2012 based on the principles of integrated management of water resources. The Law on Water Resources in 2012 continued to adjust some articles according to the Law on Planning and Law 35 (adjusting 37 laws related to planning). In the previous legal documents, it is mainly related to planning and management of water resources, or only planning of water resources according to river basins without regulations on integrated river basin planning. According to Law 35-2018 on planning adjustment, the river basin master plan is the basic content to serve IWRM. Changing from the planning of water resources to integrated river basin planning requires specific technical guidelines to reflect the general meaning of nature and human synthesis. Therefore, Circular 42-2015 on Technical Guidelines for planning water resources needs to be revised to reflect the requirements of planning contents, and integrated management of river basins, combining administrative boundaries and basins, between surface water and groundwater, between quality and quantity, and between the development of water resources and the protection of water resources.

In addition to the planning, the contents of ensuring water use rights, ensuring water quality for socio-economic development, the regulations also need to be consistent with international practices on water and in dealing with disagreements in the context. Large rivers flowing through Vietnam are suffering from huge development.

Water quality issues and environmental pollution are becoming increasingly urgent. The licensing of waste discharge into water sources has been paid attention and implemented in practice quite effectively. Tools to control pollution such as pollution fee was implemented in accordance with Article 9 of Decree No. 154/2016/ND-CP dated 11/16/2016 of the Government on environmental protection charges for wastewater, in which (i) *For domestic wastewater:* Leave 10% for the water supply unit and 25% for the People's Committee of communes, wards and townships to cover the costs for collection activities... after deducting

the deducted fee amount, the clean water supply unit and the commune, ward or township People's Committee shall remit it into the local budget for use according to regulations. (ii) *For industrial wastewater*[100]: Leave 25% of the total amount of environmental protection fee collected to cover the cost of collecting fees (investigation, statistics, review, classification, update, management of charge objects); Covering costs of measurement, evaluation, sampling and analysis of waste water samples for the evaluation of charge declarations and charge management; Periodic or irregular inspection of industrial wastewater. The remainder is submitted to the local budget for use according to regulations. After deducting the fee amount as prescribed for domestic and industrial wastewater, the charge-collecting unit shall remit it into the local budget for use in environmental protection work, and to supplement the operation capital source for the local Environmental Protection Fund to use for the prevention, restriction and control of environmental pollution caused by wastewater.

Thus, based on the above provisions, the amount of environmental protection fee for wastewater after subtracting the deducted amount of the prescribed fee shall be remitted into the local budget for use in the protection work. The environment and addition to the Environmental Protection Fund are increasingly being increased. Collection of environmental protection charges for domestic wastewater increased from VND 1,017 billion VND in 2015 to 2,017 billion VND in 2017, and environmental protection charges for industrial wastewater collected from VND 65 billion VND in 2015 to 85 billion VND in 2017[101]. This fee collection has not really created favorable conditions to improve water quality such as some typical polluted water sources in Cau, Day and Dong Nai river basins. In the coming time, it is necessary to have more effective tools (such as technology changes ...) to improve the polluted water.

In order to properly reflect the content of integrated management of river basins, the amendment is not to stop at the issue of integrated river basin planning, in which economic development, environmental protection, and social security protection must be seen at the same level. In addition, external factors affecting development scenarios must be paid special attention - this is the core for integrated river basin planning, especially for Vietnam, the important plains are located in the lower basin of other country's large rivers, which lead to the difficulty or no capacity of controlling exploitation activities in upstream areas. Recently, the development of the coastal area is very active, greatly affect the movement of water and river protection. Therefore, it is necessary to supplement the contents of coastal planning into the 2012 Law, which has not been mentioned. The requirements of socio-economic development and environmental protection are increasing. Day-to-day water service activities are also important. Therefore, it is necessary to complete the 2012 Law on water resources, and supplement the above contents to suit the requirements of new development.

5.1.2.1.3. Investment and financial policies for water resource

Investment policy for the water sector with the aim of having sufficient resources to meet water demand and comply with the principle of considering water as a commodity in integrated water resources management. Financially, the country must ensure sufficient tax and charge - water service prices to encourage reasonable and economical use of water. The water sector needs to mobilize finance to invest in three areas (i) water resource management; (ii) operational

[100] The level of environmental protection fee for industrial wastewater is calculated as follows: F = f + C (where: F is the amount to be paid. F is a fixed fee of 1.5 million VND / year; C is a fee change, calculated according to: Total amount of waste water, pollution parameter content and collection level for each substance in the following table: Chemical oxygen demand (COD) of 2,000 VND/kg; suspended solids (TSS) fee of 2,400 VND/kg, Mercury (Hg) fee of 20 million VND/kg, Lead (Pb) fee of 1 million VND/kg, Arsenic (As) fee of 2 million VND/kg, Cadmium (Cd) fee of 2 million VND/kg

[101] Source: Ministry of Finance, Financial News 13/12/2018

organization of water resources management and river basin organization, and (iii) construction and maintenance of infrastructure.

- *Investment in water resources management*: consists of two main types of investment: (i) investment in institutional and non-structural activities. In order to enhance management effectiveness in which to build a responsibility mechanism and build institutional activities, develop policies in exploitation, use, protection of water resources, legislation, strategy formulation and planning, scientific research, restoration of pollution and rivers, river management (erosion and sedimentation of rivers), management of land use in river basins. According to the 2008 Assessment of Water Sector, investment in water resource management accounts for only 1% of investment in infrastructure and investment in disaster prevention. Recently, there has been no research on investment in water resources management, but the Government has definitely shifted its investment a lot, since only infrastructure construction has been converted into investment for information collection, planning, building operating procedures, developing policies on minimum flow, technical guidelines for planning water resources, etc. Estimated an average of 15 billion VND per year but it is still very low compared to the requirement. (ii) *Investing in regular management activities* to maintain river health, collect data and operate information systems, and monitor water resources, mobilize participating organizations, strengthen capacity, and raise community awareness. This activity is being promoted and focused on the survey activities to collect information about water resources. However, the investigation also spread over a wide range, lack of concentration and experience. Lack of support from non-governmental organizations or other sectors in disseminating knowledge and protecting the river and favoring the "Water Resources Industry" activity without the "Water Industry" nature. The problems of erosion/sedimentation of riverbank banks have not been focused on research and overlap in functions and tasks with "Disaster Prevention" activities of MARD.
- *Investment in operation and organization of water resources management and river basin organization*: investment in the operation of the RBC includes expenses for (i) meetings of the Commission, (ii) operating costs According to the RBC regulations, including training and capacity building, (iii) investment in office equipment, communication and transportation. Currently, apart from the established National Committee of the Mekong River, there is no other formal established Committees to manage water resources in river basins.
- *Investment in construction and infrastructure maintenance*: this investment belongs to the water sector agencies, due to the institutional characteristics of Vietnam, the investment in infrastructure is in the exploitation and use agencies. On the other hand, using, protecting water sources or preventing natural disasters belong to other ministries of water use.

MONRE should coordinate with the Ministry of Planning and Investment and the Ministry of Finance to develop a national strategy for investment in the water sector.

It is necessary to have priority policies/capital support for projects and works in the construction of wastewater treatment systems before discharging into the environment. Policies can be researched and applied to (i) stop operation, (ii) technological change, and (iii) continue with pollution and fees

Proposals on the development of water resources strategies and policies include 16 petitioning activities, and 01 content on amending water related Law as follows:

Recommendations on Building strategies and policies

01. Develop a National Water Resources Strategy to 2030 to replace the National Water Resources Strategy to 2020, update the new situation.
02. It is necessary to amend Circular 42-2015 to fully reflect the requirements of the content of the inter-provincial river basin integrated planning and inter-provincial water sources (expected to be completed in 8/2019) in combination of border of administrative and basin, between surface water and groundwater, between the quality and quantity of water, and between the development of water resources and the protection of water resources.
03. Develop Circular regulating economic - technical norms for planning.
04. Develop a Circular guiding the preparation of National Water Resources Planning.
05. Develop a Circular to guide the recovery of degraded surface water and aquifers.
06. Revise Circular 65 on "Guidelines for determining minimum flow" to fully reflect this requirement.
07. Need to adjust the operation process: adjust 05 inter-reservoir operating procedures in river basins: Dong Nai, Huong, Vu Gia - Thu Bon, Ca, Srepok.
08. A program to determine the true potential of surface water and groundwater needs to be developed. Currently, the exploitation of water by many water sources and rivers has exceeded 40% of available water. Overexploitation will bring the river quickly to recession and depletion.
09. Need to determine the threshold of surface water exploitation for river basins and groundwater for some priority aquifers.
10. It is necessary to quickly assess the risk of surface water degradation as a basis for establishing water resource protection planning for priority river basins: Hong, Dong Nai and Cau rivers.
11. MARD coordinates with MONRE, and the localities to apply the community-based disaster risk management approach.
12. MARD needs to cooperate with Ministry of Industry and Trade to manage pollution control from industrial, village, mining or mechanical activities.
13. MONRE should coordinate with the Ministry of Planning and Investment and the Ministry of Finance to develop a national strategy for investment in the water sector.
14. Financial policies are needed to encourage private participation in the construction of a BOT or BOOT water service system.
15. It is necessary to develop priority policies/capital support for projects and works in the construction of wastewater treatment systems before discharging into the environment. Policies can be researched and applied to (i) stop working, (ii) change technology and (iii) continue to pollute and pay fees.
16. The Ministry of Natural Resources and Environment needs mechanisms and policies to build "intact rivers" to preserve the values of the river.

Amendment of Law on Water resources and Law on Environmental protection

17. Revise and complete the Law on Water Resources 2012, and the Law on Environmental Protection, and add the above contents in accordance with the Law on Planning, and the requirements of developing, protecting and managing water resources in the new context.

5.1.2.2 Create an institutional framework including Governmental administrative management, river basin management, basing on the characteristics of water resources, public and provide service organizations

World experience showed that the crisis of water is mainly due to weak management, not due to water shortage or water pollution. For IWRM, people refer to "water governance" rather than "water management". This means that political, social, economic and administrative institutions are on the way to develop and manage resources in a sustainable manner, not just administrative units as in water management. This is different from the previous situation of water management when agencies and organizations have the main function of exploiting and

using water of each sector such as irrigation, hydropower or water transport. Requirements for building an institutional framework for more effective water sector governance, sustainable water resources development and effective water services. In fact, to govern water sector effectively, it requires all four roles (i) Government, (ii) market, (iii) civil society and (iv) community. Each unit has different functions but complement each other to support water governance.

The establishment of MONRE with the function of managing water resources was a turning point in the history of separating the management of water resources with the management of water exploitation and use by ministries and branches. It took quite a long time for this to be properly understood. Recently, the principles of IWRM have been linked to reality through a strategic solution of river basin management. Regarding state management, the function of managing water resources is assigned to MONRE. Local level has DONREs. However, to manage river basins, it is necessary to organize proper management of water resources in river basins.

Current water management organizations include:

5.1.2.2.1 Executive authorities and enforcement authorities

1. Management authorities and enforcement authorities

Executing agency and enforcement agency exist in state agencies that can be separated or merged into one. The executive and enforcement functions are to ensure the implementation of water rights, environmental management related to water use, water quality, land use planning, and financial management of water resources. In addition, the executive agency also administers economic tools such as water price evaluation. Both agencies have the function of licensing, fines, compensation, etc. according to the Law. Currently, the Department of Water Resources Management under MONRE is implementing the function of managing water resources, the Vietnam Environment Administration performs the function of environmental management. Enforcement functions on water resources and water environment under the Water Resources Inspectorate and Environmental Inspectorate of the MONRE, and the Department of Environmental Police under the Ministry of Public Security. The implementation of economic instruments such as taxes, fees and fines in general MONRE proposes the financial policies in general, and the Ministry of Finance specifies in detail the financial implementation, and other ministries are in charge of water services. The diagram below identifies specific functions of agencies in each field.

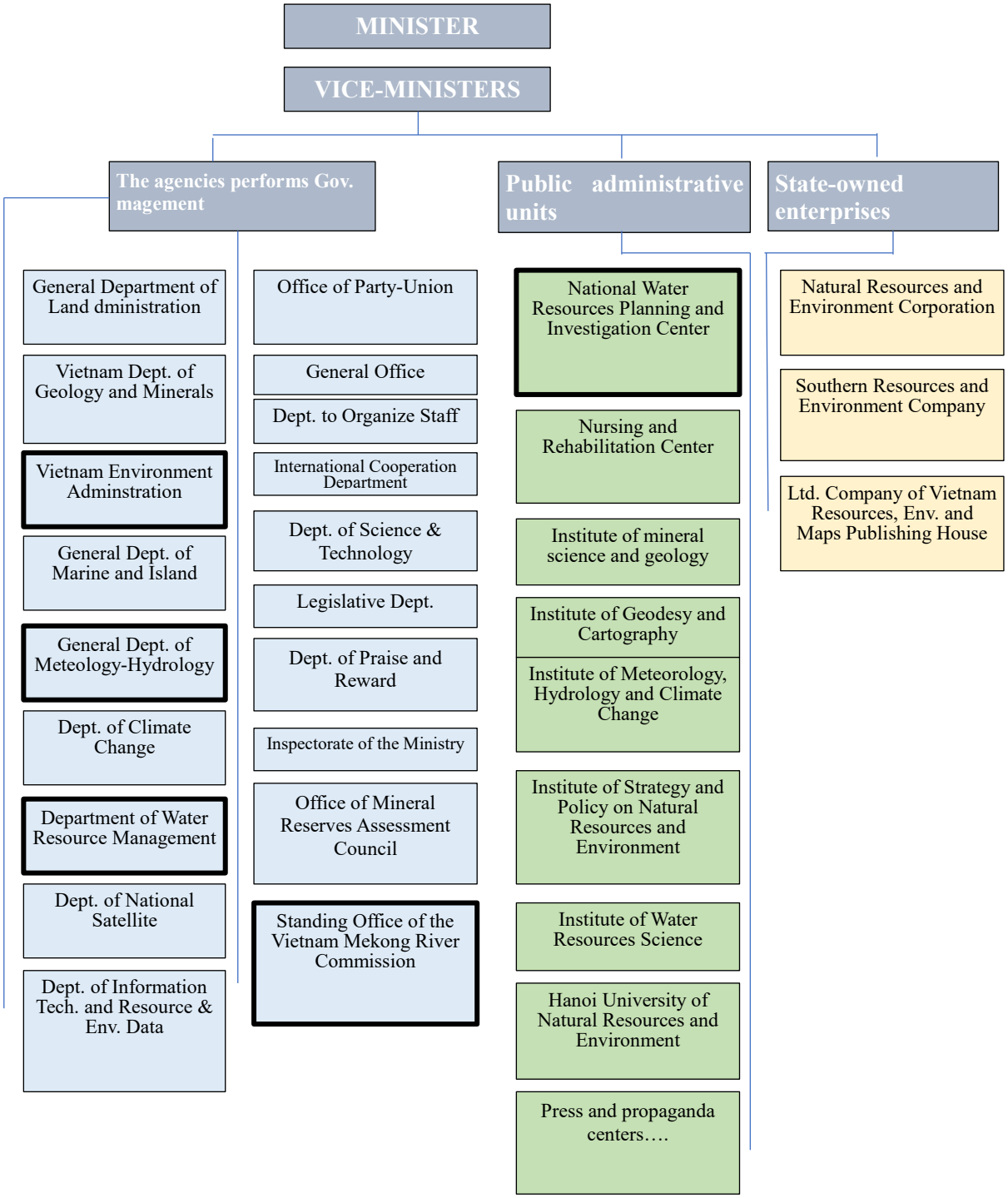

Figure 4-1: MONRE organization.

The assignment of tasks according to functions as shown in Figure 4-2 is quite clear, but in practice the implementation is still difficult due to the lack of experience in agencies, especially water environment issues. Therefore, in the long term, there should be capacity building activities for management and enforcement, especially on water environment management. Concentrate on checking, inspecting and resolutely handling violations for downstream flood control, regulating water in dry season, ensuring to maintain the minimum flow of lakes according to the inter-reservoir procedure; groundwater exploitation activities are in large scale, especially areas where subsidence is occurring such as Ho Chi Minh City and Mekong Delta.

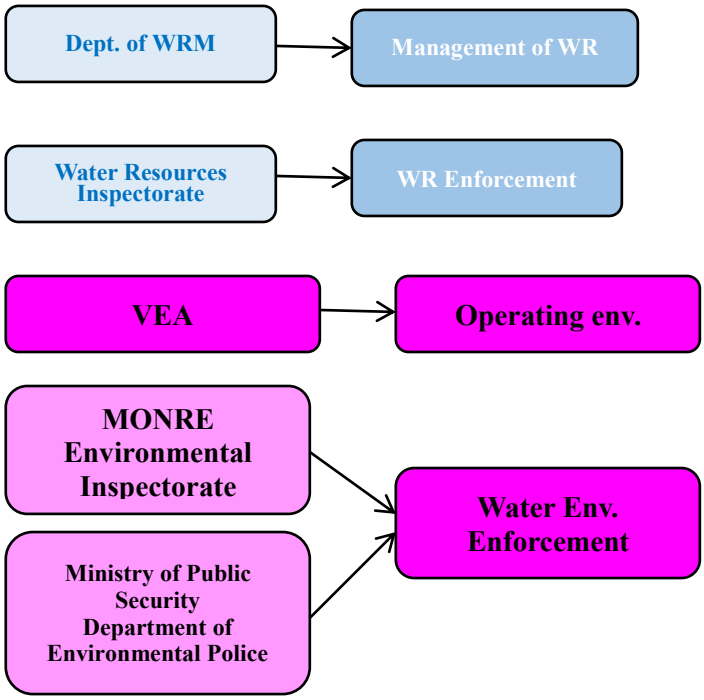

Figure 4-2: WRM Organization.

2. Local government

Under the IWRM, the local government plays a very important role in managing and resolving water issues in their locality, water service providers and seeking funding for water activities. The local government has direct or indirect responsibility for water security for production and population in its area. DONRE is the organization that assists the local government with regard to water management issues, and DARD assists with the use of water for agriculture, fisheries and irrigation, and disaster prevention. Department of Industry and Trade helps local hydropower activities. However, the support force of these agencies is too little and the experience is lacking. In charge of water resources of each DONRE has only 3-5 people, which is too little compared to the requirement.

3. Monitoring and evaluation organization

With the function of monitoring and evaluation, the state agencies such as DWRM and VEA undertake the function of monitoring and evaluating water resources on a national scale. DONRE carries out monitoring and evaluation of water resources both in quantity and quality of water, before and after the water exploitation and use activities, and provides handling measures in accordance with the law if it does not meet the stated requirements. In the license. These organizations are finalizing the information system, measuring stations, monitoring systems and evaluation tools.

About the environment, VEA has been quite strongly completing laboratories, water quality measuring stations, and tools to evaluate water quality environment analysis. The organization also offers solutions to treat management of environmental incidents according to the provisions of law.

Although monitoring and evaluation activities have been carried out, these organizations need to be improved, and improvement of the quality and equipment to meet the requirements of the mentioned work. In the coming years, it is necessary to focus on the following monitoring activities: (i) monitor activities of exploitation and usage of water resources, discharge of wastewater into water sources based on the application of automatic information and technology systems, online; (ii) monitoring the operation of reservoirs according to the inter-

reservoir procedure, and minimum flow discharge of hydropower reservoirs.... by automatic and online technology. (iii) research and construction activities of exploitation and use of water resources monitoring, discharge of wastewater into water sources, to soon put into practice.

