

MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT

# NATIONAL WATER RESOURCES STRATEGY TOWARDS THE YEAR 2020



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**MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT**

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STRATEGY**

**TOWARDS THE YEAR 2020**



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## FOREWORD

Water is a natural resource, a vital substance for human life. Life is impossible without water. We use clean water for domestic consumption, health protection and sanitation. Water is crucial to agriculture, aquaculture, industry and other sectors of the economy. It is needed for hydropower and development of waterway transportation. Water is also important in maintaining the environment's integrity and sustainability. Water is precious but limited, and is a highly vulnerable resource. Besides its benefits, water can become a danger for human beings and for the environment.

In the past decades, there have been important achievements in the exploitation of water resources and in the prevention of adverse impacts caused by water, which have significantly contributed to the nation's socio-economic development. However, for a long time there has been insufficient awareness of the significance and importance of water for human life, health and environment. Poor water resources management and protection has resulted in many examples of serious degradation in the quality and quantity of our national water resources and in shortages of water in many regions. Today, these issues tend to be increasing in magnitude, and lavish and inefficient use of water - without planning and coordination between different industries and sectors - is still common practice.

Meanwhile, the demands for water from the all sectors of the economy are increasing; and the supply-demand balance is not guaranteed in some places and times. All of this places a significant burden on the drive towards national urbanisation and modernisation amid a surging population and the added complexity of global climate change. This situation highlights the need to reform management and protection of water resources to achieve sustainable development of the resource as well as to effectively protect against its adverse impacts.

Ensuring sustainable development within the context of increasing industrialization and modernization of the country, Prime Minister has signed the decision 81/2006/QĐ-TTg dated April 14<sup>th</sup> 2006 promulgating the **National Water Resources Strategy Towards the Year 2020**. This aims to strengthen the protection, exploitation, use and development of water resources, as well as the prevention and mitigation of adverse impacts caused by water.

The **National Water Resources Strategy Towards the Year 2020** is the first national document set out comprehensively viewpoint, guiding principles, objectives, missions and implementation measures regarding the protection, exploitation, use and development of water resources, as well as the prevention, and mitigation of adverse impacts caused by water together with 18 high priority projects for implementation of the National Water Resources Strategy for the period 2006-2010.

It is my great honour to present the **National Water Resources Strategy Towards the Year 2020** to all authority levels, sectors, national and international individuals and organisations.

*Hanoi, June 2006*

**MAI AI TRUC**  
Minister  
Ministry of Natural Resources and Environment

## **PART 1: WATER RESOURCES AND MAJOR CHALLENGES**

### **1. Water Resources**

#### **1.1. Rivers, lakes, ponds, pools, lagoons, and aquifers**

##### *a. Rivers*

Viet Nam possesses 2,372 rivers which are over 10 km long and 109 of these are main rivers. The total area of river basins is 1,167,000 km<sup>2</sup> with out-of-border river basin area at 835,422 km<sup>2</sup>, accounting for 72%.

If rivers are classified according to basin area, there are 13 rivers whose basin area is over 10,000 km<sup>2</sup>, of which 9 are major rivers (Red, Thai Binh, Bang Giang-Ky Cung, Ma, Ca, Vu Gia-Thu Bon, Ba, Đông Nai and Cuu Long) and 4 branch rivers (Đa, Lo, Se San, Sre Pok). 10 out of these 13 rivers are international rivers; and the out-of-border basin area is 3.3 times bigger than the within-border basin area. The basins of the nine major rivers account for almost 93% of the total basin area of the river network, and the within-border section represents approximately 77% of the total country area.

##### *b. Natural lakes, ponds, lagoons, pools and man-made water reservoirs*

Viet Nam has many natural lakes, ponds, lagoons and pools which are not sufficiently identified. A great many ponds and lakes have been filled up in the urbanisation and industrialisation process. It is estimated that the total area of ponds and lakes remaining is merely 150,000 ha. There are some major lakes such as Lak (with an area of about 10 km<sup>2</sup>), Ba Be (5 km<sup>2</sup>), Ho Tay (West Lake - 4.46 km<sup>2</sup>) and Bien Ho (2.2 km<sup>2</sup>). In the estuary areas of rivers in the Central region, there are some huge lagoons and pools such as Thi Nai pool, Tam Giang lagoon, Cau Hai lagoon, Xuan Dai swamp, etc. The biggest of these is Cau Hai lagoon (216 km<sup>2</sup>).

The total capacity of water reservoirs is about 26 billion m<sup>3</sup>, in which hydropower reservoirs account for around 19 billion m<sup>3</sup>. Among the thousands of water reservoirs, only six have the capacity of over one billion m<sup>3</sup> - namely Thac Ba (2,940 million m<sup>3</sup>); Hoa Binh (9,450 million m<sup>3</sup>); Tri An (2,760 million m<sup>3</sup>); Thac Mo (1,310 million m<sup>3</sup>); Yaly (1,040 million m<sup>3</sup>) and Dau Tieng (1,450 million m<sup>3</sup>). Most of the water reservoirs for irrigation have a capacity of less than 10 million m<sup>3</sup>.

##### *c. Underground aquifers*

Viet Nam has significant reserves of groundwater; however this water is not evenly distributed between aquifers. High yield aquifers include those in the unconsolidated sediments in the Northern and Southern deltas and fractured aquifers in the basalt artesian formations in the Central Highland. Medium yield aquifers include those in the unconsolidated sediments in the Central coastal areas and fractured aquifers in the limestone formations in the North-east and Northern mountainous areas. Other types of rocks and soils with lower water reserves occur in the mountainous and midland areas.

#### **1.2. Quantity of water**

##### *a. Rain water resource*

Viet Nam has a mean annual rainfall of 1,940 mm and the total volume of 640 billion cubic metres per year, which ranks it as one of the world's highest rainfall countries. However, rainfall is unevenly distributed in both space and time. Rain mostly occurs each year during 4-5 months in the rainy season, and accounts for 75-85% of the year's total volume of precipitation. The rest - approximately 15-25% - falls over 7-8 months of the dry season.

*b. Surface water resource*

The total annual surface water availability in our country's territory is around 830-840 billion cubic metres per year. Of this, 310-315 million cubic metres per year is generated within the territory of Viet Nam, and accounts for 37%; while the volume of water runoff into the country is about 520-525 million cubic metres per year, equal to 63%. Like rainwater, surface water resources are also unevenly distributed in different times of the year. It is the uneven distribution of rainwater and river flows that causes droughts and shortage of water in the dry season as well as floods and inundations in the rainy seasons. Heavy rain and huge surface flows lead to erosion of river basins and cause flash floods and landslides in many regions.

Water resource availability is different in different regions. Areas that have high demands for water, such as provinces in the North, Central North, Central South and Southern eastern areas, possess a limited reserve of water, taking around 39% of the nation's total volume. Meanwhile, the Cuu Long river delta has an abundance of water resources (accounting for 61%) but the area's demand in exploiting and using water accounts for a small proportion of the region's water reserves.