5.1.2.2.2. Organization of water and sanitation services:

1. Public service

Institutional strengthening for water service provision: Water services may include urban and rural water supply and drainage. Facilitate service providers with autonomy, ability to make decisions, access to resources and take responsibility if they are not effective. In order for public services to function effectively, there should be (i) a framework of regulations on financial management and mode of service provision; (ii) the state monitors the performance of service activities; (iii) The State permits changes in tariffs; (iv) customer-oriented services. These are the factor that the water sector is gradually moving towards and practically avoiding the current plan. Service activities are still relatively new to Vietnam due to the transition from subsidy mechanism to market mechanism. Vietnam is gradually changing accordingly. The main need for water services is the provision of water for urban and rural areas, for agricultural, industrial and fishery production. Services on water drainage, environmental sanitation, wastewater treatment and pollution prevention are new and difficult services and are gradually forming. Water service organization with many economic sectors, from state companies with specialized agencies or directly under local authorities, public service organizations, private service organizations, community organizations or organizations irrigation facilities are gradually forming. Services on water supply, sanitation and irrigation are public services with low efficiency are gradually being improved and improved service functions. The urban water service industry has formed a market and has experience in management. However, rural water service activities are newly formed, gradually operating towards service business.

The agricultural sector with cultivation and animal husbandry is the largest water consumption sector, which is currently moving strongly through the agriculture restructuring project (including the irrigation sector restructuring). The project aims to improve the efficiency of the irrigation sector to serve the restructuring of the agricultural sector in the direction of improving added value and sustainable development, meeting the requirements of socio-economic and advanced development, capacity for disaster prevention and response to climate change, contributing to modernization of rural agriculture and new rural construction. In which, striving to 2020, 100% of the organizations managing the exploitation of irrigation works operate by the method of ordering or bidding for exploitation management (changing the method of assigning annual plans before). Ministry of Agriculture and Rural Development is very active in implementing the project and initially very successful. In particular, the irrigation service organizations are gradually forming a system from the management of the head to the management of inland canals and the completion of the infrastructure to facilitate service activities. Decree No. 96/2018 / ND-CP stipulated detail regulations on price of irrigation product and service and support for the use of irrigation public products and service. This Decree prescribes how to calculate the price of irrigation products and services in VND/m^3 of water and at the same time instruct the roadmap to calculate the price of irrigation product and service for the first period of 2018-2020 and the period from 2021 onwards for subjects: domestic and industrial water supply; drainage for industrial zone; combined power generation; tourism business and entertainment activities; aquaculture and transport combination. The Decree also stipulates the roadmap for implementation, plans to support the use of irrigation products and services and officially take effect from July 1, 2018.

2. Private service provider

Currently forming and encouraging private investment in water service. Through the first phase of the restructuring of the irrigation sector, many private organizations have participated in activities of supplying water for daily life and advanced technologies such as sprinkler and

drip irrigation. However, there are very few private organizations to invest in sanitation service, and irrigation because these services require large investment and are difficult to make profits in the beginning time. In order to encourage private participation, there should be policy to transfer private infrastructure to operate (eg small pumping stations, dams, etc.) or encourage private sector participation in the construction of water supply systems under BOT or BOOT form.

3. Water management based on community

Community participation in water resource management is one of four Dublin principles of IWRM. Policies are needed (including financial policy) to support community group and NGO in grassroot activities related to gender, poorer classes, promotion and dissemination of knowledge, Propaganda related to management of water resources. For irrigation, there was a period when the "202 Team" specialized in irrigation was very successful. Later, the "Grassroot Irrigation Association" participated in irrigation management (PIM), which enhanced the role of people involved in irrigation activities. In general, these organizations become inactive when the state is reducing irrigation. With the Irrigation sector restructuring project, testing to select the basic irrigation management model is suitable for each region's farming condition, which need to be carefully carried out and should be piloted before extensive implementation. With the model of rural water supply and sanitation development are an opportunity to promote the community role in rural water supply and sanitation development. With the national target program on rural water supply and sanitation for the second phase from 2006-2010, the government has made changes in financial policy, established a policy-social bank for the community to borrow credit inventively. This is an initial success when promoting the role and giving responsibility to the community.

5.1.2.2.3. Coordination and facilitation

1. Cross-border organization

Vietnam has six major inter-national river basins, including the Mekong Delta, the Red-Thai Binh River, the Se San-Sre Pok, Song Ma, Song Ca and Bang Giang - Ky Cung. However, the ongoing issues of trans-boundary impacts that are attracting interest of the whole community are the impacts on the Mekong mainstream and the Se San - Sre Pok. For Se San - Srre Pok, the Vietnamese territory is located upstream, so it actively cooperated and sought measures to mitigate impacts. In contrast, the Mekong Delta is in the lower Mekong River - where upstream countries have been constructing dams on the Mekong mainstream that have a significant impact on flow regime, sediment movement, aquatic resources and ecology for the Mekong Delta. Viet Nam's cross-border organization - the National Mekong Commission was established and actively involved in the application of the 1995 Mekong Agreement provisions as well as regulations, rules and agreements for Mekong River activities. To meet the requirements for water governance in the Mekong, Se San - Sre Pok, this agency needs to be improved to meet the requirements of water governance in the new context.

For the Red River, cooperation with China faces many difficulties in exchanging data. Other measures should be taken to resolve this issue soon.

2. National Council of Water Resources

Vietnam has established the National Council of Water Resources in 2000 with the task of advising the government on big river policies, strategies and planning by the Deputy Prime Minister who is the Chairman of the Council and the Standing Vice President is the Minister of MONRE, the trustees are the vice ministers of the water related ministries and some experts. Office of the National Council for Water Resources is located at the Department of Water Resources Management. However, with the current situation, the role of the Council is still very faint.

3. River basin organization

River basin organization is an institutional form that is highly encouraged by developed

countries in the world, a special form of water resources management in river basin, a water source, or an aquifer without depending on administrative boundary. Vietnam has clearly seen the important role of RBO in IWRM. Many RBOs have been formed, including 8 RBOs to manage the planning established by the Ministry of Agriculture and Rural Development from 2006-2008 and 3 Environmental Protection Committees established by the Ministry of Natural Resources and Environment. 2007-2008. Although these RBOs maintain regular meetings, they still transfer the position of Committee Chair, but due to lack of operational funding, the lack of policies on river basin management, these Committees have no operated really effectively. Recently, the Ministry of Natural Resources and Environment plans to establish 5 RBOs (i) Red River-Thai Binh River Committee, (ii) Dong Nai RBO, (iii) Cuu Long River Committee, (iv) Se San, Sre Pok RBO, (v) Northern Central Vietnam River Committee and (vi) Southern Central Vietnam River Committee, after many seminars and consultations, Cuu Long River Commission and the Se San and Sre Pok River Commission are proposed by the water management agency to move to Mekong RBO. So officially there are 4 RB Committees. Currently the ministries still have many opinions, so the establishment of these committees has not been approved by the Prime Minister. The French development agency is supporting Quang Nam province and Da Nang city for Thu Bon river management including river basin management and coastal management. The Se San - Sre Pok basin is also being provided with technical support and initial funding from the World Bank to establish Se San - Sre Pok river basin committee and develop a Decision Support System (DSS) to support the operating committee. However, due to change in planning, norms and technical contents of planning, the work is being implemented very slowly. Due to the characteristics of Vietnam's institutions, the establishment of the River Basin Committee faced with many difficulties in its operation. The government should urgently arrange legal and institutional details for the management of river basins and should immediately identify appropriate institutional model for river basin organizations and apply the model into practice for priority areas. The establishment of river basin organization should be based on natural conditions and the actual use of water in each basin. For the provincial river basin, it is not necessary to establish a river basin organization. The management of water resources in the inner river basin of the province will be carried out by that locality in coordination with WRMD. For large river basins such as Red River and Thai Binh River, there are scopes in many provinces. Besides establishing a common river basin organization, it is possible to establish sub-river basins, such as Cau sub-basin. It is important to establish a river basin organization for river basins in the provinces where the water is shared, such as Vu Gia - Thu Bon with two provinces namely Da Nang and Quang Nam, or as Dong Nai river basin has 6 provinces sharing[102]. Each river basin has its own characteristics, the river basin organization cooperates with the relevant agencies of the Ministry of Natural Resources and Environment and local agencies to deal with daily affairs in that river basin. Related issues between river basins will be solved by the Ministry of Natural Resources and Environment and the National Council of Water Resources. River basin organizations may have functions such as: (i) collecting and processing data on water resources and related resources; (ii) feasibility studies of projects (exploitation and use of water resources, environmental protection or restoration of water resources ...), operation of projects to recapitalize and serve the activities of the Commission. ban; (iii) participate in monitoring water resource allocation in accordance with regulations and cost-sharing principles; monitoring pollution and environmental conditions, monitoring the health of the river; (iv) participate in developing policies and strategies for socio-economic development, environmental protection and mobilize communities to participate in decision making. In order to facilitate the management of the river basin successfully, before establishing the river basin committees, it is recommended to take

[102] Source: “Thailand River basin Planning and Management Structure”. At present, Thailand has 29 River Basin committees and sub-River Basin committees

the Vu Gia - Thu Bon river basin as an experiment on the planning and integrated management of the river basin as the pilot river basin committee. Reasons for choosing the Vu Gia - Thu Bon river basin includes (i) the basin covers only two provinces of Quang Nam and Da Nang; (ii) various forms of water exploitation such as hydropower development, agriculture, industry, tourism and mining; (iii) there is an intra-basin and outside basin; (iv) there is a contradiction in the exploitation and use of water between the operation of hydropower (on Quang Nam land) and the supply of domestic and people's water supply in Da Nang city; (v) there are ecological environment issues and nature conservation area.

5.1.2.2.4. Strengthening capacity

1. Collection of data and information:

The collection and exchange/sharing of data and information system in Vietnam is being developed by the Department of Water Resources Management from the monitoring and monitoring system of water resources to monitor water quality. The four types of information to be shared are (i) data: quantity, water quality, frequency of occurrence, available water resources in space and time. (ii) information: how to share this information; (iii) knowledge: understanding of water resources and (iv) understanding of how to use and exploit water resources to ensure sustainability. Currently, water management organizations are highly focused on establishing a water resource data collection system. Initially, cooperated with the World Bank to establish a "Decision Support System" for the Se San - Sre Pok basin. This should be done in a typical case study by river basins before being deployed nationwide. Proposals outside the Se San - Sre Pok supported by the World Bank (currently being implemented very slowly due to relevant procedures), recommending early application of Decision support (Decision Support System - DSS) in Vu Gia - Thu Bon as pilot river basin.

2. Training to improve professional skills:

Strengthening capacity of water resources management and technical management training.

Application of the principles of IWRM is a process, so building capacity for water governance organizations requires a long-term plan. Firstly, human capacity must be developed at all levels. First is the capacity to manage water resources. In which, priority is given to develop legal capacity building such as policies, operating mechanisms, capacity to use survey and evaluation tools, etc. Training of knowledgeable and professional managers and management skills is a priority for water resource management agencies at all levels. In addition, facilitating knowledge is practically indispensable for water resources managers to qualification training. Capacity development includes professional fostering, enhancement and use of the capabilities and skills of individuals and organizations. Human capacity is concentrated at (i) developing plan, planning, mechanisms and policies for management and (ii) enforcement capacity. Capacity building needs to take place at three different levels (a) at the individual level, (b) at the level of management and enforcement organization and (c) at social level in general. Currently, state management organizations regularly organize training courses on IWRM through projects, foreign study tours, short-term training courses, and general workshops. However, the training and awareness raising methods of organizations, individuals as well as the community have not met the general requirement. The concepts of IWRM are mixed with the concept of multi-purpose uses. The role of the community involved in state management remains unclear. Experts on water resources are few and support for the management of state management is limited.

8 Recommendations on institutional work and 3 recommendations on capacity building are as follows:

Development and finalization of the institutional framework

1. Need to identify appropriate institutional models for river basin organizations and apply practical models to priority basins.
2. Proposing to take the Vu Gia - Thu Bon river basin as an experiment on integrated water resources management, starting with the development of a river basin integrated planning, establishing a pilot of river basin organization, improving the system monitoring and supervision of water resources; develop river basin management plan; apply measures of inspection and supervision of water resources.
3. Institutional strengthening for water service provision and mobilization of private forces to participate in water services
4. There should be a policy of transferring private operating infrastructure to encourage private participation, with priority for small-scale irrigation infrastructures.
5. In order to meet the requirements of Mekong water management, Se San - Sre Pok, VNMC organization needs to be improved and upgraded to meet the requirement of water management in the new context.
6. Establishing HONG-THAI BINH river basin committee, developing working regulations and action plans of the river basin committee
7. Establishing Dong Nai river basin committee, developing working regulations and action plans of the river basin committee
8. Establishing other river basin committees, developing working regulations and action plans of the river basin committees.

Strengthening capacity

1. Strengthening the capacity of governance and enforcement, especially the management of the water environment through training, training and learning of developed countries in water governance.
2. Strengthening the inspection and inspection and resolutely handling violations of downstream flood control, water regulation in the dry season, ensuring the maintenance of minimum flow of reservoirs according to process contact reservoir.
3. Strengthening capacity of water resources management and technical training at all management levels, including Strengthening capacity for Vu Gia - Thu Bon river basin committee.

5.1.2.3 Implementation of management tools including research, investigation, water resource assessment, strategy, planning, design, construction, operation, evaluation

Implementation of integrated management of water resources through a set of management tools and methods to support decision maker. The use of tools allows the selection of scientific decisions to adjust actions to suit each specific situation in particular depending on the context to select the appropriate tools. Vietnam currently applies a number of tools and results as follows:

5.1.2.3.1. Evaluation of water resources

Understanding water resources: the need to know how much water is available to analyze the balance between supply and demand, monitor water quality and make policies to exploit, use and protect water resources in a preferred way well suited.

Water resources assessment helps to understand the link between water resources and water users and assesses the impacts of water exploitation and use, water resources policies to make appropriate adjustments.

In order to assess water resources, it is necessary to have a database of information on (i) hydro-meteorological changes in space and time; quantity of surface water and underground water; the situation of flood, drought, impacts of climate change according to the river basin (ii) data on the current situation and forecast of exploitation and use of water, using related resources such as land use, forest cover, water use infrastructure such as lakes and dams, pump station; infrastructure for flood prevention and natural disasters such as flood-cutting reservoirs, dikes, etc. water quality, ecosystem and assets (assets) (iii) financial data related to water resources. In addition, , document quality factors are also important for the basis of data information. Vietnam has a national hydro-meteorological monitoring network implemented by the National Hydrological Data Center under the General Department of Meteorology and

Hydrology - Ministry of Natural Resources and Environment and provides information on the website http://cmh.com.vn/article/51-GIOI-THIEU/. The website provides and shares information on meteorology, meteorology, hydrology, marine hydrology, environment and climate change; sharing the results of scientific research published in the field of meteorology, meteorology, hydrology, marine hydrology, environment and climate change. The materials posted on the Web site are collected from other websites, from studies, books and documents published at the Department of Information Technology, Meteorology and hydrology Data Center, National Archives Center and from other sources.

Water resources assessment also considers the relationship between water resources and the exploitation and use of water and human impacts on water resources through the construction of water exploitation and use infrastructure. In IWRM, in addition to assessing the water requirements according to the development stages, it is necessary to mention the scenarios of water resources development in response to climate change and sea level rise, the impact of water exploitation and exploitation on the ecosystem, aquatic, strategic environmental assessment and effective application of implementation of mechanisms, regulations and institutions for water resources and society in the basin to be able to do this often applies mathematical models and systems to support DSS decision making. The Department of Water Resources Management is the agency in charge of organizing statistics, assessing and forecasting water resources, building information systems, updating and managing national information and database systems on water resources. The content of the National Water Resources Report, the report on water resources, reports on the use of water resources and the discharge of wastewater into water sources are specified in Circular No. 31/2018/TT-BTN-MT dated on December 26, 2018. So far, some provinces and cities have had reports on assessment of underground water resources or surface water. For underground water, a groundwater resource map of 1: 200,000 scale has been established for provinces across the country with information on the forecasting potential, the exploitable reserve and the exploitation status. Groundwater is assessed and shown on a detailed map set to the district administrative boundaries. With this map, underground water resources are synthesized, analyzed and evaluated in the most consistent and complete way. In the coming time, it is necessary to implement the basic planning of water resources survey.

5.1.2.3.2 Math model and decision making

Today, the application of mathematical model, GIS geographic information system and support system for DSS decision making is the process of prioritizing and developing appropriate scenarios and solutions in decision making process. The DSS consists of 3 parts (i) the knowledge base system, which includes all information about hydrology, land use, forest cover, infrastructure, detailed information about the facility. Infrastructure; (ii) assessment and analysis tools; (iii) mathematical models such as hydrological models (one-dimension, two-dimensions), basin simulation models, flood control models, silt, water quality models, etc. Currently the Center of Water Resources Planning Survey (NAWAPI) is capable of using these models. Beside using the models in planning, these models help policy makers and managers see the results of impacts in scenarios of water quantity, water quality, environment, number amount of water ... as a basis for their decisions. Developing scenarios for Vietnam is really important, including scenarios for the construction of infrastructures upstream of the Mekong or Red River (controlled by upstream countries), scenarios climate change, floods, droughts and other socio-economic development scenarios. It is recommended that Vu Gia - Thu Bon basin be selected as a typical basin to apply mathematical models in the river basin integrated planning.

5.1.2.3.2. Plan/master planning for integrated management of water resources

A water resource planning is an important tool to manage water resources. Therefore, after the Water Resources Law 2012 came into effect on January 1, 2013, the Ministry of

Natural Resources and Environment assigned the National Water Resources Planning and Investigation (NAWAPI) to set up a number of water resources planning. River basin according to Circular No. 42/2015 / TT-BTNMT on September 29, 2015, regulating water resource planning and Circular No. 15/2017 / TT-BTNM, dated July 21, 2017, on Regulation Economic and technical norms for planning and adjusting water resources planning. The content of water resources planning mainly has three component plans (i) water resource allocation plan; (ii) water resource protection planning and (iii) planning on water damage prevention. A number of river basins such as Bang Giang - Ky Cung and Red - Thai Binh river basins have been developed and planned for water resources according to Circular No.42.

However, water resource planning activities are currently stopped. On November 20, 2018, the National Assembly passed Law No. 35/2018 / QH14, supplementing a number of articles of 37 laws related to planning, including changes to specific water resource planning such as change the name of water resources planning; planning period; planning bases; planning approval competence; abolish Article 18 (provisions on the content of water resources planning of the whole country) and amend some of the phrases in Article 19 (contents of planning of water resources in the inter-provincial and inter-provincial river basins), Article 20 (planning tasks) of the Law on Water Resources; additional provisions on strategic environmental assessment. Under Law 35, planning of water resources will focus on three types of planning: (i) water resource planning is the national sector planning; (ii) integrated planning of inter-provincial and inter-provincial river basins; and (iii) planning for the protection, exploitation and use of international water resources. In the coming time, priority should be given to developing the national water resource planning; developing a project to strengthen measures to ensure national water security in the context of climate change. The WRMD should focus on guiding and directing localities to implement the policy of limiting groundwater exploitation in accordance with the provisions of Decree No. 167/2018 / ND-CP to achieve the goal of protecting underground water resources, and ensure publicity and transparency.

Due to the recent rapid socio-economic development in the coastal area, the management of coastal areas and river basins need to be combined. Due to the nature of water resources is a connection between fresh water and salt water, socio-economic and institutional, it should be a close coordination between these two types of planning. However, the coastal management plan is not mentioned in the 2012 Law on Water Resources. Therefore, if the Law on Water Resources 2012 is amended, it should be considered.

Planning of aquifer management: Vietnam only refers to aquifer planning, the recent management issue is paid attention through the proposed exploitation threshold for some aquifers. This work needs to be further researched and proposed appropriate exploitation threshold. Some degraded aquifers also need a restoration plan.

Disaster risk prevention planning: Vietnam has experience in risk prevention and many flood disaster prevention infrastructures has been built. However, climate change and sea level rise need to be studied and proposed community-based solutions as well as experiences of overcoming consequences of natural disasters that need more attention.

Due to these important changes, activities related to the upcoming planning need to (i) develop a circular regulating the integrated planning of inter-provincial and inter-provincial river basin (revision of Circular No.42) and (ii) formulate a circular regulating the economic and technical norms for planning and adjusting the integrated planning of inter-provincial and inter-provincial river basins based on the contents of elaboration of river basin general planning; (iii) develop a set of planning price sets; (iv) develop a circular guiding the preparation of the National Water Resources Planning[103] and Guidelines for rehabilitation of degraded water or

[103] In IWRM Planning includes the following planning/plans: (i) National IWRM plan, (ii) River basin management plan, (iii) water management plan; (iv) Coastal management plan; (v) Urban water management plan; (vi) Integrated disaster risk management plan; (vii) national adaptation plan

aquifers. Priority research "Protection of underground water in large urban areas.

5.1.2.3.4 Allocation of water resources and conflict resolution

The relationship between water resources allocation and conflict is very clear when water resource is increasingly depleted (both in water quantity and quality). In RRD, this relationship has been recognized very early in the relationship between operating hydropower reservoirs on the Da and Lo rivers with the use of water for agriculture in the delta. The highest water demand for agricultural production does not coincide with the highest hydropower load. So, a government-level executive team was formed to develop a plan to use water at least one month in advance (the paddy field planting spring season of the Red River Delta) to resolve this disagreement. Based on this plan, hydropower reservoirs develop plans to coordinate the opening of discharge gates to meet the water demand of the whole Red River Delta. However, water requirements for agriculture and navigation have been considered, and other water requirements for the ecological environment, saline protection have not been considered. Therefore, in the problem of water resources allocation for RRD in general and the downstream - downstream relations in the water allocation problem must be considered. Options to allocate water, compromise or trade-off between sectors must be carefully discussed before deciding on the selection of water resources allocation options.

The issue of water resources allocation and conflict resolution is even more important for the Mekong Delta when upstream countries, especially Laos are building hydroelectric dams on the mainstream. The Vietnamese side should consider preparing water use scenarios, carefully regulating water as a basis for negotiation, avoiding possible future water use conflicts.

5.1.2.3.5 Strategic environmental assessment (SEA) and environmental impact assessment (EIA)

Environmental impact assessment for water resources exploitation projects has been conducted and specific guidance has been provided. EIA is a legal tool and a basis for making decisions related to the project. However, the current Strategic Environmental Assessment is also conducted at the beginning of the planning period to consider the interaction between economy, society and environment, the cumulative impact caused by the proposed projects in the planning. Law 35 also requires the content of strategic environmental assessment of integrated water resources planning. It is necessary to add this content in the Law on Water resources in 2012.

5.1.2.3.7. Development of water management indicators

Water management indicators are an important tool for assessing activities on water resource management, policies, management objectives and monitoring management results. The assessment following management indicators shows how the purpose of IWRM can be achieved so that there can be corrections for consolidation[104]. Although there is no official set of indicators yet, it is possible to research and apply commonly used indicators such as: water m^3 per capita; m^3 of water exploited and used per capita; m^3 of exploited water/amount of water available; m^3 of water has been treated/m^3 of wastewater, etc. It is recommended that Vietnam set up a set of water management indicators soon.

5 Economic tools

For developed countries, the use of economic tools in water management has become popular. Using the right value and price of water to achieve efficiency and fairness has become a requirement. To make good use of these tools requires a reasonable standard system, professional administrative system and effective monitoring, good interdisciplinary coordination.

The most important of economic tools is the price of water. Price law was issued on June 20, 2012 and the Law on Fees and Charges was issued on November 25, 2015, based on these

[104] Vietnam Water Sector Review 2008 developed a set of indicators with about 53 basic indicators of (i) Water Resources, (ii) Socio-economics, (iii) Environment, (iv) Only management goals

Laws, the Government issued Decree No. 96/2018/ND-CP on June 30, 2018 on "Detailed regulations on price of irrigation products and services and support for the use of irrigation public products and services". Ministry of Agriculture and Rural Development is developing a roadmap to apply water prices to agricultural production, it is expected that from now to 2020, the institution and organization of water services for agriculture will be completed, from 2020 to 2030 will complete infrastructure and application of irrigation service price to some of the existing basic irrigation and service system. From 2021 onwards, organizations and individuals exploiting irrigation works will elaborate plan on pricing irrigation public products and services according to the provisions of Article 9 and Decree 96 above. The Ministry of Finance shall assume the leading responsibility and coordinate with the Ministry of Agriculture and Rural Development and localities in prescribing and announcing the maximum pricing irrigation public-utility products and services for the new budget period. This Decree states that the calculation unit (a) for domestic and industrial water supply is VND/m^3; (b) drainage of industrial parks: VND/ job content or VND/ha of drainage basins but the maximum price must not exceed 50% of the pricing irrigation products and services; (c) combination of electricity generation: VND/revenue (% of commercial electricity output); (d) business, tourism and other recreational activities: VND/revenue; (d) Aquaculture: VND/ha of open space/year; (e) traffic combination: VND/ton or VND/m^2/time.

For domestic water, there is Circular No. 88/2012/TT-BTC dated August 25, 2012 on the promulgating the tariff for domestic and production water and business, on this basis, the localities shall specify the pricing water for its locality. However, the current pricing water has not met the expenses of business and service activities, and has not impacted on the economical and efficient use of water. Need to assess the application of current water prices and adjust water prices to meet management requirements.

Water management fee: the water management authority collects fee as the licensing fee (the grant of water exploitation rights) in Decree 82/2017/ND-CP dated July 17, 2017. This decree is being implemented very well. The mining rights levy is calculated according to the commercial electricity output (for hydropower) or the volume of exploited water (for other water use operations). Up to now, the Department of State Management has granted 330 organizations[105] and individuals' licenses for water use and exploitation with the grant of VND 7,144 billion, and in 2018 alone, VND 877 billion was collected and the localities approved for nearly 750 units, in 2018, made nearly 20 billion dong[106].

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[105] Source: WRMD report 2018

[106] 2017 dated July 17, 2017 is stipulated as follows:

Article 6: Formula for calculating the fee for granting water resource exploitation rights

1. Money for granting water resource exploitation rights in case of water exploitation for hydropower is determined by the following formula:

T = W x G x M

Inside:

T - Money for the exploitation of water resources, the unit is Vietnam dong;

W - Power output specified in Article 7 of this Decree, calculation unit is kWh;

G - The price for calculating the fee for granting water resource exploitation right specified in Article 8 of this Decree, the unit for calculation is Vietnam dong / kWh;

M - The charge rate for granting water resource right exploitation rights is prescribed in Article 5 of this Decree, the calculation unit is a percentage (%).

2. Money to grant water resource exploitation rights in cases other than those specified in Clause 1 of this Article shall be determined according to the following formula:

T = W x G x K x M

Inside:

T - Money for the exploitation of water resources, the unit is Vietnam dong;

W - Output of water exploitation to calculate the fee for granting mining rights is stipulated in Article 7 of this Decree, the calculation unit is m^3;

G - The price for calculating the fee for granting water resource exploitation rights specified in Article 8 of this

Pollution fee: Currently the license to discharge waste water into water sources has been granted to the water use units by the Department of Water Resources Management. However, this grant is not based on scientific researches on environmental protection studies or regulations on regulated emission. Pollution charges are very effective pollution control tools, which are payments for services that recover wastewater into acceptable water before being discharged into the environment. Currently, industrial water use activities use the "continue to be polluting and pay" method, and there are only 10% of the domestic water pollution charges. In the long term, research is needed to apply appropriate pollution charge.

Payment of environmental services PES (Payment for Environmental Services): PES is called as payment for environmental services (or benefits) which are incentives for farmers or land owners in exchange for land management to provide some ecological environment services. They are defined as "a transparent system for providing additional environmental services through conditional payments to voluntary service providers." These programs promote the conservation of natural resources in the market. Currently PES has been applied in Vietnam, especially for the watersheds of reservoirs.

Water resources tax (WRT): tax is an indirect source of state budget revenue based on the turnover of the enterprise. Vietnam has applied water resources tax for some industries, in which hydropower is the first applied industry. *WRT* for hydropower is 2-5% of the average commercial electricity price. For production and business where water is the main material, *WRT* is 1-3% of the output value if using surface water and 8-10% if underground water is used. The exemption of tax on natural resources (0% tax rate) for activities of domestic water supply, irrigated agriculture, salt production and aquaculture.

5.1.2.3.8 Communication and information system

In IWRM, accurate and timely information is an important factor to support for correct and timely decision making. There are 4 types of information: (i) data for quantify water resources, water quality, frequency of occurrence in space and time. Data is now being finalized through the addition of monitoring and measuring stations. (ii) Information processed for specific purposes; (iii) Knowledge information is stored and becomes human knowledge and is the link to use data and information and water extraction tools to serve human goals. (iv) Wisdom in water management and exploitation. Integrating all 4 forms into the knowledge base (as stated in section 2, managers will have a powerful support tool to serve the IWRM). Currently, the database of water resources is incomplete and inconsistent. Vietnam is looking forward to building a DSS[107] for typical river basins. The baseline survey of water resources should soon have a master plan for basic water resources investigation to 2030, vision to 2050. Need to strengthen declaration propagate and disseminate widely, guide people to implement the most economical and effective measures to use water, to irrigate and implement the policy of collecting underground water exploitation for watering plants according to law provisions to prevent waste charge water source.

Information management system: This system includes many tools such as GIS, IMS and DSS, which are gradually applied by Vietnam in IWRM in some river basins.

Decree, the calculation unit is Vietnam dong/m^3;

K - The adjustment coefficient is prescribed in Article 9 of this Decree;

M - The charge rate for granting water resource right exploitation rights is prescribed in Article 5 of this Decree, the calculation unit is a percentage (%).

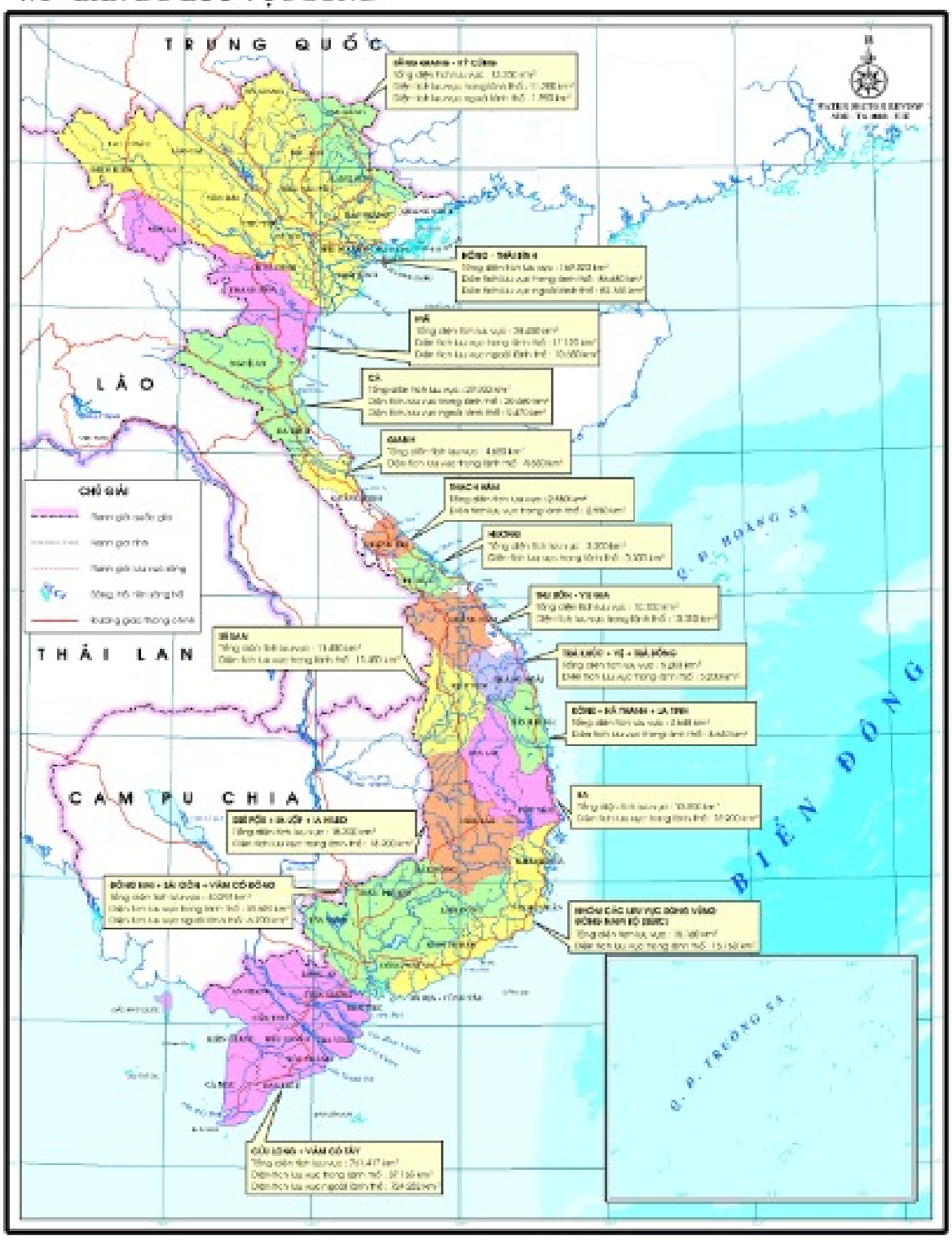
[107] Decision support system

Bellowed are 23 recommendations for management tools that should be implemented soon:

Recommendation of IWRM tools

1. Development of Master Plan for water resources survey to 2030, vision to 2050
2. Proposing Vietnam to develop water management indicators soon.
3. Proposing to select Vu Gia - Thu Bon basin is a typical basin to formulate a river basin integrated planning. Proposing to develop a decision support system (DSS) for Vu Gia - Thu Bon basin as a basis for management
4. It is necessary to assess the application of current water prices and adjust water prices to meet management requirements.
5. Research is needed to apply appropriate pollution charges, piloting pollution charges for Vu Gia - Thu Bon river basin
6. Prioritizing the development of national water resources planning.
7. It is necessary to have a master plan for coastal areas in combination with planning for development of residential areas and industrial zones, reducing the flooding caused by high tide. Combining the river basin integrated planning, the construction of integrated coastal planning for Vu Gia - Thu Bon river basin.
8. Development of a project to strengthen measures to ensure national water security in the context of climate change
9. Continuing to develop a system to monitor activities of exploiting and using water resources, discharging waste water into water sources. Pilot implementation for Vu Gia - Thu Bon river basin and some other priority basins.
10. Research "Protection of underground water in large urban areas.
11. Need to study development of pollution fee framework
12. Development of the master planning for the Red River - Thai Binh river basin
13. Development of the plan management for the Red River - Thai Binh river basin
14. Development of the master planning for the Cuu Long river basin
15. Development of the plan management for Cuu Long river basin
16. Development of the master planning for Sê San – Sre Pok river basin
17. Development of the plan management for Sê San – Sre Pok river basin
18. Development of the master planning for the Dong Nai river basin (including surrounding rivers in the Southeast)
19. Development of the plan management for the Dong Nai river basin
20. Development of the master planning for remain rivers: Ba, Cả, Mã, Hương, Kon – Hà Thanh, Bằng Giang – Kỳ Cùng, Trà Khúc – Vệ rivers
21. Development of the plan management for remain rivers: Ba, Cả, Mã, Hương, Kon – Hà Thanh, Bằng Giang – Kỳ Cùng, Trà Khúc – Vệ rivers.

W1 - BẢN ĐỒ LƯU VỰC SÔNG



5.2. Roadmap on IWRM

Activities directed to IWRM under 03 pillars of IWRM are divided into 5 main categories: (i) *strategies and policies* to be implemented, including national policies for water resources; specific policies on water resources such as policies related to water exploitation and use; national strategy on water resources until 2030; policies on river basin management; management policy on demand (management change following to supply source); policies in the allocation and protection of water resources; harmonizing upper and lower benefits (through inter-lake operation and minimum flow regulation); The most recent is to need to determine the

water resource exploitation limitation for water sources. In addition, other sectors also need policies on land use, urban development or environmental protection. The investment and financial policies for water resources also need to be paid more attention, including investment in water resources management, investment in river basin organizations, and investment in water infrastructure work maintenance. (ii) *legislation on water resources*, including the revision of the law related to planning in accordance with the Planning Law. The amendment includes 3 main Laws related to Water Resources, namely the Law on Water Resources 2012, the Environmental Law and the Law on irrigation and other related laws. (iii) *developing an institutional framework* including state administrative management of water resources, river basin management and public and private service organization for the water sector. Institutional framework includes the executive and enforcement agencies of water resources, local authorities, monitoring and evaluation agencies. This period is also a good time to facilitate private sector participation in water resources management. (iv) capacity development: is an important activity, including capacity in collecting data; improve professional skills in management, supervision of water resources, exploitation and use of water and supervision of inter-reservoir operation in accordance with law. (v) application of tools in IWRM: there are many types of tools in the world applied. However, with the conditions and qualifications of Vietnam, a number of management tools have been applied such as: water resource assessment; use the mathematical model in the water resources planning (now IWRM) and decision support framework; planning integrated river basin and planning integrated water resources river basin; allocating and resolving conflicts (particularly important in the upstream and downstream relations of international rivers flowing through Vietnam); economic tools that Vietnam has recently adopted; information and communication system.

5.2.1. Expected activities for IWRM in different periods

Under the principle of IWRM, the management of water resources is managed by the Ministry of Natural Resources and Environment and the ministries, agencies and organizations using water also participate in applying the principles of IWRM in exploitation and use water in theirs. In order to gradually approach this orientation, the formation of river basin management organization is very important. Since many RBOs have been established and operated, they do not achieve the desired results, while IWRM manages the river basin. Therefore, management activities as well as management organizations should also be formed according to the river basin. Setting up an institutional framework for river basin management is difficult due to the characteristics of Vietnam. Therefore, before finding a suitable management organization model, there should be a pilot phase to draw the lessons learned before applying them to other river basins. However, the implementation depends mainly on the resources and funding of stakeholders: (i) 16 activities on strategy and policy development; (ii) Law: 01 proposal to amend the Law on Water Resources and the Law on Environmental Protection in accordance with the provisions of the Law on Planning and Law 35; (iii) 03 capacity building activities; (iv) 08 activities on building institutional framework and focus on river basin level; (v) 21 activities to apply water resources management tools (including planning and development of river basin management plan). The implementation of the above 49 proposed activities is expected to be divided into 3 periods, depending on the process of formation of the river basin organization:

(i) Period from 2020 - 2024: is the period of policy improvement and preparation of establishment of RBO - pilot operation of Vu Gia - Thu Bon river basin.