*c. Groundwater resource*

Surveying, prospecting and exploration of groundwater have not been widely conducted - only 15% of the nation's area has been covered and this has been concentrated in few key economic areas. The total underground reserves in the prospected and assessed areas, is 735 million m<sup>3</sup>/day at A-class; 813 million m<sup>3</sup>/day at B-class; 18,452 million m<sup>3</sup>/day at C<sub>1</sub> and C<sub>2</sub> class. The total potential availability of waters in all aquifers within the country, excluding sea island areas, is around 2,000 m<sup>3</sup>/s - equal to 63 billion cubic metres per year.

The biggest groundwater reserves are found in the Red River delta, the Cuu Long River delta and the Southern East regions. Slightly smaller reserves are located in the Central Highland. The smallest reserves are those in the mountainous areas in the Northern West, the Northern East and the Southern central coastal areas.

Monitoring of groundwater movements is very important to identify both water sources as well as to estimate the natural dynamic reserves. However, this activity has only been conducted in the Northern and Southern deltas and in the Central Highlands, with a low density monitoring network.

### **1.3. Quality of water**

In general, rain water is of good quality, except for some urban areas, industrial zones and their peripherals that have rain water with a fairly low pH (less than 5.5 pH).

Surface water in the upstream reaches of almost all rivers is still relatively good, except for some locally polluted areas. However, in the downstream reaches of major rivers, especially those flowing through industrial zones and large urban areas, the water quality gradually deteriorates. Currently, ponds and canals in urban areas have been turned into sewage storages and drains. In general, lakes and canals in urban areas are severely polluted.

Seriously polluted rivers stay that way for a long time, increasing the negative effects for the water supply for residents in many areas. The major industrial zones in Ho Chi Minh City, Dong Nai and Binh Duong provinces, are pouring millions of cubic metres of untreated or sub-standard treated wastewater into rivers causing severe pollution. Water in the Nhue-Đay river is so severely polluted that Phu Ly water supply plant has been frequently forced to stop its operation. The proportion of wastewater in the Cau river in the territory of Thai Nguyen city sometimes reaches up to 15% of its flow in the dry season which make it severely contaminated and unable to be used as a water supply source for residential purposes.

Overall, groundwater meets quality standards for usage, including for domestic purposes. However, due to excessive exploitation and ill-planned use, contamination, saline intrusion and water level declines are increasing. In some areas, the groundwater has been lowered to

unrecoverable levels. The most significant cases are around Hanoi, Ho Chi Minh City, the Central Highlands and other regions in the Cuu Long river delta.

#### **1.4. Flood, inundation, drought and water pollution**

##### *a. Flood and inundation*

Flood, inundation and drought are water related disasters which affect socio-economic development and human life.

Flood and inundation often occur over a wide area; and severe and extreme floods are occurring with higher frequency. Floods in rivers in the Central region are often more violent and are increasingly occurring over short periods of time with sudden rises and quick ebbs of river levels. Flash floods and mud and rock slides are occurring more often on larger scales and with greater levels of havoc.

Floods happen at different times in different regions, such as from June to October in the Northern area and to the north of Thanh Hoa province; September to November in the south of Thanh Hoa to Ninh Thuan province; and from July to October in the Southern area and the Central Highlands. In an effort to prevent and control floods, Viet Nam has built 5,700 km of river dykes, 3,000 km of sea dykes, 23,000 km of banks and thousands of under-dyke sluices, as well as hundreds of kilometres of jetties and quays to protect banks.

The Red -Thai Binh river dyke system can protect Hanoi at the projected flood level of 13.4 m and can protect the Red river delta at the projected level of 13.1 m in Hanoi and 7.21 m in Pha Lai. The jetty systems and related structures in the Cuu Long river delta can prevent and control early floods and seasonal floods. The Dyke system in the Ma and Ca rivers can prevent floods with the frequency from 2 to 2.5%. The sea dyke system can withstand storms of grade 9 and an average flood-tide equal to 10% frequency.

##### *b. Drought*

Droughts occur in the dry season when high temperatures lead to high demands for water. Dry seasons can last from 6 to 9 months depending on different regions. The river flow volumes in this season account for only 15 - 25% of the total annual flow. In dry seasons, there are three consecutive months in which the smallest flows occur in different regions at different times. The flows in this season are only 2-10%, while the month's smallest flows are only 1 - 3% of the annual flow. In the dry season, groundwater is the main source to supplement water from rivers, and in this season many rivers in the coastal areas, especially in the Southern centre, have no flow. In the 44 years from 1960 to 2004, droughts occurred in 32 of these years, accounting for 73%. Out of the 32 drought years, the droughts occurred from October to February in 9 years, from March to July in 12 years, and from July to August in 11 years. In recent years, droughts and water shortages in the dry season are a common phenomenon in most provinces nationwide, with increasingly large scale.

Droughts, in most cases, transforms a state of prosperity into a situation of unusable land – shortage of water – scattered population. Droughts caused by human beings also occur. Excessive deforestation, with consequences such as flood, inundation and increasing land erosion, leads to a reduction of the water reserve, thus increasing the likelihood of water shortages. Droughts, shortages of water and the level of its severity are also increased by soaring demands for water inappropriate with the real capacity of water sources, unplanned exploitation and use of water and lack of coordination among provinces and industries.

##### *c. Water source pollution*

The impacts of polluted water sources on society are becoming obvious and more serious, especially in the urbanisation and industrialisation process of the country. Polluted water sources become unusable water which causes “water scarcity” despite abundance of quantity. Using sub-standard quality water can adversely affect human health and increase illnesses, leading to a decline in working efficiency, soaring social spending on curing diseases, and

reduced product quality. In many regions, polluted water has become a threat to human life and production.

Industrial and municipal wastewater and household wastes are major agents that cause water pollution. With over 180 industrial and processing parks and economic centres, 12,259 health care centres, and 72,012 businesses, every day millions of cubic metres of untreated wastewater are poured into rivers. In many urban, high density residential and city areas, lakes, rivers and canals are turning into dumps for household, municipal and industrial wastes.

In rural area, beside pollution in rivers and lakes due to wastes from living, husbandry and production activities, there is an increasingly alarming contamination of water as a result of over use of pesticides and chemical fertilizers. Water pollution resulting from small scale but high density production establishments in craft villages is also serious. Wastewater generated from aquaculture is polluting surface and groundwater. Groundwater in some regions in the Red River delta shows signs of significant arsenic contamination.