The objective of IWRM for this period is:

Focusing on completing and supplementing a number of legal documents, developing policies and institutions, creating a favorable environment for IWRM activities. Implementing the approach of IWRM, taking the Vu Gia - Thu Bon river basin as a pilot to apply institutions,

policies and management tools to draw experience for other river basins. Many river basin organizations have been established, but most are inefficient. Therefore, the establishment of a new river basin organization must be very careful, it is necessary to carefully study the model of other countries and apply it appropriately to Vietnam. With the institutional characteristics of Vietnam, very it is difficult to have a river basin organization with enough power like the French or Australian RBOs. Therefore, empowering this organization to where and how it should work should be carefully studied through the construction of the Vu Gia - Thu Bon river basin organization model. The main function in the experiment is to collect information and support WRMD to perform the function of "monitoring" activities of exploiting and using water and discharging waste water in the basin. Experience is learnt to apply to other river basins. This period needs to be done at least in 4 years, including administrative procedures to set up the river basin committee, develop regulations and plans for the operation of the river basin committee and develop river basin master planning.

(ii) Period from 2025 - 2030: The period of establishing a number of priority river basin organizations and supporting the Department of State Management to successfully test the function of "supervision":

The objective of the IWRM in this period is:

Continuing to improve policies and strategies. Draw experience of Vu Gia - Thu Bon RBO to establish and operate RBO in order of priority, closely coordinate between WRMD and the RBO to apply synchronously solutions of water resources management in the basin river.

After withdrawing the experience of Vu Gia - Thu Bon RBO, the establishment of RBO is prioritized for important river basins such as the Red - Thai Binh river basin, the Cuu Long river basin and the Sre San river basin - Sre Pok and Dong Nai river basin. The development of the river basin mater planning for large and complex basins will take more time and in the process of operation, it is necessary to establish additional sub-basin committees, the planning function only belongs to the National Center for Investigation. and planning water resources, so this period requires a very sophisticated combination of activities and agencies inside and outside the Ministry of Natural Resources and Environment. RBO will support the WRMD not only "monitoring" function, but also will expand the function of "sanctioning" activities of small-scale water exploitation and discharge in the basin and possibly add other functions authorized by the WRMD. So, this period must be at least 5-6 years before it can be implemented.

(iii) Period after 2030: The period of establishment and operation of the remaining RBO and perfecting the functions of each RBO to manage IWRM according to the river basin. Promoting the application of economic instruments in IWRM, promote the participation of the private and public sector in the management of water resources. Completing and supplementing policies to support administrative watermanagement.

The objective of the IWRM in this period is:

Continuing to improve policies and strategies to serve the IWRM, improve the operational regulations of the River Basin Commission and enhance the operational capacity for the RBO to operate and apply public management tools. Commission work, roadmap for integrated management of water resources follows priority activities for the period as follows: assisting WRMD and operation of RBO to add the function of "sanctioning small-scale violations in the basin": this period continues establishing additional RBO for the remaining river basins. Among the approximately 16 major river basins, one can consider the establishment of a Committee of the Fatherland Front of Ba, Ma, Ca, Tra Khuc-Ve-Tra Bong, Kone-Ha Thanh and Bang giang - Ky Cung. Depending on the river basin, the operation regulation can be adjusted accordingly. The categories of activities divided according to the three phases mentioned above are classified as self-prioritized from the boat and recommend implementing agencies and coordinating agencies (as shown in Table 5-1), to be coded: P: Policy (Policy); I: Institution; L: Law (Law);

C: Capacity Building; T: Management Tools (Management Tools). The implementation schedule is shown in Tables 5-2, 5-3 and 5-4.

Table 5-1: Proposal activities for IWRM

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
I		***Development of strategies and policies***		
1	P.01	01 Development of national strategy on water resources	WRMD	Institute of Strategy and Policy on Natural Resources and Environment MONRE
2	P.02	02. Revision of Circular No. 42 on planning integrated river basin management	NAWAPI	WRMD, Experts
3	P.07	07. Modification of 05 rules for inter-reservoir operation	WRMD	Vietnam Meteorological and Hydrology Administration
4	P.04	04. Development of Circular on guideline on development of master planning of national water resources	WRMD	Experts
5	P.03	03. Development of circular on norm for planning development	NAWAPI	WRMD, MOF
6	P.06	06. Revision of circular No. 65 on minimum flow	WRMD	Vietnam Meteorological and Hydrology Administration, MARD, Experts
7	P.13	13. MONRE coordinates with MPI to develop national strategy investment for water sector.	WRMD	MPI, Institute of Strategy and Policy on Natural Resources and Environment, MONRE
8	P.10	10. Ministry of Agriculture and Rural Development coordinates with the Ministry of Natural Resources and Environment and the local government to apply disaster management method based on community	MARD	MONRE
9	P.14	14. Policy development “mobilization private sector for participating water service”	WRMD	MARD, MOIT, MOC
10	P.12	12. MARD and MOIT control craft village pollution	MARD	MOIT, VEA – MONRE
11	P.11	11. Completing the land use policy to manage urban and rural development associated with water supply and water discharge	General Department of Land - MONRE	WRMD. MOC, VEA, MARD

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
12	P.08	08. Determining the limitation of surface water exploitation of river basin, underground water in some priority acquirers	NAWAPI	WRMD
12	P.09	09. Assessing risk of degradation of surface water source of Red river, Dong Nai river and Cau river.	WRMD	Institute of Water Resources Science
14	P.05	05. Development of a circular guiding the recovery of degraded surface water and aquifers	NAWAPI	Institute of Water Resources Science
15	P.16	16. Policy development "The original river"	WRMD	Institute of Water Resources Science, University of Natural Resources
16	P.15	15. Development of policies "Priority / capital support for wastewater treatment"	VEA	WRMD, MOF, MPI
II		***Finalization legal document***		
17	L.17	Revision of Law on water resource, Law on environment protection, and Law on irrigation and continuous finalization of legal document as required	WRMD- LWR VEP – LEP	WRMD, VEA, Experts
III		***Development and finalization of institutional framework***		
18	I.18	18. Research for determining appropriate institutional model for priority river basins	WRMD	Ministry of Home Affairs, Experts
19	I.22	22. Improving the upgrade of the Vietnam Mekong Committee (including Cuu Long river basin committee, and Sê San-Sre Pok river basin committee)	Vietnam MeKong Committee (VNMC)	Ministry of Home Affairs, WRMD, PPCs in river basin
20	I.19	19. Integrated river basin management model pilot for Vu Gia - Thu Bon river basin: - Integrated river basin management; -Development of river basin management plan -Development of integrated coastal zone management master -Development of water resources monitoring system; - Establishment of trial RBO	WRMD	NAWAPI; Vietnam Meteorological and Hydrology Administration, Institute of Water Resources Science, University of Natural Resources & Environment

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
		- Development of action plan for RBO -Inspection, monitoring water resources - Experience		
21	I.23	23. Establishment of Hong-Thai Binh RBO, Development of operation regulation and action plan for Hong-Thai Binh RBO	WRMD	Ministry of Home Affairs, 23 PPCs in river basin
22	I.24	24. Establishment of Dong Nai RBO, Development of operation regulation and action plan for Dong Nai RBO	WRMD	Ministry of Home Affairs, 6 PPCs in river basin
23	I.25	25. Establishment of other RBOs, Development of operation regulation and action plan for other RBOs	WRMD	Ministry of Home Affairs, PPCs in river basin
24	I.20	20. Strengthening institutions for water service provision, private participation	WRMD	Ministry of Home Affairs, Experts
25	I.21	21. Developing and applying the policy of transferring infrastructure for private participation in management, prioritizing small-scale irrigation infrastructure	Institute of Strategy and Policy on Natural Resources and Environment	WRMD, MOIT, MARD
IV		***Strengthening capacity***		
26	C.26	26. Strengthening executive and enforcement capacity, especially operating the water environment through training, training, and learning of developed countries	WRMD, RBO, DONRE	
27	C.27	27. Strengthening the inspection, checking and resolutely handling violations for the operation of flood reduction for downstream, regulating water in the dry season, ensuring to maintain the minimum flow of lakes in the process of inter-reservoirs	WRMD, MONRE - Inspection Department	
28	C.28	28. Strengthening capacity of water resources management and technical management training at all levels including strengthening the capacity of RBO Vu Gia - Thu Bon CPVS and other RBOs	WRMD, RBO (typical Vu Gia-Thu Bon RBC) and established RBOs	

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
V		***Application of IWRM tools***		
29	T.29	29. Development of master Plan of integrated river basin management for water resources survey to 2030, vision to 2050	WRMD	NAWAPI
30	T.31	31. Piloting integrated river basin management development for Vu Gia - Thu Bon river basin: - Water resources allocation - Protect water resources - Prevention of harm caused by water - Institutional activities - Develop a support framework for DSS decision making - Activities of monitoring digital architectures, discharging waste water into water sources - Development of river basin management plan for Vu Gia – Thu Bon	NAWAPI	WRMD
31	T.30	30. Development of water management indicators	WRMD	Institute of Water Resources Science
32	T.34	34. Development of the master planning of national water resources	WRMD	MARD, MOC, MOIT
33	T.36	36. Development of a project to strengthen national water security measures in the context of climate change	WRMD	Vietnam Meteorological and Hydrology administration, experts
34	T.39	39. Research on the protection of underground water in large urban areas	NAWAPI	WRMD, MOC
35	T.37	37. Development of a monitoring system for water quality activities; discharge of wastewater into water sources; Inter-reservoir operation - Pilot application for Vu Gia - Thu Bon river basin	WRMD	Vietnam Meteorological and Hydrology administration, Experts
36	T.35	35. The Master planning of integrated river basin management for coastal zone, pilot Vu Gia – Thu Bon river basin	NAWAPI	Institute of Water Resources Science University of Natural Resources

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
37	T.44	44.Development of the master planning of integrated river basin management for the Cuu Long river basin	NAWAPI	VNMC, Vietnam Meteorological and Hydrology Administration, Experts, MARD, local government
38	T.45	45. Development of the river basin plan management for Cuu Long river basin	WRMD	RBO, VNMC, Ministries and local governments
39	T.46	46. Development of the master planning of integrated river basin management for Sê San – Sre Pok river basin	NAWAPI	VNMC, EVN, Vietnam Meteorological and Hydrology administration Experts, MARD, local government
40	T.47	47. Development of the river basin plan management for Sê San – Sre Pok river basin	WRMD	RBO, VNMC, EVN, Ministries, local governments
41	T.42	42. Development of the master planning of integrated river basin management for the Red River - Thai Binh river basin	NAWAPI	MARD, EVN, ROB, local governments
42	T.43	43. Development of the river basin plan management for the Red River - Thai Binh river basin	WRMD	MARD, MOIT, EVN, MOC, RBO, local governments
43	T.48	48. Development of the master planning of integrated river basin management for the Dong Nai river basin	NAWAPI	MARD, MOIT, EVN, MOC, RBO, local governments
44	T.49	49. Development of the river basin plan management for the Dong Nai river basin	WRMD	MARD, EVN, MOC, RBO, local governments
45	T.50	50. Development of the master planning of integrated river basin management for the orther river basins	NAWAPI	MARD, MOIT, EVN, MOC, RBO, local governments
46	T.51	51. Development of the river basin plan management for the remaining river basins	WRMD	MARD, MOIT, EVN, MOC, RBO, local governments
47	T.32	32. Assessment of the application of water prices and adjust water prices to match the new context	WRMD	MOF, related Ministries and Sectors
48	T.40	40. Research for development of	VEA	WRMD, MOF

No.	Code	Activities type	Proposal implementing organization	Proposal coordination organization
		Pollution Charge framework		
49	T.33	33. Pollution Charge research for Vu Gia - Thu Bon river basin	VEA	WRMD, MOF, RBO, Local governments
Note: P: Policy I: Institutional L: Law C: Capacity Building T: Management Tools				

5.2.2. Roadmap for conducting actions

TABLE 5-2

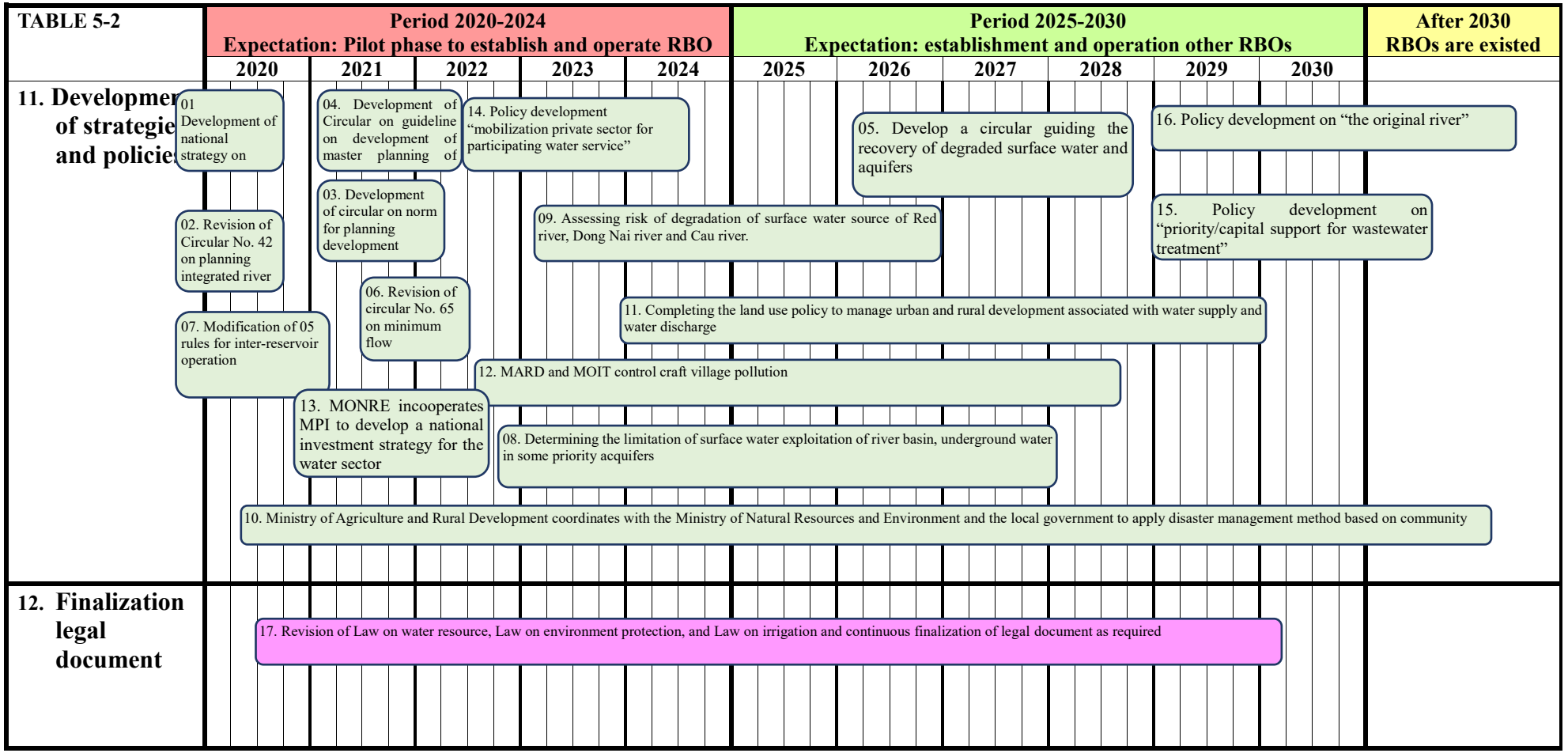
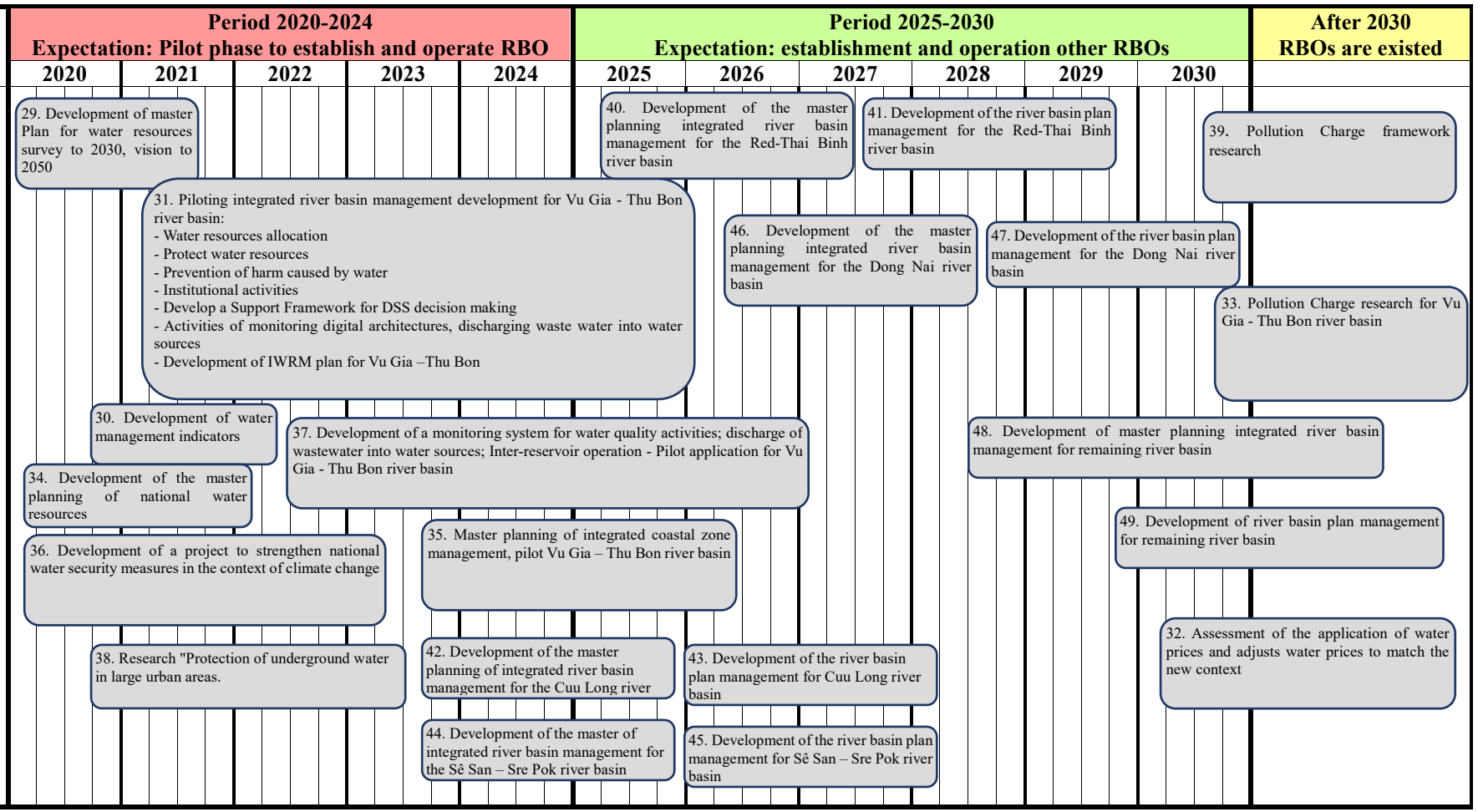