### **1.5. Aquatic eco-systems**

Viet Nam has a very rich and diversified freshwater ecosystem with various kinds of flora and fauna - planktons, algae, plants, wetland weeds, invertebrates and fish. It is estimated that there are 20 types of freshwater seaweed; 1,402 algal species; 782 invertebrate animals; 547 types of fish; and 52 types of crab and some other endemic species (there are 60 endemic species among freshwater fish). However, in recent years, a number of structures have been built across rivers without any concern for the migration of fish or the required water levels for the well being and healthy development of aquatic ecosystems. Water exploitation on a large scale has changed the transportation of sediments and nutrients (food chain) and the hydrologic regimes in river systems. This has significantly changed river environments, the biodiversity of water species in rivers, as well as the natural characteristics of wetlands and river mouth deltas. As a result, a number of aquatic species, including those with high economic value, have become extinct and natural fishing outputs have largely decreased, particularly in the Red river and Cuu Long river deltas. Many species of flora and fauna already on the brink of extinction are becoming scarcer, some of which have been listed in the Red Book.

Brackish and sea water ecosystems in Viet Nam are highly diversified, mixed with low levels of endemic and regional differences. Currently, around 11,000 floating flora species and sea species have been identified, including: 537 floating flora; 667 seaweeds; 657 floating fauna; around 6,000 bottom species; 225 types of shrimp; 2,038 types of fish; and nearly 300 types of coral. Beside these, there are about 50 species of sea snakes and other poisonous algae.

Viet Nam possesses a huge number of freshwater, brackish and sea water swamps. Most of them are in the Red river and Cuu Long river deltas and along the 3,260 km long coastal zone. Although Viet Nam has many wetlands that meet "standards of internationally important wetlands", there is only one wetland however, the Xuan Thuy conservation site, which is listed in the Ramsar Convention.

The area of mangrove forest has been on a sharp decrease in recent years, especially when most coastal provinces are encouraging the aquaculture industry, mostly for shrimp cultivation. The biggest loss of mangrove forest area happens in the Cuu Long river delta, Quang Ninh and Hai Phong provinces. In the last five decades, 80% of the mangrove forest area has been lost.

### **1.6. Viet Nam water resources are not sustainable**

- Surface water that flows into the country's territory accounts for 63% of total volume and over 70% of river basin area.
- Global climate changes will lead to a decline in water resources. Recent researchers in Viet Nam forecast that the total volume of surface water in 2025, 2070 and 2100 will be around 96%; 91% and 86% respectively of today's quantity.



- The current average per capita surface water availability from the total volume of water in rivers within Viet Nam is about 3,840 cubic metres per year. If water inflows from outside the country are included, the average per capita river water availability is 10,240 cubic metres per year. Taking the population growth into consideration, by 2025 the average per capita surface water availability will be 2,830 cubic metres per year, and this figure can be 7,660 cubic metres per year if water flows from outside the country are taken into account. According to standards of the International Water Resources Association (IWRA), nations with average per capita water availability lower than 4,000 cubic metres per year are considered nations with inadequate water supply. Thus, if we only count the volume of surface water generated within the territory, Viet Nam is already a water deficient nation and will face many challenges with water resources in the near future.
- Water resources are not evenly distributed over different regions. Over 60% of river water is concentrated on the Cuu Long river delta (Mekong river basin). The remaining 40% is spread over nearly 80% of the nation's population and over 90% of production, trade and service activities. The provinces in the Southern east areas and the basin of Đông Nai-Sai Gon rivers have an average per capita water availability of only 2,900 cubic metres per year, equal to 28% of the nation's average.
- Water resources are unevenly distributed by different times of the year and between different years. The average volume of water in 3-5 months in the flood season makes up 70-80% of the total volume, while the 7-9 months of the dry season receives 20-30% of the year's water quantity. The variation of water volumes between different years is also high; whereas the required level of supply is 95% of the annual water amount, the amount of water is often only 70 - 75% of this.
- High economic growth has negative impacts on water resources. Pollution of surface water is increasing in both scope and scale. Groundwater in many urban areas and deltas has signs of pollution due to organic wastes with low decomposition and high levels of bacteria. Signs of degradation and the exhaustion of groundwater have become obvious and widespread.

## 2. Major Challenges

### 2.1. *Awareness of the importance of water resources in sustainable development*

For a long time, the role of water in the nation's sustainable development, human health and life were not fully appreciated; the value of water was not appreciated, and water was not considered a scarce natural resource, an economic good. The protection and management of water resources had not been given proper attention.

Enhancing public awareness and consciousness in protecting and preserving the resource is still limited. The poor result in this area hinders the participation of the entire society in the protection of water resources.

### 2.2. *Balance between protection and development of water resources and ensuring adequate supply of water and water security for socio-economic development*

#### a. *Shortage of water in the dry season is occurring with higher frequency and more severe impacts, especially in the Centre and Central Highlands*

According to statistics and the results of research on water balance, the potential reserves of water and the current infrastructure in many river basins cannot meet the demand for water in dry seasons. Water shortage symptoms in dry seasons will become even more critical with the surge in population and with rapid socio-economic development.

The construction of more infrastructure projects can ease the situation but it cannot solve the entire problem. It would be unfeasible and uneconomical, as well as environmentally costly, if we just focus on building more infrastructures to achieve a target of "no drought occurrences".

What really works is the combination of creating more supply and regulating the distribution of water, with economic and efficient use of the available water resources.

*b. Obsolete exploitation and use of infrastructure; wasteful and inefficient use of water has not been improved*

Obsolete infrastructure and inadequate management leads to waste and inefficient exploitation and use of water. The rate of water loss in some urban water supply systems in many cities is 40-50%. The designed supply capacity of irrigation systems is being progressively reduced. Many river-side hydraulic works (reservoirs and spillways) have been designed without proper consideration of the adequacy of downstream flows, leading to severe depletion of flows and increasing salt intrusion, thus narrowing the access to good water for the residents living in the lower reaches of rivers. Shortage of water in the dry seasons and the decline of downstream flows, together with increasing pollution, lead to rising competition among water users.

*c. Degradation and exhaustion of groundwater occurs in some areas and has not been controlled*

Inadequate and excessive exploitation of groundwater is causing serious problems in some regions. In some parts of Hanoi, Ho Chi Minh City and the Central Highlands, the groundwater level has been continuously lowering and will continue to do so in the future. The excessive drop in water levels increases the risk of land subsidence that threatens some construction sites and infrastructure. The decline of water levels as the result of over exploitation, uncontrolled wastewater discharge and polluted surface water are some of the factors that lead to the contamination and saline intrusion of groundwater in many regions.

*d. Lack of an integrated and multi-purpose approach in water exploitation and use.*

Some hydropower reservoirs are only operated to increase electricity output, with no consideration of the flows required to supply water for downstream needs and protecting the environment. Other reservoirs only focus on supplying irrigation water and do not consider other purposes. Most projects for water resources exploitation and use are designed to serve one particular purpose, with combined uses, if any, not planned.

*e. Population growth, economic development and poverty*

The population is increasing at approximately 1.12% per year. GDP growth is averaging 7.5-8% per year, in which the share of agriculture, forestry and aquaculture is 3.2% per year, industry and construction is 10-10.2% per year, service is 7.7-8.2% per year. This situation causes a larger demand for the exploitation and use of water, both qualitatively and quantitatively, at a time when the water reserve is limited, the potential development of water resources is constrained, and unsustainable factors tend to increase. Hunger eradication and poverty reduction is one of the important directions of the Party and State in the country's socio-economic development. In order to achieve sustainable social development, the poor must be given access to safe water and the management and development of water resources must change to respond to the fact that the proportion of poor households, according to the new standard, remains high at 25-26%.

*f. Accession to the World Trade Organisation (WTO)*

Viet Nam's accession to the World Trade Organisation (WTO) demands the efforts of domestic businesses to enhance their development capacity and production efficiency and also the state management agencies to speed up administrative reform so that Viet Nam's products can compete with their rivals throughout the world. In the water resources area, the legal framework should be amended and supplemented to ensure that enterprises are efficient and effective in their production and service provision, and ensure stable and high quality water services for the entire society.

### **2.3. Mitigation of adverse impacts caused by water**

#### *a. The prevention and control of the adverse impacts of water is not effective*

In recent years droughts and floods have occurred with an increasingly higher frequency and larger scale which has caused severe damage to the economy and people's lives, especially the poor. There have been important achievements in the prevention and control of natural disasters, however many provinces and river basins still lack standards for prevention and control of flood, lack remedies to reduce damage caused by flash floods and mud-and-rock slides, and have not been able to mitigate against floods and droughts in the Central and the South. Overall, the technical infrastructure, basic survey and forecasting and warning systems for disasters caused by water remain inadequate.

#### *b. Water sources continue to be polluted and degraded*

Improving the quality of the environment in general and of the water environment in particular is a special concern of the whole society. Over the past years, due to the strong focus on GDP growth and less attention to the protection of water resources, water sources have been severely polluted and degraded - especially in dry seasons and at those river sections that run through urban areas or industrial parks, densely populated areas, and small rivers in the delta. The consequence is an increasing shortage of water as its quality does not meet the standards for useable water. Despite the fact that the Government has issued a number of legal documents as well as having implemented many programs on the preservation of water resources, water source pollution is increasing. The supervision, warning and information systems for water quality management have not been properly developed.

### **2.4. Protection of aquatic ecosystems**

The focus on economic development and low awareness of the importance of aquatic ecosystems in the balance of nature have led to severe degradation of aquatic ecosystems, especially freshwater ecosystems, where many species are becoming rare, and some are on the brink of extinction.

The cause of this problem is the lack of attention to aspects such as the importance of ensuring environmental flows; the importance of water ecosystem protection when physical structures on rivers are built; and the importance of controlling the exploiting and use of water to sustainable levels. Polluted water can contaminate and damage the flora and fauna of rivers, lakes and wetlands; unplanned removal of mangrove forests and concrete lining of the banks of river and lakes is impacting on the flora cover in the basin and reducing the self-cleaning functions and natural processes of rivers. Inappropriate and uncontrolled exploitation of minerals and other land based activities in and along our rivers can seriously change the living environment for many species of flora and fauna.

### **2.5. Water resources management**

#### *a. The incomplete legal system for water resources management and the inadequate organisation and management capacity in water resources*

The legal system for water resources has not been fully implemented. The Law on Water Resources has not really penetrated into our lives, has not been effectively applied and is now not suitable to deal with new situations.

Water resources management activities are dispersed, poorly coordinated and overlapping between management and exploitation and use. A rational organisational framework has not been accomplished, management capacity remains weak and unable to meet requirements, and assistance from technical organisations is lacking. There are still overlaps and gaps in the assignation and decentralisation of the state management function in the water resources field. The cooperation amongst sectors, between central government and local authorities, and amongst provinces in comprehensive and multi-purpose exploitation and use of water resources



remains loose and inefficient. Sectors that exploit and use water resources too often only pay attention to their own benefits and have little concern about the benefits of others.

*b. Lack of coordination between the development of water resources and the efficient, multi-purpose allocation and use of water resources*

There has not been effective coordination in the allocation and use of water resources in water projects, even in existing multi-purpose projects. Many infrastructure works for water exploitation and use have been built over past years; however, few of them really work for multiple purposes. In fact it is common practice that each project is separately undertaken with a lack of coordination between exploiting and using water, so that the efficiency of these works is very low.

This means that water resources will continue to decline, that increasing disputes over water will lead to conflict, and poverty will be prolonged. The water potential of our scarce resources is not being fully and effectively exploited.

*c. Lack of mechanisms and policies, especially economic and financial policies in water resources*

The perception that water is an economic good has not been sufficiently incorporated into Viet Nam's current policy and mechanism, especially in economic and financial policies, to create internal forces and incentives for sustainable development, to ensure reasonable exploitation and sufficient supply of water for society, as well as to encourage efficient and effective uses of water to preserve water resources.

The sub-law documents of the Law on Water Resources that provide guidance for the regulation of the rights and financial responsibilities of people and organisations exploiting water resources and supplying and using water services, are not adequate and comprehensive. The State budget continues to meet virtually all capital investment and operational costs of drainage and water supply projects.

*d. Inadequate and inaccurate information and data on water resources and constraints on information sharing*

The current extent and condition of national water resources has not been fully assessed, and the data on water resources is not reliable and comprehensive. The collection, management and archive of information on water resources are still dispersed. Data in different agencies is inconsistent and is not exchanged among state agencies. Data and necessary information on water resources, and changes in water resources are the basis for making plans for socio-economic development in provinces and territories, but are not adequate and are not regularly updated. Information management is not efficient and there is no national databank for water resources. Systems for reporting and providing data and information on water resources and on water exploitation and use of industries, sectors, organisations and individuals are not well focused.

*e. A suitable model for organisation and content of integrated river basin management has not been established*

Integrated river basin management is an important part of water resources management. However, the model for management has not been completed either institutionally or in implementation steps. As a result, current water resources use is still uncontrolled with low efficiency and water pollution persists.

All sectors, industries and provinces exploit water for their development and have brought about many achievements. However, due to the lack of proper integrated planning for river basins as a foundation for the coordination among industries and provinces in protecting, developing, exploiting and using water resources as a unifying mechanism, many issues arise that need the cooperation of different sectors and provinces to solve.

Integrated river basin management does not only cover quantity and quality of water resources but also aspects of the environment and ecology. Water resources management cannot be isolated from protecting the environment and the management of other resources. Integrated river basin management must ensure self-control and self-determination, as well as guiding local decision making in the river basin in dealing with water-related benefits, between the upstream and downstream regions, between organisations and individuals living in the basin, in accordance with rules and regulations issued by state authorities.