Period 2020-2024
Expectation: Pilot phase to establish and operate RBO
Period 2025-2030
Expectation: establishment and operation other RBOs
After 2030
RBOs are existed
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
11. Developmer of strategie and policie
01 Development of national strategy on
04. Development of Circular on guideline on development of master planning of
14. Policy development "mobilization private sector for participating water service"
05. Develop a circular guiding the recovery of degraded surface water and aquifers
16. Policy development on "the original river"
03. Development of circular on norm for planning development
02. Revision of Circular No. 42 on planning integrated river
09. Assessing risk of degradation of surface water source of Red river, Dong Nai river and Cau river.
15. Policy development on "priority/capital support for wastewater treatment"
06. Revision of circular No. 65 on minimum flow
07. Modification of 05 rules for inter-reservoir operation
11. Completing the land use policy to manage urban and rural development associated with water supply and water discharge
12. MARD and MOIT control craft village pollution
13. MONRE incooperates MPI to develop a national investment strategy for the water sector
08. Determining the limitation of surface water exploitation of river basin, underground water in some priority acquifers
10. Ministry of Agriculture and Rural Development coordinates with the Ministry of Natural Resources and Environment and the local government to apply disaster management method based on community
12. Finalization legal document
17. Revision of Law on water resource, Law on environment protection, and Law on irrigation and continuous finalization of legal document as required

TABLE 5-3	Period 2020-2024 Expectation: Pilot phase to establish and operate RBO					Period 2025-2030 Expectation: establishment and operation other RBOs						After 2030 RBOs are existed
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
13. Devlopment and finlizaation of institutional framework	18. Research for determining appropriate institutional model for priority river basins	19. IWRM model pilot for Vu Gia - Thu Bon river basin: - Integrated river basin management; - Development of river basin management plan - Development of integrated coastal zone management master - Development of water resources monitoring system; - Establishment of trial RBO - Development of action plan for RBO - Inspection, monitoring water resources - Experience				23. Establishment of Hong-Thai Binh RBO, Development of operation regulation and action plan for Hong-Thai Binh RBO	24. Establishment of Dong Nai RBO, Development of operation regulation and action plan for Dong Nai RBO		25. Establishment of other RBOs, Development of operation regulation and action plan for other RBOs			
	22. Improving the upgrade of the Vietnam Mekong Committee (including Cuu Long river basin committee, and Sê San-Sre Pok river basin committee)					20. Strengthening institutions for water service provision, private participation						
						21. Developing and applying the policy of transferring infrastructure for private participation in management, prioritizing small-scale irrigation infrastructure						
14. Strengthening capacity	26. Strengthening executive and enforcement capacity, especially operating the water environment through training, training, and learning of developed countries											
	27. Strengthening the inspection, checking and resolutely handling violations for the operation of flood reduction for downstream, regulating water in the dry season, ensuring to maintain the minimum flow of lakes in the process of inter-reservoirs											
	28. Strengthening capacity of water resources management and technical management training at all levels including strengthening the capacity of RBO Vu Gia - Thu Bon RBO and other RBOs											

TABLE 5-4


Period 2020-2024
Expectation: Pilot phase to establish and operate RBO
Period 2025-2030
Expectation: establishment and operation other RBOs
After 2030
RBOs are existed
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
15. Application of IWRM tools
29. Development of master Plan for water resources survey to 2030, vision to 2050
40. Development of the master planning integrated river basin management for the Red-Thai Binh river basin
41. Development of the river basin plan management for the Red-Thai Binh river basin
39. Pollution Charge framework research
31. Piloting integrated river basin management development for Vu Gia - Thu Bon river basin:
- Water resources allocation
- Protect water resources
- Prevention of harm caused by water
- Institutional activities
- Develop a Support Framework for DSS decision making
- Activities of monitoring digital architectures, discharging waste water into water sources
- Development of IWRM plan for Vu Gia –Thu Bon
46. Development of the master planning integrated river basin management for the Dong Nai river basin
47. Development of the river basin plan management for the Dong Nai river basin
33. Pollution Charge research for Vu Gia - Thu Bon river basin
30. Development of water management indicators
37. Development of a monitoring system for water quality activities; discharge of wastewater into water sources; Inter-reservoir operation - Pilot application for Vu Gia - Thu Bon river basin
48. Development of master planning integrated river basin management for remaining river basin
34. Development of the master planning of national water resources
49. Development of river basin plan management for remaining river basin
35. Master planning of integrated coastal zone management, pilot Vu Gia – Thu Bon river basin
36. Development of a project to strengthen national water security measures in the context of climate change
32. Assessment of the application of water prices and adjusts water prices to match the new context
38. Research "Protection of underground water in large urban areas.
42. Development of the master planning of integrated river basin management for the Cuu Long river
43. Development of the river basin plan management for Cuu Long river basin
44. Development of the master of integrated river basin management for the Sê San – Sre Pok river basin
45. Development of the river basin plan management for Sê San – Sre Pok river basin

5.3. Conclusions and recommendations

Based on the 5 main activities of 3 pillars of IWRM are a) creation of a favorable environment (legal environment); b) development of an institutional framework and c) management tools to develop IWRM roadmap for Vietnam. In any context, policy development must be cared by the manager firstly. Based on the analysis of existing issues to give priority recommendations for management activities according to 5 types of activities. However, the implementation of IWRM as 38 recommendations in this report depends on budget and implementation capacity and coordination among ministries. The sequence number does not have priority.

ANNEX

Annex 1: Legal framework related to river/river basin

No	Document Number	Issue date	Contents	Remarks
General				
01	No number	22/11/2013	The Constitution of the Socialist Republic of Vietnam	Article 53, 63
02	67/2014/QH13 03/2016/QH14	26/11/2014, 22/11/2016	Investment Law Law on Amendment and Supplement to Article 6 and Annex 4 on the List of Conditional Business Lines Stipulated in the Law on Investment.	Annex 4
03	49/2014/QH13	18/6/2014	Law on Public Investment	
04	55 /2014/QH 13	23/6/2015	Environmental Protection Law	
05	45 /2013/QH 13	29/11/2013	Land Law	
06	21/2017/QH14	24/11/2017	Law on Planning	
07	172/2007/QĐ-TTg	16/11/2007	The National Strategy for Natural Disaster Prevention, response and mitigation to 2020.	
08	1393/QĐ-TTg	2594/2012	National Strategy on Green Growth	
09	432/QĐ-TTg	12/4/2012	Sustainable Development Strategy of Vietnam Period 2011-2020.	
10	130/2013/NĐ-CP	16/10/2013	Decree on the Production and Provision of Public-Utility Products and Services.	
11	18/2015/NĐ-CP	14/02/2015	Decree on Environmental Protection Planning, Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Plans.	
12	118/2015/NĐ-CP	12/11/2015	Decree on Guidelines for some Articles of the Law on Investment.	
13	36/2017/NĐ-CP	04/4/2017	Defining the functions, tasks, powers and organizational structure of the Ministry of Natural Resources and Environment.	
14	15/2017/NĐ-CP	17/02/2017	Defining the functions, tasks, powers and organizational structure of the Ministry of Agriculture and Rural Development.	
15	25/2017/QĐ-TTg	03/7/2017	Defining the functions, tasks, powers and organizational structure of the Directorate of Water	

No	Document Number	Issue date	Contents	Remarks
			Resources under the Ministry of Agriculture and Rural Development.	
16	1896/QĐ-TTg	28/11/2017	Establishing the Institute of Water Resources under the Ministry of Natural Resource and Environment.	
17	34/2007/QĐ-TTg	12/3/2007	Regulations on the establishment, organization and operation of inter-agency coordination	
River/River Basin Water Resource Management				
18	08/1998/QH10 17/2012/QH13 06/VBHN-VPQH	20/5/1998 21/6/2012 04/7/2017	Law on Water Resources	
19	81/2006/QĐ-TTg	14/4/2006	Approving the National strategy on water resources to 2020.	
20	27/2014/TT-BTNMT	30/5/2014	Regulating the registration for groundwater extraction, form of dossier for issue, extention, modification, re-issue of water resource permits.	
21	47/2017/TT-BTNMT	07/11/2017	supervision of extraction and use of water resources	
22	64/2017/TT-BTNMT	22/12/2017	Regulating of minimum flow in rivers, streams and downstream reservoirs, dams.	
23	76/2017/TT-BTNMT	29/12/2017	Assess the capacity of receiving wastewater bearing capacity of rivers and lakes	
24	73/2017/NĐ-CP	14/06/2017	Decree on Collection, management and use of data on natural resources and environment	
25	75/2017/TT-BTNMT	29/12/2017	Regulating the protection of groundwater in drilling, excavation activities and groundwater exploration and exploitation	
26	64/2017/TT-BTNMT	22/12/2017	Regulating techniques to identify the minimum flow in rivers, streams and establish inter-reservoir operation procedures	
27	82/2017/NĐ-CP	17/7/2017	Decree on Providing for calculation method and charge for granting water right.	
28	96/2018/NĐ-CP	30/06/2018	Providing guidelines for prices of irrigation products and services and financial support for use of public irrigation products and utilities.	
29	104/2017/NĐ-CP	14/9/2017	Decree on Penalties for administrative violations against regulations on disaster preparedness, operation and protection of hydraulic structures and flood control systems	
30	33/2017/NĐ-CP	03/4/2017	Decree on Penalties for administrative violations against regulations on water and mineral	

No	Document Number	Issue date	Contents	Remarks
			resources.	
31	120/2008/NĐ-CP	01/12/2008	Decree on River basin management.	
32	201/2013/NĐ-CP	27/11/2013	Decree on Detailing the implementation a number of articles of the Law on water resources	
33	60/2018/NĐ-CP	01/07/2016	Providing for certain regulatory requirement for trade and investment in the environment and natural resource sector.	
34	15/2017/TT-BTNMT	21/7/2017	Economic-technical norms for planning and adjusting water resources planning	
35	16/2017/TT-BTNMT	25/7/2017	Technical regulations and economic-technical norms for investigation and assessment of the current situation of water resource extraction and use.	
36	36/2017/TT-BTNM	06/10/2017	Promulgation of technical regulation and economic-technical norms for surveying and measuring water resources, assessing and forecasting water resources by means of flow models.	
37	64/2017/TT-BTNMT	22/12/2017	Regulations for determining minimum flow in rivers, streams and downstream reservoirs, dams	
38	44/2017/TT-BTC	12/5/2017	Circular on Imposing the taxable price brackets for groups/types of natural resources with similar physical and chemical properties.	
39	73/2017/TT-BTNMT	29/12/2017	Promulgation of statistical indicator system of National Resources and Environment sector (environment, water resources).	
40	341/QĐ – BTNMT	23/3/2012	List of provincial river basins.	
41	3399/QĐ-BTNMT	26/12/2017	List of inter-provincial river basins.	
42	No Number	05/4/1995	Agreement on Cooperation for sustainable development of the Mekong River Basin.	
43	1536/QĐ-BTNMT	26/6/2017	Defining the functions, tasks, powers and organizational structure of the Department of Water Resources Management.	
44	379/QĐ-TNN	06/12/2017	Defining the functions, tasks, powers and organizational structure of the department of Surface Water Extraction Management under the Department of Water Resources Management.	
River/River Basin Water Resource Protection				
45	166/QĐ-TTg	21/01/2014	Decision on issue the plan for implementation of natural environmental protection strategy by	

No	Document Number	Issue date	Contents	Remarks
			2020, with a vision to 2030.	
46	57/2008/QĐ-TTg	29/4/2008	Approving the "Overall scheme for environmental protection of Nhue river-Day river basin up to 2020"	
47	174/2006/QĐ-TTg	28/7/2006	Approving the “Overall scheme for protection and sustainable development of the ecological environment and landscape of Cau river basin”.	
48	187/2007/QĐ-TTg	03/12/2007	Approving the "Overall scheme on environmental protection in the basin of the Dong Nai river system up to 2020".	
49	14/2009/TT-BTC	22/01/2009	Guiding the establishment, management, use and settlement of state budget funds for the performance of tasks and projects under the scheme for environmental protection in river basins under the Prime Minister's decisions.	
50	15/2018/QĐ-TTg	12/3/2018	Defining the functions, tasks, powers and organizational structure of the Vietnam Environmental Administration under the Ministry of Natural Resources and Environment.	
River/river basin water related irrigation management				
51	08/2017/QH14	17/6/2017	Law on Irrigation	
52	67/2018/NĐ-CP	14/5/2018	Decree on Guidelines for some Articles of Law on Irrigation	
53	77/2018/NĐ-CP	16/5/2018	Regulations supporting small irrigation development, intra-irrigation and advanced irrigation, water savings.	
River/Basin River flood Management				
54	1879/QĐ-TTg	13/10/2010	The List of Irrigation Lakes, hydroelectric power on the river basin which must establish inter-reservoir operation procedures.	
55	245/QĐ-TTg	13/2/2018	Inter-reservoir operation procedure on the Se San river basin.	
56	936/QĐ-TTg	30/7/2018	Inter-reservoir operation procedure on the Kon – Ha Thanh River Basin.	
57	1622/QĐ-TTg	17/9/2015	Inter-reservoir operation procedure on the Red River basin.	
58	214/QĐ-TTg	13/2/2108	Inter-reservoir operation procedure on the Ma river basin.	

No	Document Number	Issue date	Contents	Remarks
59	2125/QĐ-TTg	01/12/2015	Inter-reservoir operation procedure on the Ca River basin.	
60	2482/QĐ-TTg	30/12/2015	Inter-reservoir operation procedure on the Huong River basin.	
61	1537/QĐ-TTg	07/9/2015	Inter-reservoir operation procedure on the Thu Bon River basin.	
62	911/QĐ-TTg	25/7/2018	Inter-reservoir operation procedure on the Tra Khuc River basin.	
63	878/QĐ-TTg	18/07/2018	Inter-reservoir operation procedure on the Ba River basin.	
64	1201/QĐ-TTg	23/07/2014	Inter-reservoir operation procedure on the Sre Pok River basin.	
65	471/QĐ-TTg 305/QĐ-TTg	24/03/2016 08/03/2017	Inter-reservoir operation procedure on the River basin. Modification of a number of articles of the inter- reservoir operation procedure on the Dong Nai River.	
66	114/2018/NĐ-CP	04/9/2018	Safety management of dams and reservoirs	
Cross-sectoral, Interregional river basin coordination				
67	459/QĐ-TTg	02/04/2014	The functions, tasks, powers of National Council on Water Resources. (Substitute Decision 67/2000/QĐ-TTg dated 15/6/2000 - Establishing the National Council on Water Resources)	
68	932/QĐ-TTg	30/6/2017	The assignment of the Chair and Vice Chair of the National Council on Water Resources.	
69	41/2006/QĐ-BNN	15/5/2006	Establishment of the Srepok River Basin Council.	
70	157/2008/QĐ-TTg	01/12/2008	Establishment of the Committee for Environment Protection in the Dong Nai River Basin Committee.	
71	1404/QĐ-TTg	31/8/2009	Establishment of the Committee for Environmental Protection in the Nhue River-Day River Basin	
72	171/2007/QĐ-TTg	14/11/2007	Establishment of the Committee for Environmental Protection in the Cau River Basin	
73	38/2001/QĐ-BNN-TCCB	09/4/2001	Establishment of the Dong Nai river basin planning management board.	
74	39/2001/QĐ-BNN-	09/4/2001	Establishment of the Hong-Thai Binh river basin planning management board	

No	Document Number	Issue date	Contents	Remarks
	TCCB			
75	20/2005/QĐ-BNN	13/4/2005	Establishment of the Vu Gia - Thu Bon river basin planning management board	
76	37/2001/QĐ-BNN-TCCB	09/4/2001	Establishment of the Cuu Long river basin planning management board	
77	14/2004/QĐ-BNN	09/4/2004	Regulations on Organization and operation of the river basin planning management board.	
78	13/2004/QĐ-BNN	08/4/2004	Establishment of the Office of River Basin Planning Management.	
79	41/2006/QĐ-BNN	25/5/2006	Establishment of the Srepok River Basin Management Office.	
80	363/QĐ-BNN/TCCB	11/5/2006	Establishment of the Cau River Basin Planning Management Sub-Committee located in the Red River Delta-Thai Binh.	

QH = National Assembly
NĐ-CP = Decree of the Government
QĐ-TTg = Decision of the Prime Minister
BGTVT = MOT
BTC = MOF

Annex 2: Policy and legal documents related to river/river basin management in Vietnam

No.	1. Name, Nos., Date, Issuing Body	2. Objective	3. Current Status	4. Key Contents related to River/River Basin Management in Vietnam	5. Target Stakeholders	6. Remarks
1	The Constitution of the Socialist Republic of Vietnam, Nov. 28, 2013 The National Assembly.	Chapter III. Economy, Social Affairs, Cultural, Education, Science, Technology and Environment	Effect on January 1, 2014.	- Land, water resources…are public property, owned by all the people, and represented and uniformly managed by the State. - The State shall adopt environmental protection policies; manage and use natural resources in an efficient and sustainable manner; conserve nature and biodiversity; and take the initiative in preventing and controlling natural disasters and responding to climate change.	All people	Article 53 Article 63
2	Law on Investment, 67/2014/QH13, Nov 26, 2014; amended by 03/2016/QH13, Nov.22, 2016. The National Assembly.	The Annex 4 on the List of conditional business lines.	Come Into force from January 01, 2017, except the conditional business lines take effect from July 01, 2017.	The List of conditional business lines: - Groundwater drilling and exploration services; - Extraction and use of water resources, discharge of wastewater into water sources; - Basic survey and consulting services for preparation of water resource planning, schemes and reports; - Environmental monitoring services.	Investors, other organizations and individuals involved in business investment.	-No.227 -No.228 -No.229 -No.234
3	Law on Planning, 21/2017/QH14, Nov., 24, 2017. The National Assembly.	Provide for formulation, appraisal, decision or approval, announcement, implementation, assessment and adjustment of the planning under the	Come into force from January 01, 2019.	- Planning means the spatial arrangement and distribution of socio-economic, national defence and security activities in combination with infrastructure development, use of natural resources and environmental protection in a defined territory in order to effectively use the resources of country in service of sustainable development for a definite period.	Organizations and individuals involved in the formulation, appraisal, decision or approval, announcement,	Article 3

No.	1. Name, Nos., Date, Issuing Body	2. Objective	3. Current Status	4. Key Contents related to River/River Basin Management in Vietnam	5. Target Stakeholders	6. Remarks
		national planning system; responsibility for state management of planning.		- National comprehensive planning means the national and strategic planning towards zoning and interconnecting regions of a territory, including mainland, islands, archipelagos, territorial waters and airspace; urban and rural systems; infrastructure; use of natural resources and environmental protection; natural disaster preparedness, climate change resilience, assurance of national defense and security and international integration. - Region means a part of a national territory that includes some neighboring provinces and central-affiliated cities adjacent to some river basins or has similarities in natural and socio-economic conditions, history, population and infrastructure, and has an interrelationship that makes a strong connection. - Regional planning means the planning that is aimed at realizing the national comprehensive planning at regional level in terms of spaces used for socio-economic, national defense and security activities, urban system and rural population distribution, development of inter-provincial regions, infrastructure, water resources of river basins, use of natural resources and environmental protection on the basis of provincial interconnection. - Contents of regional planning: “Orientation to environmental protection, extraction and protection of river basin water, natural disaster preparedness and climate change resilience within the	implementation, assessment and adjustment of the planning under the national planning system and other relevant organizations and individuals.	Article 26