## **PART 2: VIEWPOINT, GUIDING PRINCIPLES AND OBJECTIVES OF THE STRATEGY**

### **1. Viewpoint and Guiding Principles**

#### **1.1. Viewpoint**

- a. Water resources are a major component of people's livelihood, and are an important key factor to ensure that the strategic planning, and plan objectives, for socio-economic sustainable development can be met, and to ensure national defence and national security.
- b. Water resources belong to the entire people and are managed in a uniform manner by the State. Organisations and individuals have rights of water resource exploitation and use for living and for meeting their production demands. At the same time they have obligations for protection and sustainable development of water resources, and the prevention, control and remedy of the adverse impacts caused by water.
- c. Management of water resources should be implemented in an integrated and uniform manner on a river basin basis. Water use components should be aligned with the transformation of economic structures in the period of enhancement of national industrialisation and modernisation.
- d. Water resources must be developed, exploited and used in a sustainable, economically efficient, integrated and multi-purpose manner. Water in production should be considered as an economic good; subsidised systems should be abolished; and activities in water resources protection and development and in water service provision should be performed with the participation of all social and economic sectors.
- e. Cooperation, sharing benefits, ensuring fairness and appropriateness in the exploitation, use, protection, and development of water resources, and the prevention and control of the adverse impacts caused by water, for international rivers and river basins shall be based on principles that ensure national sovereignty, territorial integrity and national interests.

#### **1.2. Guiding principles**

- a. The National Water Resources Strategy must be implemented in a comprehensive and step-by-step manner and with concentration on the main focuses. Implementation of the Strategy is both urgent and of a long-term nature, and should contribute significantly to industrialisation and modernisation of the country from now up to year 2020 and beyond.
- b. The Management, protection and development of water resources must reflect the integrated nature of river basins; and not be separated by administrative boundaries. As well, the natural processes of aquatic and ecological systems must also be integrated, especially those of precious and scarce species of high economic and scientific values; preserving the diversity and uniqueness of Viet Nam's aquatic ecological systems.
- c. The enforcement and effectiveness of the State management of water resources must be strengthened. The obligations and responsibilities of organisations and individuals in the protection, exploitation and use of water resources, and the prevention, control and remedy of adverse impacts caused by water must be enhanced.
- d. Socio-economic development should be based on the real potential of the water source, and its protection and development. Water resources exploitation and use should be made in an integrated and multi-purpose manner, harmoniously incorporating interests of individual sectors, localities and communities in a global inter-relationship between upstream and downstream regions and between different sectors, to ensure balanced, focused, high socio-economic efficiencies and environmental protection.



- e. Investments in protection and in the sustainable development of water resources are investments for our future, bringing socio-economic benefits both in the short and longer terms. The State shall ensure the necessary resources and at the same time with appropriate policies, mobilise contributions of businesses and communities and extend international cooperation for enhancing investment in the protection and sustainable development of water resources and in the prevention, control and remedy of water caused adverse impacts.

## 2. Objectives

### 2.1. General objective

Protection, efficient exploitation and sustainable development of water resources on the basis of integrated and unified water resources management in order to meet water demands for people's living and socio-economic development; while ensuring national defence and national security; environmental protection in the period of enhancement of the country's industrialisation and modernisation; proactive prevention, control and to the largest possible extent, mitigation of adverse impacts caused by water; gradual establishment of multi-sector water resources economic industries fitting into the socialist-oriented market economy; and improving effective international cooperation to ensure harmonious and fair interests of the countries who share the water resources with Viet Nam.

### 2.2. Specific objectives

#### a. Protection of water resources

- 1) Restoration of the rivers, reservoirs, aquifers and wetlands, which have been seriously polluted, degraded and depleted; while priority shall be given to those located in the Nhue-Day, the Cau, the Đong Nai-Sai Gon and the Huong river basins.
- 2) Ensuring the provision of ecological flows for maintaining aquatic eco-systems consistence with the plans approved by authorities, while focusing on the rivers with significant reservoirs and dams.
- 3) Protecting the integrity of, and ensuring the efficient uses of, the wetlands and estuaries of the main rivers and important aquifers.
- 4) The elimination of unlawful and unlicensed exploration, exploitation and uses of water resources, and of the discharge of wastewater into water sources.
- 5) Putting water source pollution under control. Elimination of the excessive use of toxic chemicals in agriculture and aquaculture production which cause water pollution and biodiversity degradation

#### b. Exploitation and use of water resources

- 1) The efficient and economic exploitation and use of water resources. Ensuring that water extraction shall not exceed the extractable limits for rivers and the extractable available water for aquifers; and that due attention is paid to the main rivers of major basins and important aquifers of the key economic regions.
- 2) Ensuring the appropriate and fair allocation and sharing of water resources among sectors, industries and localities, while priority is given to domestic use, uses of high economic benefits and ensuring environmental flows. In the short term to the year 2010, water allocation should ensure efficient exploitation of 10.5 million hectares of annual and perennial crops in order to attain the food security production targets of 39 - 40 million tonnes of equivalent rice per year; ensure a total installed capacity of hydropower plants in the range of 13,000 - 15,000 MW; ensure aquaculture areas of approximate 0.64 million hectares in fresh water and 0.8 million hectares in brackish water; and ensure that water supply for industrial use shall be increased by 70 - 80% of the year 2000 level.

- 3) Ensuring integrated socio-economic and environmental efficiencies of the system of reservoirs and dams in both the wet and dry seasons, with proper attention to the Red - Thai Binh, the Đong Nai – Sai Gon river basins and the main river basins in Central and Highlands regions.
- 4) Ensuring consistency and uniformity between plans for socio-economic development, for land use, for forestry development, for national defence and national security, with plans for exploitation and use of water resources, and for river basin plans at national as well as regional and local levels.
- 5) The formation of a water service market with participation of various economic sectors; and a market for the transfer and exchange of water resources licences.

*c. Water resources development*

- 1) Ensuring the safety of water reservoirs, particularly for those of larger capacity and those reservoirs with densely populated downstream areas or important political, economical, cultural, national defence and security facilities.
- 2) Ensuring the construction of multi-purpose water projects and groundwater supplementation projects, with priority given to those areas suffering water scarcity.
- 3) Ensuring integration occurs between planning for sustainable water resources development and with plans for protection, exploitation and use of water resources and with prevention and control of adverse impacts caused by water, and with the plans for forest protection and development, for land uses, for socio-economic development and for national defence and security.
- 4) Applying effective remedies for fighting against droughts and water shortages in dry seasons in South Central, Central Highlands, Cuu Long river delta, Sea Islands and border areas.

*d. Mitigation of adverse impacts caused by water*

- 1) Minimising to the largest possible extent, the losses of people and properties caused by floods, flash floods, mud-and-rock slides, with special attention being paid to areas where these kinds of events occur frequent.
- 2) Ensuring the highest level of safety for the Red - Thai Binh river dyke system; improving flood-control capacities of the dyke systems in the Central coastal, the Central Highlands and the Southern East regions; strengthening the sea-dyke systems for protecting coastal residential areas as well as contributing to socio-economic development and ensuring national defence and security in these regions; improving flash flood monitoring and warning capability in mountainous provinces aiming at mitigating losses caused by such floods.
- 3) Formation of flood-safe areas for low-lying areas, ensuring the safety and adaptability of conditions for residents in low-lying areas in the Cuu Long river delta. By 2010, measures should be capable of controlling floods of magnitudes equivalent to those of 1961 for the major rivers and to that of 2000 for inland fields; and continuous improvement of the flood control capacity in the following years.
- 4) Ensuring that all development plans, construction standards and norms for socio-economic infrastructures and residential areas in low-lying areas are in line with flood-control criteria for the area.

*e. Enhancing regulatory and institutional capacity in water resources management*

- 1) Achieving compatibility, and comprehensiveness in the legal system of policies, laws, standards and norms in the field of water resources management, and developing water services in order to efficiently provide water resources and create an engine for the sustainable development of multi-sector water economic industries fitting into the socialist-oriented market economy.

- 2) Systematic formation of state management institutional arrangements to make them effective and operational at all administrative levels. Encouraging the formation and extensive development of service organisations in the field of water-related consultancy, science and technology and water supply; separating and clarifying the functions and duties of state water resources management organisations from those of organisations operating facilities for the extraction and use of water resources or providing water services.
- 3) Development of water resources knowledge, science and technology to achieve an advanced level comparable to Asian standards, with some aspects at advanced world-level standards.



## **PART 3: MAJOR MISSIONS AND MAIN IMPLEMENTATION MEASURES**

### **1. Major Missions**

#### **1.1. *Strengthening protection of water resources and aquatic eco-systems***

- a) The classification of surface water quality and the determination of water quality criteria for river basins, with priority being given to the Red - Thai Binh, the Đong Nai – Sai Gon, the Cuu Long and the Vu Gia – Thu Bon river basins.
- b) The classification of groundwater quality and the determination of water quality criteria for all aquifers, firstly for those in key economic regions.
- c) Establishing and implementing plans for the protection of water resources and aquatic eco-systems, ensuring that water quality meets various demands for water, especially for residential use.
- d) Comprehensive implementation of measures for the protection and control of surface and groundwater pollution; ensuring the minimal ecological flows of rivers; the prevention and control of excessive water resources exploitation causing degradation and depletion of water sources; and ensuring the integrity of aquatic eco-systems, wetlands, estuaries and coastal areas.
- e) Establishment and implementation of plans for the protection and recovery of water quality for rivers and aquifers to meet the water quality criteria for socio-economic development and national defence and security objectives for each period of development.
- f) Strict and effective control of groundwater exploration activities; limiting and the progressive prohibition of applications of toxic and polluting chemicals in agricultural production and aquaculture.

#### **1.2. *Ensuring sustainability and effectiveness in exploitation and use of water resources***

- a) Establishment of river basin plans and water resources plans for all regions and management of the implementation of the plans. Implementation of the water resources of river basins, in such a manner as to ensure the appropriate and fair allocation and sharing of water resources among sectors, industries and localities. Priority is to be given to domestic use, to uses in urban, industrial and concentrated economic zones and industrial uses of high economic benefits and ensuring appropriate irrigation for cultivated crops.
- b) Materialising the policy of priority for domestic water use in management of water supply and in the building and operation of water resources exploitation and use facilities.
- c) Determination of the water availability to meet demands for domestic use supply of all rivers, water reservoirs and aquifers, with a focus on the Central, Central Highlands and other regions of water shortage.
- d) Enhancing the controls of water resources exploitation and uses. Strengthening coordination in the building and operation of integrated and multipurpose water exploitation facilities with priority being given to domestic use, securing water to meet demands for drought control, power generation and navigation, and realignment of the operation regulations of major reservoirs.
- e) Combining efficient surface and groundwater exploitation and use; protecting and preserving groundwater resources; minimising groundwater exploitation wherever surface water can be exploited.

- f) Management of water demands, whereby incentives should be given for water saving and recycling. Establishment of a legal framework for the provision of water service and for transfer and exchange of water resources licences.

**1.3. Sustainable development of water resources**

- a) Enhancing the protection and development of forests, with the first priority given to watershed forests. Maintaining and protecting water generation sources of rivers and reservoirs.
- b) Increasing the structural safety and maximising the storage capacity of existing reservoirs.
- c) Enhancing water resource development planning for river basins and ensuring integration of these with land use plans, forest development plans and socio-economic development plans, for the whole country and for each region and locality.
- d) Development of water resources as a basis for enhancing the value of water resources by the construction of dams and water reservoirs so as to increase water flow regulation capacity, with priority given to development of integrated and multipurpose water extraction and use facilities, water storage projects in South Central region and Central Highlands, and salinity control projects for the Cuu Long river delta.
- e) Strengthening measures for artificial recharge of groundwater sources with the focus on areas of water shortage. Implementing water transfers between river basins to alleviate water shortages.

**1.4. Mitigation of adverse impacts caused by water**

- a) Upgrading, modernising and completion of flood monitoring, warning and forecast systems; developing warning system for flash floods and mud-and-rock slides, with priority for mountainous areas in the North and Central regions.
- b) Defining flood and inundated areas in all river basins, focusing on areas with the highest frequency of occurrence of natural disasters.
- c) Establishment and implementation of plans for the prevention, control and mitigation of adverse impacts caused by water for major river basins and Central coastal rivers, while a harmonious combination of structural and non-structural measures are to be applied to ensure safety to human life and limitation of losses to the minimal extent possible.
- d) Enhancing scientific research and comprehensive assessment of both the positive and negative aspects of flooding; determining the best way to make use of the benefits provided by flooding. Elaboration of flood control criteria for inundated areas.
- e) Continuously reviewing development plans and building codes for the construction of infrastructure in areas subject to inundation to ensure they are consistent with the area flood control criteria.
- f) Improving quality of drought forecasting and carrying out drought and water shortage classification for all river basins; establishment of drought occurrence maps for all areas of water shortage with a focus on the most affected areas in the Central coasts, Central Highlands and Northern mountainous regions.
- g) Establishment and completion of water quality monitoring networks; establishing a communication network on water quality and water resource pollution accidents, for all river basins, focusing on the Red – Thai Binh, Vu Gia - Thu Bon, Dong Nai – Sai Gon, Cuu Long river basins.

**1.5. Improvement of institutional arrangements**

- a) Review, amendment and supplementation of the Law on Water Resources and other related legal documents to satisfy the requirements of integrated and uniform water resources

management; transforming water management from a subsidised, supply-focused approach into a demand-focused approach that recognises the commercial nature of water service products; putting in place specific legal tools to regulate the water resource elements such as river beds and banks, alluvial floodplain lands and estuary wetlands; implementation of river basin-based management for the protection of aquatic eco-systems and wetlands.