No.	1. Name, Nos., Date, Issuing Body	2. Objective	3. Current Status	4. Key Contents related to River/River Basin Management in Vietnam	5. Target Stakeholders	6. Remarks
				region". -Contents of province planning: "Plans for development of irrigation and water supply networks, including regional and inter-provincial irrigation and water supply networks already specified in the national planning and regional planning within the province; inter-district irrigation and water supply networks". - Water resource planning, Environmental protection planning are national sector planning - Inter-province Inter-provincial comprehensive planning for river basins and water sources; Inter-national planning for protection, extraction and use of water resources, Irrigation planning, Comprehensive planning for baseline survey of water resources are detailed technical inter – branch planning		Article 27.
04	Law on Water Resources 17/2012/QH13, June, 21, 2012. The National Assembly.	Provide on management, protection, exploitation and use of water resources, as well as the prevention of, combat against and overcoming of harmful effects caused by water in the territory of the	Takes effect on January 01, 2013.	-Definitions: Water resources, Water sources Surface water, underground water, Inter-provincial water sources, Intra-provincial water sources, Inter-country water sources, River basin, River basin, Inter-provincial river basin, Inter-provincial river basin. - Principle of management, protection, exploitation and use of water resources, as well as the prevention of, combat against and overcoming of harmful effects caused by water - State's policies on water resources Dissemination and education of water resources	Organizations and individuals.	Articles

No.	1. Name, Nos., Date, Issuing Body	2. Objective	3. Current Status	4. Key Contents related to River/River Basin Management in Vietnam	5. Target Stakeholders	6. Remarks
		Socialist Republic of Vietnam. Not subject to adjustment of underground water and sea water in exclusive economic zones, continental shelves of the Socialist Republic of Vietnam, mineral water, and natural hot water.		- List of river basins, list of water sources Archival, use of water resource information - The strictly prohibited acts. - Basic survey, strategy, master plan on water resources protection of water resources. - Exploitation, use of water resources. - Prevention of, combat against and overcoming of harmful effects caused by water. Planning on water resources includes: + The general planning on water resources of whole country; + Planning on water resources of inter-provincial river basin, inter-provincial water sources; + Planning on water resources of central-affiliated cities and provinces. - Finance on water resources. - International relationship on water resources. - Responsibility for management on water resources. - The specialized inspection on water resources, solving disputes on water resources.		
05	Law on Hydrometeorology, 90/2015/QH13, Nov. 23, 2015. National Assembly	Stipulate hydro-meteorological activities including: Management and operation of station networks; forecasts, warnings; information, data;	Takes effect since July 01, 2016	Hydro-meteorological monitoring includes observations and systematic measurements of indicators of conditions, phenomena, developments of the atmosphere and water on earth.	Agencies, organizations, and individuals; foreign organizations and individuals; international organizations	Article 3

No.	1. Name, Nos., Date, Issuing Body	2. Objective	3. Current Status	4. Key Contents related to River/River Basin Management in Vietnam	5. Target Stakeholders	6. Remarks
		hydro-meteorological services; climate change monitoring; impacts on weather and state administration; rights, responsibility and obligations of agencies, organizations, and individuals involved in hydro-meteorological activities;			participating in hydro-meteorological activities in the territory of the Socialist Republic of Vietnam.	
06	Law on Natural resource Tax, 45/2009/QH12, Nov. 25, 2009. National Assembly	Provide for natural resource tax-liable objects, natural resource tax payers, natural resource tax bases, and natural resource tax declaration, payment, exemption and reduction.	Takes effect since July 1, 2010	- Natural resource tax-liable objects Natural water, including surface water and groundwater. - Natural resource tax bases, Natural resource output used for natural resource tax calculation, Natural resource tax-liable prices, Natural resource tax rates (Surface water:1-3%, Groundwater:3-8%). - Natural resource tax declaration, payment, exemption and reduction.	Organizations Individuals, enterprises	
07	Law on Irrigation, 08/2017/QH14, June 19, 2017.	Addresses irrigation water basic investigations, strategies and	Takes effect on July 1, 2018.	- Principles in irrigation operations: correspond to the general irrigation management rules; ensure that irrigation operations are in line with practical conditions of river basins, systems of irrigation	Organizations or individuals engaged in irrigation	

No.	1. Name, Nos., Date, Issuing Body	2. Objective	3. Current Status	4. Key Contents related to River/River Basin Management in Vietnam	5. Target Stakeholders	6. Remarks
	National Assembly	planning; investments in development and construction of irrigation works and facilities; management, exploitation or utilization of irrigation works and facilities, and operation of hydropower reservoirs for irrigation water uses; irrigation water utilities or services; protection and assurance of safety for irrigation works and facilities; small-scale and inter-field irrigation works or facilities; rights and responsibilities of organizations or individuals engaged in irrigation operations; responsibilities for state management of		projects, administrative subdivisions and serve multiple objectives; ensure national interests, defense and security; environmental protection and adaptability to climate change; contribution to water resource security and sustainable socio-economic development. - The irrigation planning shall be categorized: + The general irrigation planning covers the whole country, specific regions, river basins, systems of irrigation work or facilities or administrative divisions with a view to dealing with general matters relating to water supply, crop irrigation and drainage, prevention and control of water-related disasters; + The specialized irrigation planning covers specific regions, river basins, systems of irrigation work or facilities or administrative divisions with a view to dealing with one of matters like water supply, crop irrigation and drainage; prevention and control of water-related disasters. + The region-specific irrigation planning, the planning for irrigation system, the administrative division-based irrigation plan shall align with the national irrigation plan and river basin-based irrigation plan. + The irrigation planning shall remain valid for the period of 10 years with a vision for 20 years or more in the future, and shall be subject to a periodic review conducted every 5 years.	operations.	

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		irrigation operations.		--Principles of setting up an irrigation plan: Provide the general management of water resources and ensure consistency with river basins and systems of irrigation works or facilities, adaptability to impacts resulting from climate change and socio-economic development activities occurring in river basins and sustainable development.		
08	Law on Environmental Protection, 56/2014/QH13, June 23, 2014. National Assembly.	To provide statutory provisions on environmental protection activities; measures and resources used for the purpose of environmental protection; rights, powers, duties and obligations of regulatory bodies, agencies, organizations, households and individuals who are tasked with the environmental protection task.	Takes effect since January 01, 2015.	- Prioritize the solutions to pressing environmental problems, serious environmental pollution and water contamination - One of the basic contents of the planning for environmental protection is environmental management of river basins. - General provisions on the environmental protection for river water: + The environmental protection for river water is one of basic requirements set out in the planning and proposal for extraction and utilization of river water. + Waste discharges drained out to the river basin must be managed to meet the accepted standards of river's maximal load. + The quality of river water and sediments must be monitored and assessed. + The environmental protection for the river basin must be closely connected with the biodiversity conservation, river water extraction and utilization. + Owners of manufacturing or business establishments, family households and individuals	Regulatory bodies, public agencies, organizations, family households and individuals within the territory of the Socialist Republic of Vietnam, including mainland, islands, territorial waters and airspace.	

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				must be responsible for reducing and disposing of waste substances before being discharged to the river basin as stipulated by laws. - Processes for monitoring and controlling the river-water environmental pollution: + Make a statistical report, assess, mitigate and dispose of wastes discharged to the river basin. + Carry out the periodical monitoring and assessment of the quality of river water and sediments. + Investigate and assess the river's maximal load; publicize river sections or rivers that are no longer capable of loading waste substances; determine the limited amount of wastes discharged to the river. + Control pollution conditions and improve the environmental condition for contaminated river sections or rivers. + Conduct the trans-border monitoring and assessment of the environmental quality of river water and sediments, and share necessary information on the basis of complying with international laws and practices. + Develop and become involved in the initiative for the river environmental protection. + Disclose the information about river water and sediment environment to the organization specializing in the management, extraction and utilization of river water.		

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				- Responsibility of provincial People's Committees for the environmental protection for water derived from provincial rivers: + Disclose the information about waste discharges into rivers. + Direct and arrange activities to prevent and control waste discharges drained to the river. + Conduct the assessment of the river's maximal load; determine the limited amount of wastes discharged to the river; publicize river sections or rivers that are no longer capable of loading waste substances. + Carry out the assessment of loss incurred by the river-water environmental pollution and the control of such pollution conditions. + Direct the formulation and development of the initiative for the river environmental protection. - Responsibility of the Ministry of Natural Resources and Environment for the river-water environmental protection: + Assess the quality of river water and sediments at inter-provincial and trans-border rivers. + Investigate and assess the river's maximal load, determine the limited amount of waste discharges which corresponds to the objective of using water and making the related information known to the public.		

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				+ Issue and provide guidance for the implementation of technical regulations on river-water and sediment environment. + Issue and provide guidance for the assessment of the river's maximal load and quota of sewage discharged to the inter-provincial rivers, control the pollution condition and improve the environmental health for contaminated river and river sections. + Arrange and direct activities that should be performed for the purpose of the environmental protection for inter-provincial river water. + Conduct the assessment of the polluting waste discharges, damaging levels and take measures to control the pollution condition for inter-provincial rivers. + Make a final report on the information about the quality of river water and sediments and send an annual report on this matter to the Prime Minister. + Prepare and submit the initiative for the water environmental protection for inter-provincial rivers to the Prime Minister to seek an approval. - Technical regulations on surrounding environment quality include: Environmental technical regulations on surface water and underground water.		
09	Land Law 45/2013/QH13, Nov 29, 2013,	To prescribe the land ownership, powers and responsibilities of	Takes effect on July 1, 2014	Land used for cemeteries, graveyards, funeral service centers and cremation centers; Land with rivers, streams, canals, springs and special-use water surface	1. State agencies that exercise the powers and	

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	National Assembly	the State in representing the entire-people ownership of land and uniformly managing land, the land management and use regimes, and the rights and obligations of land users over the land in the territory of the Socialist Republic of Vietnam.		classified into Non-agricultural land group.	perform the responsibilities of the representative of the entire-people ownership of land, and perform the tasks of uniform state management of land. 2. Land users. 3. Other subjects involved in land management and use.	
10	Law on Fees and Charges, 97/2015/QH13, Nov.25, 2015. National Assembly	To regulate the list of fees, charges; fee and charge payers (hereinafter referred to as 'payers'); fee and charge collecting agencies (hereinafter referred to as 'collectors'); principles of determination of level of collection,	January 01, 2017	- Fees for assessment of plan for environmental remediation. - Fees for exploitation and use of water sources. - Fees for assessment of projects, reports on survey, exploitation and use of underground water. - Fees for assessment of conditions for practicing drilling water underground. - Fees for assessment of projects on exploitation and use of surface water, seawater. - Fees for assessment of projects on discharge of wastewater into water sources, irrigation works	Regulatory agencies including Vietnam's overseas representative bodies, public service providers and other organizations and individuals relating to	Appendix 01: List of Fees, Charges

No.	1. Name, Nos., Date, Issuing Body	2. Objective	3. Current Status	4. Key Contents related to River/River Basin Management in Vietnam	5. Target Stakeholders	6. Remarks
		exemptions, remissions, payment, management and use of fees, charges; authority and responsibility of regulatory agencies and other organizations in management of fees and charges.			collection, payment, management and use of fees and charges.	
11	Decree on Environmental Protection Planning, Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Plans. 18/2015/ND-CP, dated Feb.14, 2015. Government.	To promulgate environmental protection planning (EPP), strategic environmental assessment (SEA), environmental impact assessment (EIA) and/or environmental protection plans of the Law on Environment protection.	Take effect from April 1, 2015.	1.Entities subject to strategic environmental assessment: - Strategies or planning for development of infrastructure in river traffic, port traffic. - Planning for development of inter-provincial and inter-regional industries and fields: Planning for development of aquatic products, irrigation and hydropower. 2. Entities subject to environmental impact assessment: - Projects for new or renovated drainage system in urban areas or residential areas; dredging of canals, river, or lakes: Length of a project for new or renovated drainage system in urban areas or residential areas at least 10 km; dredging canal, river, o lakes areas at least 5 ha; total dredging volume at least 50.000 m3.	Agencies, organizations, or individuals involved in EPP, SEA, EIA, and/or environmental protection plans in the territories of the Socialist Republic of Vietnam.	Appendix I: -4.1: 4.1.4, 4.2.1, - 4.2: 4.2.1, 4.2.2, 4.2.3, 4.2.7, Appendix II: 4, 23, 30, 31, 32, 39

No.	1. Name, Nos., Date, Issuing Body	2. Objective	3. Current Status	4. Key Contents related to River/River Basin Management in Vietnam	5. Target Stakeholders	6. Remarks
				- Construction projects for river and sea ports; asylum harbours; projects for dredging of navigable channels, inland waterway jet. -Construction projects foe water reservoirs: with volume at least 500.000 products per year. - Project for dykes and sea and river embankments. - Project for water extraction for business and domestic purpose.		
12	Decree on Detailing the implementation a number of articles of the Law on Water Resources, 201/2013/ND-CP, dated Nov.27, 2013. The Government	To provide for the collection of opinions of local community representatives when exploiting water resources and discharging wastewater into water sources; baseline study on water resources; granting water permits; Fee for granting water exploitation right and transferring such right; river basin organizations; managing and supervising the exploitation, use,	Takes effect on February 01, 2014	- The collection of opinions of local community representatives and relevant entities when exploiting water resources and discharging wastewater into water sources: The projects which have water exploitation works and wastewater discharge works opinions; time for collecting; information; surveying authorities; procedures for collecting opinions; expenditure of the collection of opinions. - Rules on publication of information related to the exploitation of water resources or discharge of wastewater into water sources. - National Council on water resources; river basin organization; baseline study of water resources; investigation on the exploitation of water resources and discharge of wastewater and observation of water resources; construction and maintenance of forecast and warning systems of flood, drought, saltwater intrusion, rise of sea level and other negative effects of water; report on use of water resources. - Protection and exploitation of water resources:	- Local community representatives and relevant entities when exploiting water resources and discharging wastewater into water sources; - Other related agencies.	

No.	1. Name, Nos., Date, Issuing Body	2. Objective	3. Current Status	4. Key Contents related to River/River Basin Management in Vietnam	5. Target Stakeholders	6. Remarks
		protection of water resources, the prevention and mitigation of negative effects of water on the river basins.		underground water exploitation; water permits; Cases in which water exploitation, use and wastewater discharge are exempt from registration or licensing; Registration of underground water exploitation, Regulations on issuing permits, Bases for issuing permits, Requirements for being issued with permits, Validity period of permits, Renewal of permits, Modification of permits, Suspension of permits, Revocation of permits, Return of permit, termination of permit validity, Jurisdiction of issuance, renewal, modification, suspension, revocation and reissuance of water permits, Agencies receiving and managing applications for water permits, Application for issuing, renewing, modifying permits for underground water exploration, Application for issuing, renewing, modifying permits for underground water exploitation, Applications for issuing, renewing and modifying permits for exploitation of surface water and seawater, Applications for issuing, renewing and modifying wastewater discharge permits, Applications for reissuing water permits, Procedures for issuing permits for exploration, exploitation of water and wastewater discharge, Procedure for renewing, modifying and reissuing permits for exploration, exploitation of water and discharge of wastewater, Procedures for suspending water permits, Procedures for revoking water permits, Transfer of exploitation		

No.	1. Name, Nos., Date, Issuing Body	2. Objective	3. Current Status	4. Key Contents related to River/River Basin Management in Vietnam	5. Target Stakeholders	6. Remarks
				right of water resources. - Finance: Charge for granting water exploitation right; Funding for the baseline study, planning development and protection of water resources - Management and supervision of exploitation of water resources, prevention and mitigation of negative effects of water on river basin: activities which require management and supervision, contents of and requirements for management and supervision. - Responsibility for distribution and supervision in river basin: Responsibilities of the Ministry of Natural Resources and Environment, provincial People's Committees, Ministries, ministerial-level agencies.		
13	Decree on Providing for calculation method and charge for granting water right, 82/2017/NĐ-CP, July, 2017. Government.	Dealing with the calculation method and charge for granting water right	Come into force as from September 01, 2017.	- Compulsory payment of charge for granting water right (surface water and underground water; Grounds for calculation of charge for granting water right. - Collection rate, calculation method of charge for granting water right: Grounds for calculation of charge for granting water right; Formula for calculation of charge; Volume to calculate charge; Price to calculate charge; Adjustment coefficient; Power to approve charges; Procedures for calculating charge; Adjustment, collection and refund of charge; Time limit for issuing notice and paying charge; Methods of collection, transfer, management and use of charges. - Responsibility of Ministries, Ministerial-level	1. Regulatory authorities that perform the work of calculation, collection and transfer of charge for granting water right. 2. Organizations and individuals involved in the work of calculation, collection and	

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				Agencies and Provincial-level People's Committees; Responsibility of regulatory authorities involved in calculation and collection of charges for granting water right; Responsibility of payers of charges for granting water right.	transfer of charge for granting water right.	
14	Decree on Collection, management and use of data on natural resources and environment, 73/2017/ND-CP, June 14, 2017. Government.	Deals with the collection, management and use of data on land, water resources, geology and minerals, environment, hydro-meteorology, climate change, topographic and cartographic activities, remote sensing, resources and environment of sea and islands (hereinafter referred to as natural resources and environment data); mechanism for cooperation, connection and sharing of natural resources and	Comes into force as of August 01, 2017	- Data on water resources includes: Quantity and quality of surface water and underground water; data on hydro-geological surveys; other data on exploitation and use of water resources and discharge of wastewater into water bodies; plans for river valley areas, management, exploitation and protection of domestic and inter-country water sources; results of issuance, renewal, revocation and revision to the license to explore, exploit and use water resources; the license to discharge waste water into water bodies; the license for borehole filling; data on factors affecting water resources; technical documentation of water resources monitoring stations/ projects; data on the list of river valleys. - Environmental data includes: Results of valley, coastal and marine environmental management; cross-border environmental pollution; - Organizations and individuals are encouraged by the Government to make investment in collection, establishment, provision and sharing of natural resources and environment data in accordance with regulations of law; to provide or donate natural	Regulatory authorities, organizations and individuals performing activities of collecting, managing and using natural resources and environment data in the territory of the Socialist Republic of Vietnam.	

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		environment data; responsibility and rights of authorities, organizations and individuals in course of collection, management, development and use of natural resources and environment data.		resources and environment data to regulatory authorities in order to serve the protection of national sovereignty and common social benefits. - The Government adopts policies for cooperation with foreign countries, foreign organizations and international organizations in investigating, surveying, doing research, sharing and providing natural resources and environment data; encourages the sharing of international sources of information and data on natural resources and environment matters; cooperates in doing research and investigating data and facilitates the effective management and use of international data sources of natural resources and environment. - Collection, management, use of natural resources and environment data; connecting and sharing natural resources and environment data electronically. - Responsibility and right of agencies in charge of managing natural resources and environment data. - Protecting intellectual property right in natural resources and environment data.		
15	Decision on Approving the national strategy on water resources to 2020, 81/2006/QD-	- Determine the general objectives, specific objectives, major tasks and solutions - List of priority schemes and projects	April 14, 2012	- Major tasks: To enhance the protection of water sources and aquatic ecosystems; To ensure the sustainability and efficiency of water resource exploitation and use; To develop water resources in a sustainable manner; To minimize harms caused by water; To perfect institutions and organizations; To	- The National Council on improving competitiveness and sustainable development	

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	TTg, April 14, 2006. Prime Minister	for implementation of the national strategy on water resources in the period 2006-2010.		enhance the investigation, technological research and development capacity. - Major solutions: To conduct communication and education, raise public awareness and encourage participation of communities; To enhance legislation; To increase investment and boost the socialization of water services; To develop human resources, science and technology; To expand and raise the effect of international cooperation; To renew financial mechanisms - The scheme on inventory and assessment of national water resources and establishment of a water resource-information and data system.	- Ministries, sectors, localities and agencies and organizations concerned.	
16	Decision on Approval of Sustainable Development Strategy of Vietnam 432/QD-TTg, April 12, 2012. Prime Minister	Regulations on Viewpoint, Objectives, Groups of Solution and Priority Orientation for Sustainable Development period 2011-2020.	April 12, 2006	- Sustainable development is required throughout the development process of the country; closely, reasonably and harmoniously combining between the economic development with social development and protection of natural resources and environment, securing national defense, security and social order and safety. - Protecting water surface and sustainably using water resources: Protecting and effectively exploiting and sustainably using national water resources on the basis of integrated and unified management of water resources, ensuring water security for social economic development and promoting cooperation with neighboring countries in the sharing of		

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				transboundary water resources. Thriftily using and increasing the economic efficiency in the use of water resources. Water is considered as important national asset and increasing effectiveness and efficiency in the management of water resources. Focusing on environmental protection of the river basins. Developing and implementing programs and projects of integrated management of river basins, watershed and groundwater. Strengthening the building of wastewater collection and treatment system in urban areas and industrial zones. Strengthening the research of methods of wastewater treatment from activities of agricultural production and aquaculture. Preventing degradation and restoring the quality of water resources, especially water quality restoration in the main river basins.		
17	Decree on River basin management, 120/2008/NĐ-CP 01/12/2008. Government	Provides for the management of river basins, covering basic surveys of the river basin environment and water resources; river basin planning; protection of the river basin water environment; regulation and	Around January 2009	- Principles for river basin management: Water resources in a river basin must be uniformly managed without division among administrative levels, between upstream and downstream; the fairness, rationality and equality in obligations and interests among organizations and individuals in the same river basin must be ensured; To comprehensively and uniformly manage water volume and quality, surface and ground water, inland water and river-mouth coastal water, ensuring that water resources are used thriftily and efficiently for multiple purposes.	Agencies, organizations and individuals conducting activities related to river basins.	