- b) Enhancing the use of economic tools in preventing and handling water resources pollution, in ensuring efficient water resources exploitation and use, as well as in the provision and use of water services.
- c) Promulgating fees, duties and tax policies and regulations on unit pricing and cost recovery norms in the field of water resources. To ensure that all water service providers are operating on the basis of financial self-sufficiency and are proactively responsible for O&M costs of their water service infrastructure. Encouraging communities, organisations and individuals to participate in the provision of water services - while ensuring integrated, multi-purpose and efficient water use, and ensuring water security and environmental protection.
- d) Enhancing administration reforms in the field of water resources with a focus on amendments and supplementation of functions and duties of state water resources management agencies from the central government level to localities, and ensuring clear assignment of duties and powers to the concerned ministries and sectors as well as improving the decentralisation process to assign to localities more functions and duties in the field of water resources management.

**1.6. *Strengthening capacities in basic survey, scientific research and technology development***

- a) Enhancing basic surveys and assessments of water quantity and quality and the current status of water resources exploitation, use, pollution and other factors causing impacts on water resources.
- b) Promoting water management related research and developing technologies and applications of scientific and technical advances in management, protection, exploitation and use of water resources; prevention, control and mitigation of adverse impacts caused by water.
- c) Progressive application of automation and digital technologies in the monitoring and supervision of water resources exploitation, their use and the discharge of wastewater into water sources.
- d) Carrying out periodical inventories of water resources, an inventory of current water resources exploitation and use, and discharge of wastewater into water sources. Enhancing the development and efficient use of national water resources information and database systems.

**2. Major Implementation Measures**

**2.1. *Communication, education, public awareness improvement and encouragement of community participation***

Developing and implementing communication campaigns with contents and forms appropriate to each group in society; promoting the role of the mass media in improving public awareness of the policies and laws on water resources; and organising quizzes and art contests for improving public knowledge of water and life.

Mobilising public participation in the protection of water resources, firstly, in large cities, densely populated areas and heavily polluted water resource areas. There must be suitable mechanism to facilitate public involvement in and providing active support to monitoring and



protection of water resources, as well as fighting against and preventing activities causing pollution to water bodies. Incentives and awards should be given to communities and to individuals demonstrating good practice in the protection of water resources, and then building upon these good examples.

Enhancing and encouraging the participation of community and social organisations in the establishment, monitoring and implementation of river basin plans and of water resources projects.

Integrating water resources education concepts into the national education curricula.

## **2.2. *Strengthening legislation***

Improving effectiveness in the enforcement of laws on water resources. In addition to education on compliance with laws, the monitoring activities on water resources law enforcement should be strengthened.

Establishment of a specific water resources inspection force; carrying out periodic and unannounced inspections and resolute handling of the acts violating laws on water resources.

Giving prominence to the role of the Viet Nam Fatherland Front, and other mass and social organisations in communication campaigns for involving the public in the implementation and supervision of the enforcement of the law on water resources. Integrating the protection of water resources into action agendas of communal groups, villages, residential wards, etc.

## **2.3. *Increasing public investment and enhancing community participation in the provision of water services***

Increasing investment and efficient spending of state budget allocations for: basic survey, assessment and forecasting of developments in water resources quantity and quality; river basin planning and planning for water resources exploitation, use and protection; restoration of polluted, degraded and depleted water sources; and scientific and technological research and development (application) in the field of water resources.

Making full and efficient use of the Official Development Assistance (ODA) financing available for water resources management. Prevention and control of losses in collection of water resources royalties, taxes and wastewater discharge fees. Mobilisation of various investment sources from society and the community for water resources protection.

Urgent elaboration of policies and mechanisms for eliminating subsidised regimes in water supply services and for ensuring full cost-and-benefit pricing of water supply services. Implementation of benefit and financial burden sharing among the organisations and individuals who exploit and use water resources in major and important river basins, on the basis of integrated socio-economic and environmental benefits generating from integrated and multipurpose water exploitation and use projects.

## **2.4. *Development of human resources, science and technology***

Enhancing capacities for the development of human resources for water resources management, protection, exploitation and use, and the prevention and control of adverse impacts caused by water. Special attention should be made to the development of highly skilled professional human resources.

Continuously developing and improving, both institutionally and in operational mechanisms, the network of research organisations, training bodies and facilities, including centres, institutes, universities and colleges in the field of water resources.

Enhancing scientific and technical research and studies and a transfer of technologies in the field of: water resources protection, exploitation, economic use; measures and solutions for prevention and control of adverse impacts caused by water; wastewater treatment technologies; solutions for artificial recharge of groundwater; effective solutions for the combined use of

surface and groundwater; and developing and improving models for integrated river basin management.

### **2.5. *Extension and improvement of international cooperation***

Diversifying international cooperation and enhancing regional and international integration on water resources management through multi-lateral and bilateral cooperation programs and projects in compliance with international conventions to which Viet Nam is a party or signatory.

Enhancing international cooperation with the member countries of the Mekong River Commission in the framework of the Mekong River Cooperation Treaty (1995). Strengthening cooperation on water resources with the Greater Mekong Sub-region countries.

Taking the initiative in cooperation regarding the Red river basin and other river basins whose sources are shared with neighbouring countries aiming at the formation of agreements and conventions for international and cross-border river controls and water resources extraction and protection.

Strengthening the cooperation with international organisations such as UNDP, ADB, WB, etc., and with governmental and non-governmental organisations to make full use of international support for the water resources sector, with particular attention to cooperation in education, training and studies in water resources.

Active participation in regional and international forums on water resources, including activities such as information exchange, experience sharing, seminars, conventions and other forms of cooperation in water resources.

### **2.6. *Renovation of financial mechanisms***

The State Budget investments in the field of water resources management shall focus on: strengthening management capacities for water resources; the protection, development and the prevention and control of adverse impacts caused by water; and the implementation of basic survey projects, of river basin planning projects and of local and regional water resources planning projects.

Financial institutions are encouraged to take part in the provisions of financing and financial services for the cause of water resources protection, development and the prevention and control of adverse impacts caused by water.

The State encourages and protects eligible interests of the organisations and individuals investing in the field of water resources. There should be incentives for mobilising enterprises and businesses in all economic sectors making investments in water resources protection, exploitation, efficient use and sustainable development, as well as in prevention and control of adverse impacts caused by water.

Organisations and individuals who are beneficiaries from the services of water resources protection, exploitation, use, prevention and control of adverse impacts caused by water shall be responsible for making adequate payments to the service providers.

Increasing ODA financing rates for projects on water resources protection, prevention and control of adverse impacts caused by water. Foreign Direct Investment (FDI) projects in the field of water resources exploitation and use, development of water resources protection industry, is fully supported and encouraged.