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		allocation of water resources and river basin water transfer; international cooperation and implementation of treaties on river basins; organization of river basin coordination; and river basin management responsibilities.		- Contents of river basin management; Lists of river basins; Investment policies for sustainable development of river basins. - Basic surveys of the river basin environment and water resources: Major contents of basic surveys of the river basin environment and water resources; Organization of basic surveys of the river basin environment and water resources. -River basin planning: River basin planning period and elaboration time limit; River basin planning tasks; Grounds for formulation of river basin planning; Major contents of a planning on allocation of river basin water resources; Major contents of a planning on protection of river basin water resources; Major contents of a planning on prevention, combat and address of consequences of harms caused by water in river basins; Formulation of river basin planning; Adjustment of river basin planning; Organization of implementation of river basin planning; Funds for formulation and implementation of river basin planning; Archival of files on river basin planning. -Protection of the river basin water environment: Control of polluting sources and protection of river basin water quality; Plans for water pollution prevention and combat and rehabilitation of polluted water sources in river basins; Responding to and		

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				addressing river basin water environment incidents. - Maintenance of minimum flow in river basins; Regulation and allocation of water resources in river basins; Transfer of river basin water. - International cooperation and implementation of treaties on river basin. - River basin coordinating organization: The River Basin Committees; River Basin Office. - River basin management responsibilities: MONRE, Ministries and ministerial-level agencies; MPI, MOF, Provincial-level People's Committees; The National Water Resources Council; The River Basin Committees. - Inspection, examination, and handling of violations.		
18	Decree regulating some articles of the Law on Irrigation, 67/2018/ND-CP, 14/5/2018. Government	This Decree provides for the classification and decentralization of irrigation works; The capacity of organizations and individuals exploiting irrigation works; The competence, order and procedures for the grant, re-grant, extension, adjustment, suspension and withdrawal of permits	July 01, 2018	Minimum capacity requirements for organizations and individuals exploiting culvert culverts, conduits and water transfer systems for culverts under grade I and grade II river dykes; large electrical drainage bridges: Culvert under special river dikes, grades I and II; Large electric-powered drainage bridges and drains shall be arranged with one irrigation engineer, one electro-mechanical engineer; 01 staff with intermediate level mechanical and electrical work in key works with senior management and operation for 03 years or more;	Vietnamese organizations and individuals; Foreign organizations and individuals engaged in irrigation-related activities in the territory of the Socialist Republic of Vietnam.	

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		for activities within the protection area of irrigation works.				
19	Determination of minimum flow in rivers, streams and downstream areas of reservoirs and dams, Circular No. 64/2017 / TT-BTNMT dated 22/12/2017 of Minister of Natural Resources and Environment.	This Circular prescribes the identification and announcement of minimum flows in rivers, streams, canals and rivers (referred collectively to as rivers and streams) and downstream areas of reservoirs and dams (referred collectively to as reservoirs)	05/02/2018	It regulates: - Principles, objectives, requirements for minimum flow determination. - Determining, announcing minimum flow for rivers and streams: location for minimum flow estimation; method of calculating flow characteristics; requirements on information, data and results of minimum flow determination; reviewing, adjusting and supplementing the minimum flow in rivers and streams.	This Circular applies to state management agencies, organizations and individuals involved in the identification, announcement and maintenance of minimum flow in rivers, streams and downstream areas of reservoirs.	
20	Technical regulation on minimum flow in rivers and streams, and establishment of multi-reservoir operation procedure, Decision No.	This Decision provides the techniques for identifying, reviewing and adjusting minimum flow in rivers and streams without reservoirs or dams; after reservoirs, dams; and the	05/02/2018	1) Technical regulation on minimum flow in rivers and streams without reservoir: Procedure of determining the minimum flow in rivers and streams without reservoirs and dams; Collecting, analyzing and processing documents and data related to the determination of minimum flow in rivers and streams without reservoirs and dams; Restoring, prolonging the flow data on the river sections which need to determine the minimum flow; Field surveys for river and stream segmentation and minimum flow	This Circular applies to state agencies, organizations and individuals involved in the identification, review and adjustment of minimum flow in	

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	65/2017 / QD-BTNMT dated 22/12/2017 of the Minister of Natural Resources and Environment .	construction, review and adjustment of inter-reservoir operation.		estimation; Measuring and supplementing information and data on water level, flow, topography, cross-sections of rivers and streams, and water quality (if any) to determine the minimum flow in rivers and streams without reservoirs and dams; Synthesizing and processing information collected and investigated in sections of rivers and streams, which are necessary for determining the minimum flow; Analysis of river sections to maintain minimum flow and proposed minimum flow; Conducting workshops and gathering comments from concerned agencies on minimum flow in rivers and streams without reservoirs or dams; Synthesizing and preparing report on minimum flow in rivers and streams without reservoirs or dams; Making records on results of the minimum flow in rivers and streams without reservoirs and dams; 2) Technical regulation on minimum flow in rivers, streams after lakes and dams: procedure of determining minimum flow in rivers, streams behind reservoirs and dams; Collecting, analyzing and processing documents and data related to minimum river flow, after reservoirs and dams; Preliminary definition of impact range of reservoir and dam; Field surveys within the impact of reservoirs and dams; Measuring and supplementing information and data on water level, flow, topography, cross-sections of rivers and streams, water quality (if any) for the	rivers and streams without reservoirs or dams; after reservoirs, dams and construction, review and adjustment of inter-reservoir operation.	

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				determination of minimum flow in rivers and streams after reservoirs and dams; Synthesizing and processing information collected and investigated within the impact of reservoirs and dams; Restoring and prolonging the flow data after the reservoir and dams; Analysis and calculation of water use demand for downstream area; Analyzing and proposing minimum flow levels; Organizing workshops, collecting comments from relevant agencies on the minimum flow of rivers and streams after reservoirs and dams; Synthesizing and preparing reports, on minimum flow of rivers and streams after reservoirs and dams; Producing profile on the results of the minimum flow in the rivers, streams behind the reservoirs and dams; 3) Technical regulations on the inter-reservoir operation procedure: The steps of building inter-reservoir operation procedure; Collecting and compiling information and data related to the development of multi-reservoir operation procedure; Analyzing and processing information, data collected related to the development of inter-reservoir operation procedure; Additional field survey to develop inter-reservoir operation procedure; Measuring and supplementing information and data on hydro-meteorology, topography and river cross-sections (if any) to serve the development of inter-reservoir operation procedure; Synthesizing and analyzing		

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				documents collected and investigated in service of development of inter-reservoir operation procedure; Collecting comments of concerned agencies on operation monitoring stations; Formulating operation plans and setting up inter-reservoir operation model for the flood season; Formulating plans for operation and setting up inter-reservoir operation calculation model; Procedure compilation; Conducting meetings, collecting comments of concerned agencies on inter-reservoir operation procedures; Synthesizing and preparing reports on inter-reservoir operation procedure; Preparing profile for inter-reservoir operation.		
21	Decree on sanctioning of administrative violations in the field of water and mineral resources, 33/2017 / ND-CP, 03/04/2017. Government	Regulating the administrative violations sanctioning forms, sanctioning levels, remedial measures applicable to administrative violations, sanctioning competence and the competence to make records on administrative violations in the field water and mineral resources.	Effective from 20 May 2017.	- Administrative violations in the field of water resources include: Violation of regulations on investigation, planning, exploration, exploitation and use of water resources; Violation of regulations on reservoir and reservoir operation; Violation of regulations on protection of water resources; Violation of regulations on prevention, combat and overcoming of harmful consequences caused by water; Violation of regulations on community consultation and other violations in water resource management.	Organizations and individuals concerned.	

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22	Defining the functions, tasks, powers and organizational structure of the Ministry of Natural Resources and Environment. 36/2017/NĐ-CP, April 04, 2017. Government	The Ministry of Natural Resources and Environment is a governmental agency performing the function of state management of land; water resources; minerals and geology; environment; hydrometeorology; climate change; survey and cartography; integrated management of marine and island resources and protection of the marine and island environment; remote sensing; and state management of public services in the fields under its management.	April 04, 2017.	a/ To guide, examine and organize the implementation of policies, laws and decided or approved strategies, master plans, plans, programs, schemes and projects on prevention and control of water source pollution, deterioration and depletion, restoration of deteriorated or depleted water sources and response to and remediation of water source pollution incidents so as to economically and effectively exploit and use water sources of river basins under the Ministry's management for integrated and multiple purposes; b/ To elaborate master plans on baseline survey of water resources and the national water resource master plans; to elaborate and approve water resource master plans for inter-provincial river basins and inter-provincial water sources and organize the implementation of the master plans after they are approved; to give written opinions on water resource master plans of provinces and centrally run cities; to approve contents involving exploitation, use and protection of water resources and the prevention, control and remediation of harmful effects caused by water to irrigation, hydroelectric power and water supply, and inland waterway transport master plans and other master plans involving the exploitation and use of water resources which are elaborated by ministries and ministerial-level agencies, and activities related to the exploitation, use and	Ministers, heads of ministerial-level agencies, heads of government-attached agencies and chairpersons of provincial-level People's Committees	

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				protection of water resources according to its competence; to appraise projects on water transfer between river basins; c/ To classify inter-provincial water sources by degree of pollution and depletion; to elaborate plans on the regulation and distribution of water resources to restore inter-provincial water sources already polluted, deteriorated or depleted and organize the implementation of such plans after they are approved by competent authorities; to guide and examine the implementation of plans on the regulation and distribution of water resources and plans on prevention and control of water source deterioration and depletion in construction, production, business and service activities in accordance with law; d/ To make a list of inter-provincial river basins; to make and promulgate a list of intra-provincial river basins and lists of inter-provincial and transnational water sources; d/ To zone off and announce areas where groundwater exploitation is banned or restricted, areas requiring artificial supplementation of groundwater, the minimum flow and groundwater exploitation limits in accordance with law; to guide the observance of regulations on the formation and management of water source protection corridors in accordance with law; to determine and publicize sanitation protection zones of domestic water-supplying areas;		

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				e/ To develop water conservation models; to provide public information about water- saving models, technologies and equipment; to guide the observance of regulations on incentives for water conservation activities; g/ To elaborate and adjust inter-reservoir operation processes for river-basin reservoirs on the list of reservoirs, for which inter-reservoir operation processes are required, and guide the implementation of such processes after they are promulgated; to guide the implementation of regulations on surveillance and observation of water resource exploitation and use and discharge of wastewater into water sources of river basins; to appraise reservoir construction projects whether they satisfy the requirements of protection, exploitation and use of water resources for integrated and multiple purposes and conform with master plans on water resources; h/ To guide, examine and take measures to maintain the minimum flows of rivers, ensure the exploitation and integral and efficient use of water sources of river basins for reservoirs and the protection of river beds and banks and maintenance of water flow; to comply with standards and technical regulations on safety, prevention and control of land subsidence in the course of water exploration and exploitation in accordance with law; to direct the implementation of measures to restrict land subsidence (excluding		

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				irrigation works, dikes and natural disaster prevention and control) in the course of water exploration and exploitation in accordance with law; i/ To conduct baseline surveys of national water resources; to summarize results of baseline surveys of water resources and water resource exploitation, use and protection conducted by ministries, sectors and localities; to conduct water resource inventory, assessment and forecasts; to develop and manage a system for observation and surveillance of water resources, water exploitation and use and discharge of wastewater into water sources with regard to inter-provincial river basins and inter-provincial and transnational water sources; to develop, manage and exploit the national information system and database on water resources; to manage, archive, publicize and provide information and data on water resources, exploitation and use of water resources, water scarcity and shortage in river basins and measures to regulate, distribute and economically use water; k/ To guide, examine and organize the grant, extension, modification, suspension, revocation and re-grant of licenses to explore, exploit and use water resources, discharge wastewater into water sources and practice groundwater drilling; to approve the transfer of the water resource exploitation right in accordance with law; l/ To settle problems and disputes arising in the		

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				exploitation and use of water resources or discharge of wastewater into water sources falling under its licensing competence and other water resource-related problems among provinces and centrally run cities; m/ To act as the national focal body in exchanging information relating to transnational water sources and participating in international river basin organizations and river basin forums; to guide and examine the implementation of international conventions, treaties and agreements on water resources to which the Socialist Republic of Vietnam is a contracting party; n/ To monitor, supervise and summarize developments of transnational water sources and promptly report to and propose the Government or the Prime Minister to handle arising issues so as to ensure Vietnam's rights and interests; o/ To act as the standing body of the Vietnam Mekong River Commission, the National Council of Water Resources and other river basin committees.		
23	Defining the functions, tasks, powers and organizational structure of the Ministry of Agriculture and	The Ministry of Agriculture and Rural Development is a governmental agency performing the function of state management of the	February 17, 2017.	- To direct, guide and examine the approval of provincial master plans on irrigation, irrigation work systems - To perform tasks of state management of dam and irrigation reservoir safety in accordance with law; to perform the tasks under the Ministry's state management as prescribed in the Law on Water	The Minister of Agricultural and Rural Development, ministers, heads of ministerial-level agencies,	

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	Rural Development. 15/2017/NĐ-CP, February 17, 2017. Government.	sectors and fields of agriculture, forestry, salt production, fisheries, irrigation, natural disaster prevention and control, and rural development; and state management of public services in the sectors and fields under its management as prescribed by law.		Resources and other laws. - To perform tasks of state management of anti-flood master plans of diked rivers and dike master plans; investment in dike construction, repair, upgrading and solidification; dike management and protection, dike protection corridor management and dike use in accordance with the Law on Dikes and other laws; to approve master plans on prevention and control of floods, inundation, riparian and coastal landslide in accordance with law; - To perform tasks of state management of natural disaster prevention and control in accordance with the Law on Dikes, the Law on Natural Disaster Prevention and Control, the Law on Water Resources and other laws.	heads of government-attached agencies and chairpersons of provincial-level People's Committees	
24	Establishment of the National Water Resources Council 67/2000/QD-TTg, June 6, 2000. Prime Minister	The National Water Resources Council shall be established to advise the Government on important decisions on water resources within the tasks, powers of the Government.	May 29, 2000	1. The National Water Resources Council shall advise the Government before the Government makes decisions on: - Strategies and policies on national water resources, - Major river basin plans, - Plans for major inter-basin diversions, - Projects for protection, exploitation and utilization of water resources and projects for flood control and overcoming the adverse effects caused by water where such projects require Cabinet approval, - Management, protection, exploitation and utilization of international water sources and settlement of any disputes,	The Chairman and members of the National Water Resources Council, Ministers, Heads of agencies equivalent to ministries, Leaders of agencies of the Government, Chairmen of	

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				- Resolution of conflicts regarding water resources between ministries and agencies, between ministries & provinces, cities directly under the central control. 2. The National Water Resources Council has its own seal. The Office of the Council is located within MARD. Operation fund of the Council and its Office is supplied from the State budget through the annual fund of MARD. Members of the Office shall be assigned from the personnel of MARD. 3. Members of the National Water Resources Council include: - Chairman of the National Water Resources Council: Vice Prime Minister; - Standing member: Minister of Agriculture and Rural Development; - Other members: + Permanent members are Vice Ministers of the following Ministries: Ministry of Agriculture and Rural Development ; Ministry of Fisheries; Ministry of Science, Technology and Environment; Ministry of Planning and Investment; Ministry of Finance; Ministry of National Defence; Ministry of Construction, Ministry of Transportation and Communication; Ministry of Industry; Ministry of Public Health; General Department of Hydro-meteorology; the Chairman of NWRC Office; and some specialists working in water sector (list attached).	provincial People's Committees, cities directly under the central control	

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				+ Non-permanent members are those who represent central and local agencies with regards to specific issues and will be appointed by the Chairman of NWRC at each session of the Council. Members of the National Water Resources Council work on a part-time basis.		
25	Defining the functions, tasks and powers of the National Council on Water Resource, Decision No. 459 / QD-TTg, dated 02/4/2014. Prime Minister	The National Water Resources Council has the function of providing advice to the Prime Minister on research, guidance and coordination in addressing important issues of water resources.	Effective from the signing date and replacing the Prime Minister's Decision No. 67/2000 / QD-TTg of June 15, 2000 establishing the National Board on Water Resource; Decision No. 99/2001 / QD-TTg of June 28, 2001 of the Prime	1. The National Water Resource Council has its own seal. - The National Water Resources Council consists of the chairman, some vice chairmen and members, working on a part-time basis. The organization and operation regulations of the Council are decided by the Council chairman. The Ministry of Natural Resources and Environment is the standing body of the Council. - Organizing or participating in studying and proposing to the Prime Minister orientations, mechanisms, policies, strategies, target programs and national action programs related to the protection, exploitation and sustainable use of water resources; preventing, combating and overcoming the harmful effects caused by water. - Advising the Prime Minister on the direction, coordination and cooperation among ministries, sectors and localities in settling matters related to: + Planning on water resources and specialized planning on water resources exploitation and use; + Water transfer between inter-provincial water	The Chairman of the National Council on Water Resource, Ministers, Heads of the ministerial-level agencies, Heads of the agencies under the Government, Chairmen of the People's Committees of the provinces and cities directly under the Central Government and the members of the National Council on water resources	

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			Minister promulgating the Regulation on organization and operation of the National Council on Water Resource.	sources; + Supervising the use of inter-country water sources and settling disputes arisen; + Major programs, schemes and projects on the protection, exploitation and use of water resources and other tasks assigned by the Prime Minister. + Advising the Prime Minister in urging the ministries, sectors and localities in implementing important and inter-sectoral issues related to the protection, exploitation and use of water resources, prevention and combat of harmful effects caused by water. - Chairman of the Council is a Deputy Prime Minister; - Vice Chairman of the Council is the Minister of Natural Resources and Environment; - Members of the Council include Permanent members: the Deputy Chairman of the Government Office, the Deputy Ministers of Natural Resources and Environment, Agriculture and Rural Development, Industry and Trade; Transportation, Science and Technology; Non-permanent members include Deputy Ministers of Health, Finance, Planning and Investment, Culture, Sports and Tourism, Foreign Affairs, Public Security and Defense. 2. The Office of the National Council on Water Resource, assisting the Council, is under the Ministry		

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				of Natural Resources and Environment. The Chairman of the Council decides the organization and operation of the Office. - The Office of the National Water Resources Council has its own seal and account. - Staffs of the Office are the staffs of Ministry of Natural Resources and Environment.		
26	Assigning the position of Chairman and Vice Chairman of the National Council on Water Resources, Decision No. 932 / QD-TTg dated 30 June 2017. Prime Minister	Assigning the position of Chairman and Vice Chairman of the National Association on Water Resources	30/6/2017	Assigning the Deputy Prime Minister Trinh Dinh Dung to be on position of Chairman of the National Council on Water Resources; Mr. Tran Hong Ha - Minister of Natural Resources and Environment on position of Vice Chairman of the National Council on Water Resources.	The ministers, heads of the ministerial-level agencies, heads of the agencies under the Government, chairmen of the People's Committees of the provinces and centrally-run cities, Mr. Trinh Dinh Dung and Mr. Tran Hong Ha.	
27	Defining the functions, tasks, powers and organizational structure of the	The Water Resource Management Department is an organization under the Ministry of Natural	26/6/2017	The Department of Water Resources Management has the following tasks and powers: 1. Submitting to the Minister of Natural Resources and Environment: a / Strategy, mechanism, policy and draft legal	The director of the Ministry's Office, director of the Organization and	

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	Water Resource Management Department, Decision No. 1536 / QD-BTNMT of June 26, 2007, of the Minister of Natural Resources and Environment	Resources and Environment, which has the function of assisting the Minister in the performance of the State management over water resources and river basins throughout the country; Organizing the implementation of public services on water resources according to the provisions of law.		documents in the field of water resources under the Ministry's management; b / National technical regulations and standards, , techno-economic norms and unit prices of products in the field of water resource; c / Water resource planning, plans, programs, schemes and projects; plans and measures under the Ministry's management to prevent, combat and restore polluted, degraded and depleted water sources and respond to the impacts of climate change on the water resources; d / Plans for settlement of disputes and disagreements arisen in the exploitation and use of water resources, discharge of wastewater into water sources, under the competence of the Minister; e / Options and measures to coordinate and supervise the activities of exploitation, use and protection of water resources, prevention combat and overcoming of harmful consequences caused by water in river basins; f / Approval documents on contents related to the exploitation, use and protection of water resources and the prevention and overcoming of consequences and harms caused by water to the irrigation, hydropower and water supply planning, inland waterway navigation and other plans on water resource exploitation and use, which are prepared by ministries and ministerial-level agencies.	Personnel Department, director of the Water Resources Management Department and heads of the agencies and units under to the Ministry of Natural Resources and Environment.	

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				2. Organizing the implementation of master plan on basic investigation of water resources, national planning on water resources, planning on water resources in inter-provincial river basins and inter-provincial water sources; Classifying water sources and making list of river basins and list of water sources according to regulations. 3. Organizing the implementation and adjustment of inter-reservoir operation procedure in river basins; Providing guidance on the implementation of measures to maintain minimum flow on the river, determination of the minimum flow in the river; Guiding the implementation of the regulations on the implementation and management of water resource protection corridors. 4. Classification of water sources according to level of pollution and exhaustion; Working out plans for prevention of and combat against pollution, degradation and depletion of water sources in inter-provincial river basins, inter-provincial water sources; Organizing the implementation of measures to prevent and combat pollution, degradation, depletion of water sources, restoration and improvement of water sources and rivers, which are polluted and exhausted. 5. Making plans on regulating and distributing water resources, restoring polluted and depleted inter-provincial water sources and organizing the		

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				implementation thereof after they are approved by competent authorities; Guiding and inspecting the implementation of water resource allocation and distribution plans. 6. Determining the limit for exploitation of water-aquifers, water reserve areas and areas of restricted underground water exploitation; Guiding the identification and announcement of hygiene zones in the area of water intake for domestic use. 7. Organizing the conduct of statistics, inventory, evaluation and forecast of water resources; Building, updating and managing information systems and national databases on water resources; development of national water resources report, specialized report on water resources and indicators of water resources in the indicator system of natural resources and environment statistics; Providing information and data on water resources, and the situation of exploitation and use of water resources; Announcing water scarcity, water shortage in river basins and the application of measures to save water and to limit water exploitation and use according to the provisions of law. 8. Submitting the Minister or performing the Minister authorization on granting, extending, adjusting, suspending, withdrawing and re-granting permits for exploration, exploitation and use of water resources,		

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				discharge of wastewater into water sources and drilling ground water; Approving the grant of rights to exploit water resources; Approving the transfer of the right to exploit water resources according to the provisions of law. 9. Organizing the appraisal of reservoir construction projects in meeting the requirements on protection, exploitation and multi-purpose use of` water resources in accordance with the water resource planning and plans for prevention, combat and restoration of polluted, degraded and depleted water sources set up by Provincial People's Committees of the provinces and centrally-run cities; Providing comments on the water resources planning of the provinces and cities directly under the Central Government. 10. Guiding, examining and organizing the implementation of legal documents, mechanisms, policies, strategies, planning, plans, programs, projects, standards, economic and technical norms and unit prices of products in the field of water resources after being promulgated. 11. Guiding the application of measures for integrated and efficient exploitation and use of water sources in river basins for reservoirs and the protection of river banks and beds, ensuring the water flow; the compliance with standards and technical regulations on safety, prevention and fight against land		

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				subsidence due to water resources exploration, exploitation and use; Directing the implementation of measures to limit land subsidence caused by exploration, exploitation and use of water resources according to the provisions of law. 12. Guiding the implementation of the regulations on monitoring and supervision of water resource exploitation and use and discharge of waste water into water sources in river basins, inspection of the construction and operation of national and local water resource observation and supervision systems; management of baseline survey, monitoring and supervision of water resources, exploitation and use of water resources, and discharge of wastewater into water sources, according to the provisions of law.		
28	Establishing the Srepok River Basin Council, Decision No. 41/2006 / QD-BNN dated 15/5/2006. Minister of Agriculture	Setting up the Srepok River Basin Council to coordinate activities on integrated exploitation, use and protection of Srepok river water sources within the four provinces: Dak Lak, Dak Nong, Gia Lai and Lam Dong.	15/5/2006	1. The Srepok River Basin Council is responsible for advising on the areas related to the Srepok River water resources such as: - Water use strategies and policies; - River basin planning; - Projects on protection, exploitation and use of water; Preventing, combating and overcoming the consequences of floods and damage caused by water; - Participating in the management, protection, exploitation and use of downstream water sources in accordance with international treaties and settlement of disputes; - Solving disputes over water resources within the	The director of the Office, director of the Organization and Personnel Department, director of the Irrigation Department, director of the Department for Management of Dykes, and	

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				basin of 4 provinces. 2.The composition of the Srepok River Basin Council is as follows: - Chairman of the Council: Leader of the People's Committee of Dak Lak province; - Vice Chairman of the Council: leaders of the People's Committees of Dak Nong, Gia Lai and Lam Dong provinces; - Standing Member: Leader of Dak Lak Department of Agriculture and Rural Development; - Regular members: Leaders of Departments of Agriculture and Rural Development, Natural Resources and Environment, Planning and Investment, Finance, Irrigation Sub-Department, Office of the Steering Committee for Typhoon and Flood Control, and Natural Disaster Mitigation of Dak Lak, Dak Nong, Gia Lai and Lam Dong Provinces and Leaders of Irrigation Sub-Department, Vietnam National Mekong Committee, and Hydropower Project 5 Management Board; - Irregular members: leaders of relevant departments and agencies; People's Committees of cities, districts and towns in the Srepok river basin; Representatives of central and local agencies as well as organizations and individuals invited by the Chairman of the Council when necessary for settling the related issues. Members of the Srepok River Basin Council work on a part-time basis.	Flood and Storm Prevention and Fight, director of the Finance Department and members prescribed in Article 3. Director of Department of Agriculture and Rural Development of Dak Lak, Dak Nong, Gia Lai and Lam Dong provinces	

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				3. The Srepok River Basin Council has an office under the Dak Lak Department of Agriculture and Rural Development. The director of the Council's Office is the Standing Council member. Heads of Irrigation Department of Dak Lak, Dak Nong, Gia Lai and Lam Dong provinces are Deputy Directors of the Office of the Council. The Srepok River Basin Council may use its own seal and may open accounts at banks or state treasuries for operation, in accordance with current regulations. The Office of the Srepok River Basin Council has three Branches located in the Departments of Agriculture and Rural Development of Dak Nong, Gia Lai and Lam Dong provinces. Deputy Chiefs of the Dak Nong, Gia Lai and Lam Dong Provincial Councils are the Chief Branch.		
29	Dong Nai River Basin Environmental Protection Committee, Decision No. 157/2008 / QD-TTg dated 01/12/2008. Prime Minister	Setting up the Committee for Environmental Protection for the Dong Nai River Basin (hereinafter referred to as the Dong Nai River Committee). The Dong Nai River Committee directs and coordinates the inter-sectoral and inter-	01/12/2008	1) Duties and authorities of Dong Nai River Committee: - Organizing and guiding the implementation of the Dong Nai River Master project. - Coordinating and solving inter-sectoral and inter-regional issues in environmental protection and sustainable development in the Dong Nai river basin. - Approving and directing the implementation of five-year and annual component projects, programs and action plans under the Dong Nai River Master project, according to the principle of close coordination among the provinces and centrally-run	Minister of Natural Resources and Environment, Chairmen of People's Committees of Ho Chi Minh City and provinces of Dong Nai, Binh Duong, Binh	

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		regional coordination in order to uniformly implement the project on environmental protection in the Dong Nai river basin up to 2020, already approved by the Prime Minister. Decision No. 187/2007 / QD-TTg of December 3, 2007 (called Dong Nai master project for short).		cities in the basin. - Proposing relevant ministries and sectors in directing and guiding the implementation of programs and projects within to the Dong Nai Master project, and other programs and projects on environmental protection in the Dong Nai river basin. - Proposing the development, modification and supplementation of mechanisms, policies and legal documents on environmental protection in order to effectively implement the contents of the Dong Nai Master project. - Directing the building of a database on natural resources and environment in the Dong Nai river basin to effectively serve the implementation of the Dong Nai master project. - Mobilizing domestic and international resources to support the implementation of the tasks of the Dong Nai Master project and other tasks, contributing to environmental protection and sustainable development of the Dong Nai River basin. - Monitoring and evaluating the implementation of programs, plans and component projects under the approved Dong Nai Master project. - Proposing the Prime Minister to settle disputes and issues between localities in the exploitation and use of natural resources and the protection of the basin's environment beyond their competence. - Providing recommendations for amendment and	Phuoc, Ba Ria-Vung Tau, Long An, Tay Ninh, Lam Dong, Dak Lak. , Dak Nong, Ninh Thuan, Binh Thuan; ministers and heads of the ministerial-level agencies, heads of the agencies under the Government	

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				supplementation of the contents of the Dong Nai Master project 2) Organizational structure: - The members of the Dong Nai River Committee include: + The chairman of the Dong Nai River Committee is the chairman of the People's Committee of one of the twelve provinces and centrally-run cities in the basin; + The Chairman of the Dong Nai River Committee for the first term shall be chaired by the Chairman of the People's Committee of Ho Chi Minh City for a period of three years. The chairman of the Dong Nai River Committee for the next two-year terms is assigned to the Chairman of the People's Committee of one of the provinces and centrally-run cities in the basin, voted based on the confidence. The chairman of the Dong Nai River Committee is not assigned for more than two consecutive terms; + Vice Chairman of Dong Nai River Committee is Vice Minister of Natural Resources and Environment; + Members of the Dong Nai River Committee are leaders of the People's Committees of the provinces and centrally-run cities in the basin, and Ministries of Planning and Investment, Finance, Agriculture and Rural Development, Science and Technology, Industry and Commerce, Construction, Transportation, Health, Police, Information and Communication, and Culture, Sports and Tourism.		

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				3. To assist the Dong Nai River Committee is the Office of the Dong Nai River Committee		
30	Nhue - Day River Basin Environmental Protection Committee, Decision No. 1404/2009 / QD-TTg dated 31/8/2009. Prime Minister	Setting up the Committee for Environmental Protection of the Nhue - Day River Basin (called Nhue-Day River Committee for short) to organize the inter-sectoral and inter-regional steering and coordination in order to uniformly and effectively implement the "Master Plan for Environmental Protection in the Nhue – Day River Basin to 2020" approved by the Prime Minister in Decision No. 57/2008 / QD-TTg dated 29 April 2008 (called Nhue - Day Master project for short). 2. Nhue River - Day River Committee	31/8/2009	1) Tasks and powers of Nhue-Day River Committee: - Organizing and guiding the implementation of the Nhue - Day river Master project; Proposing for competent authorities to approve, direct and guide the implementation of five-year and annual projects, programs and action plans under the Nhue-Day Master project according to the principle of close coordination between ministries, sectors and People's Committees of the provinces and centrally-run cities in the Nhue-Day river basin; Formulating, amending and supplementing mechanisms, policies and legal documents on environmental protection in order to effectively implement the contents of the Nhue - Day Master project; - Proposing for competent state agencies to mobilize domestic and international resources to support the implementation of the tasks under the Nhue - Day Master project and other tasks, thus contributing environmental protection and sustainable development of the Nhue-Day river basin; Solving inter-sectoral, inter-regional and conflicts in environmental protection in the Nhue-Day river basin. - The ministries, branches and localities are requested to supply data on natural resources and environment in the Nhue-Day river basin; To inspect and evaluate		

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		operates in accordance with the collective modality, majority-based decision and working regulation of the Nhue - Day River Commission.		the implementation of programs, plans and projects under the Nhue-Day river scheme; To propose amendments and supplements to the contents of the Nhue-Day river scheme. - Report to the Prime Minister periodically or biannually about the operation of Nhue River - Day River Committee. 2) Organizational structure and operation of the Committee: - The Committee for Environmental Protection of the Nhue-Day River basin composes of the chairman, standing vice chairman, vice chairmen and members. + The Chairman of the Committee is the Chairman of the People's Committee of one of the five provinces and centrally-run cities in the Nhue-Day river basin. The Chairman of the Nhue-River Committee for the first term is the Chairman of the Hanoi city People's Committee for a term of three years. The Chairmen of the Nhue - Day River Commission for the next two - year terms are assigned to the Chairmen of the People 's Committees of the provinces and centrally - run cities in the Nhue - Day river basin based on vote of confidence. The Chairman of the Nhue – Day River Committee does not work for more than two consecutive terms; + Vice Chairmen of the Nhue - Day River Committee, include Standing Vice Chairman - Deputy Minister of Natural Resources and		

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				Environment; Vice Chairman: Deputy Minister of Agriculture and Rural Development. - The members of the Nhue River - Day River Committee are the leaders of the People's Committees of the provinces and centrally-run cities in the Nhue-Day river basin; leaders of the Ministries of Planning and Investment, Finance, Science and Technology, Industry, Commerce, Construction, Transportation, Health, Police, Information and Communication, Culture, Sports and Tourism; - The Minister of Natural Resources and Environment approves the list of members of the Nhue - Day River Basin Committee at the proposal of the ministries, sectors and the People 's Committees of the provinces and cities directly under the Central Government - Nhue - Day River basin Committee meets every six months. When necessary, the Chairman of the Committee may convene an extraordinary meeting. - The Nhue - Day River basin Committee is entitled to use the seal of the People's Committee of the province or city directly under the Central Government in the Nhue-Day river basin, during the term of the Chairman of this province/city is on the position of the Committee Chairman. 3) To assist Nhue - Day River Basin Committee is the office of the Nhue - Day River basin Committee.		
31	Cau River Basin Environmental	Establishment of the Cau River Basin	14/11/2007	1) Tasks and powers of the Cau River Committee - Organizing and guiding the implementation of the		

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	Protection Committee, Decision No. 171/2007 / QD-TTg dated 14/11/2007. Prime Minister	Environmental Protection Committee (hereinafter referred to as the Cau River Committee). 2. The Cau River Committee is to direct and coordinate inter-sectoral and inter-regional coordination in order to uniformly implement the Master Plan for the Protection and Sustainable Development of the Landscape and Ecological Environment in the Cau River Basin (hereinafter referred to as the Cau River Master Plan) approved by the Prime Minister in accordance with Decision No. 174/2006 / QD-TTg dated 28 July 2006.		Cau River Master Plan; - Coordinating and solving inter-sectoral and inter-regional issues in the protection and sustainable development of the ecological environment and landscape of the Cau River basin; - Approving and directing the implementation of five-year and annual programs, projects and action plans, based on the principle of coordination among the provinces in the basin; - Proposing the concerned ministries and sectors to direct and guide the implementation of programs and projects for the realization of the Cau River Master Plan and other programs and projects on environmental protection in the river basin; - Proposing the development, modification and supplementation of mechanisms, policies and legal documents on environmental protection in order to effectively implement the Cau River Master Plan; - Directing the development of database and provision of environmental information in the implementation of the Cau River Master Plan; - Mobilizing domestic and international resources to support the implementation of the tasks under the Cau River Master Plan, as well as the environmental protection and sustainable development of the Cau River Basin; - Periodically inspecting and evaluating the implementation of the approved programs, projects		

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				and plans; - Proposing the Prime Minister to settle disputes and issues among localities in the exploitation and use of natural resources and the protection of the basin environment beyond the competence of the Committee; - Proposing amendments and supplements to the contents of the Cau River Master Plan. 2) Organizational Structure: Members of the Cau River Committee include: - Chairman of the Cau River Committee is the Chairman of the People's Committee of one among six provinces in the basin with 3 years for the first term and 2 years for the next terms; Chairman of the Cau River Committee for the first term is the Chairman of the Thai Nguyen People's Committee. - Vice Chairman is the Vice Minister of Natural Resources and Environment. - Members are leaders of the People's Committees of the provinces in the Cau River basin; Representatives from the Ministries of Planning and Investment, Agriculture and Rural Development, Finance, Science and Technology, Industry, Commerce, Construction, Transportation and the Government Office. 3) To assist the Cau River Committee is the Cau River Committee Office.		
32	The list of iner-provincial river	The list of iner-provincial river basins	April 2012.	- The list of iner-provincial rivers in 63 provinces and centrally-run cities includes 3,045 rivers and streams.	The director of the MONRE	

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	basins, Decision No. 341 / QD-BTNMT dated March 23, 2012. Minister of Natural Resources and Environment	is promulgated together with the Decision.		1) For mountainous areas (where river basins can be defined) the rivers include those of a length of 10 km or more. 2) For the deltas (where river basin boundaries cannot be defined), the rivers include: - Those having an average width of 50 m or more,; - Those having an average width of 25 m or more and a length of 10 km or more.	Office, director of the Legal Department, director of the Water Resource Management Department, heads of the concerned units under the Ministry, directors of Provincial Departments of Natural Resources and Environment; heads of agencies, organizations and individuals concerned.	
33	The list of inter-provincial river basins, Decision No. 1989 / QĐ-TTg dated 01/11/2010.	The list of inter-provincial river basins is promulgated together with the Decision.	01/11/2010	The inter-provincial rivers include: 1) Inter-provincial river in major river basins. 2) Independent Inter-provincial rivers	The ministers and heads of the ministerial-level agencies, heads of the agencies under the	

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	Prime Minister				Government, Chairmen of the People's Committees of the provinces and centrally-run cities	