Estimated expenditures for implementing the tasks in the field of water resources of concerned ministries, sectors and localities shall be integrated in the State Budget Estimates in accordance with the Law on State Budgets.

## **PART 4**

### **STRATEGY IMPLEMENTATION ARRANGEMENTS**

1. The National Water Resources Council shall be responsible for advising Government and the Prime Minister on important decisions on water resources; decisions on ensuring the proper coordination of actions and activities of concerned ministries, sectors and localities in the implementation of this National Water Resources Strategy towards the Year 2020, in an effective manner.
2. The Ministry of Natural Resources and Environment has the following duties:
  - Organising and directing the implementation of the measures and objectives of this Strategy; providing the concerned ministries, sectors and localities with guidance and supervision in development and implementation of programmes, projects and plans in line with the objectives and measures set forth in this Strategy within the framework of the functions, duties and powers assigned to them.
  - Directing reviews, inventories and assessments which are to be carried out and directing and coordinating with the concerned ministries, sectors and localities in the implementation of the projects of high priority (specified in Annex I to this Decision), which is also the base for setting up specific programmes, defining specific priorities, and clearly determining tasks and duties of the concerned ministries, sectors and localities.
  - Taking the lead and coordinating with the concerned ministries, sectors, localities and authorities in carrying out monitoring and inspection of the Strategy implementation; carrying out periodic (annual, five-year, etc.) reviews and assessments of the Strategy implementation and drawing experiences and lessons for improvements and/or modifications in next period; submitting for the Prime Minister's approval proposals for decisions regarding the amendment and/or modification of objectives and contents of the Strategy as required.
3. The Ministry of Planning and Investment and the Ministry of Finance take the lead and coordinate with the Ministry of Natural Resources and Environment and other concerned ministries and sectors in allocating and balancing annual investment budgets in accordance with the Law on State Budgets for effectively achieving the Strategy objectives.
4. Ministries, sectors and localities, as per their assigned functions and duties, are responsible for the implementation of the high priority projects of this Strategy (listed in Annex I to this Decision) and the objectives and measures of the Strategy which concern their respective organisations and/or localities.

**Annex:****List of High Priority Projects for Implementation of the National Water Resources Strategy in the Period 2006-2010**

*(Issued in conjunction with Prime Minister's  
Decision No. 81/2006/QĐ-TTg dated April 14<sup>th</sup>, 2006)*

1. **Inventory, assessment of the national water resources and establishment of national water resources information and data system**  
**Implementing agency:** Ministry of Natural Resources and Environment;  
**Participating agencies:** Ministry of Agriculture and Rural Development, Ministry of Industry, Ministry of Construction; concerned ministries and sectors and people's committees of provinces, cities under Central Government management (hereinafter referred to as provincial people's committees).
2. **Water resources sharing with priority given to domestic uses and securing water for power generation of key hydropower plants in cases of drought occurrence**  
**Implementing agency:** Ministry of Natural Resources and Environment;  
**Participating agencies:** Ministry of Industry, Ministry of Agriculture and Rural Development, Ministry of Construction; concerned ministries, sectors and provincial people's committees.
3. **Water allocation and regulation for water security for provinces of severe water shortage**  
**Implementing agency:** Ministry of Natural Resources and Environment;  
**Participating agencies:** Ministry of Agriculture and Rural Development, people's committees of the Ninh Thuan, Binh Thuan, Central Highlands provinces.
4. **Restructuring cropping patterns for a more economical and efficient water use**  
**Implementing agency:** Ministry of Agriculture and Rural Development;  
**Participating agencies:** Provincial people's committees.
5. **Development of inter-reservoirs operational rules for the major and important river basins**  
**Implementing agency:** Ministry of Natural Resources and Environment;  
**Participating agencies:** Ministry of Agriculture and Rural Development, Ministry of Industry, Ministry of Transport, concerned ministries, sectors and provincial people's committees.
6. **Protection and preservation of groundwater in large cities**  
**Implementing agency:** Ministry of Natural Resources and Environment;  
**Participating agencies:** Ministry of Construction, concerned provincial people's committees.
7. **Implementation of community participation in water service provision, development of multi-sectoral water industry in accordance with a socialist-oriented market economy.**  
**Implementing agency:** Ministry of Natural Resources and Environment;  
**Participating agencies:** concerned ministries, sectors and provincial people's committees
8. **Protection of rare and precious aquatic species at high risk of extinction**



- Implementing agency:** Ministry of Fisheries;
- Participating agencies:** Ministry of Natural Resources and Environment; concerned ministries, sectors and provincial people's committees.
9. **Determining and ensuring environmental flows, maintaining aquatic eco-systems for irrigation and hydropower reservoirs and dams.**
- Implementing agency:** Ministry of Natural Resources and Environment;
- Participating agencies:** Ministry of Industry, Ministry of Agriculture and Rural Development; concerned ministries, sectors and provincial people's committees.
10. **Protecting and rehabilitating protective forests of major reservoir watersheds**
- Implementing agency:** Ministry of Agriculture and Rural Development;
- Participating agencies:** Concerned ministries, sectors and provincial people's committees.
11. **Developing management mechanism of irrigation and hydropower reservoirs for economy and tourism development, environment protection as well as improvement of riparian living standard**
- Implementing agency:** Ministry of Natural Resources and Environment;
- Participating agencies:** Ministry of Industry, Ministry of Agriculture and Rural Development; concerned ministries, sectors and provincial people's committees.
12. **Bilateral cooperation with neighbouring countries in water resources basic survey, information and data sharing, protection, exploitation and uses of transboundary water sources**
- Implementing agency:** Ministry of Natural Resources and Environment;
- Participating agencies:** Ministry of Agriculture and Rural Development; concerned ministries, sectors and provincial people's committees.
13. **Rehabilitating, upgrading and modernising sea and estuaries dyke systems**
- Implementing agency:** Ministry of Agriculture and Rural Development;
- Participating agencies:** concerned ministries, sectors and provincial people's committees.
14. **Revising and amending the Law on Water Resources**
- Implementing agency:** Ministry of Natural Resources and Environment;
- Participating agencies:** concerned ministries, sectors
15. **Developing economic tools for water resources management**
- Implementing agency:** Ministry of Finance;
- Participating agencies:** Ministry of Natural Resources and Environment; concerned ministries, sectors and provincial people's committees.
16. **Communication and improvement of public awareness on water resources**
- Implementing agency:** Ministry of Culture and Information
- Participating agencies:** Viet Nam Television, Voice of Viet Nam Radio, Ministry of Natural Resources and Environment.
17. **Developing curricula on water resources at different education levels**
- Implementing agency:** Ministry of Education and Training;
- Participating Agency:** Ministry of Natural Resources and Environment.

**18. All nation participation in water resources protection**

**Implementing Agency:** Central Committee of Viet Nam Fatherland Front

**Participating agencies:** Ministry of Natural Resources and Environment, political, social and mass organisations.