

## 2.13 Viet Nam

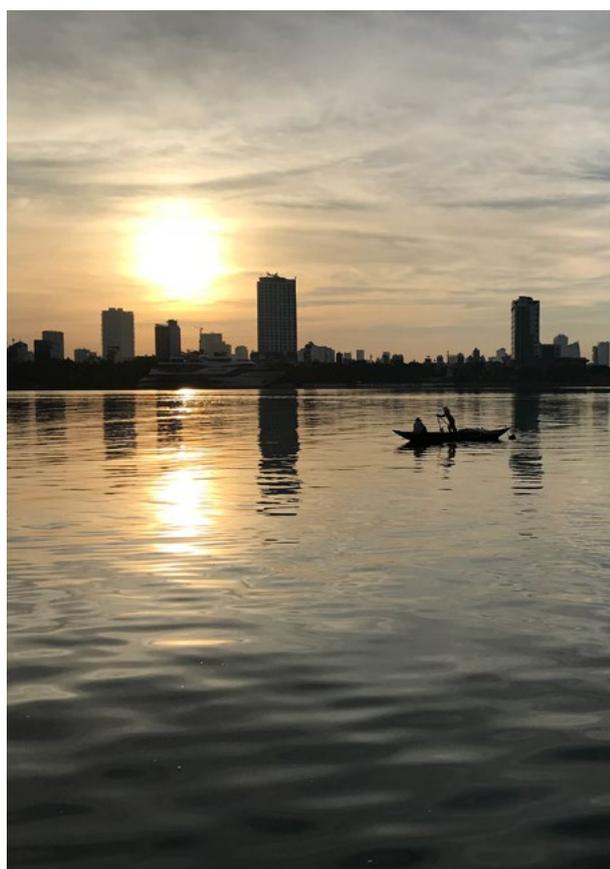


### 1 | Country Information

**Table 2.13.1** Basic indicators

Land Area (km <sup>2</sup> )	310,070 (2016)	
Total Population	96.46 million (2019)*	
GDP (current USD)	261.9 billion (2019)*	
GDP per capita (current USD)	2,715 (2019)*	
Average Precipitation (mm/year)	1,950 (2017)**	
Total Renewable Water Resources (km <sup>3</sup> )	884 (2017)	
Total Annual Freshwater Withdrawals (billion m <sup>3</sup> )	82 (2014)	
Annual Freshwater Withdrawals by Sector	Agriculture	80.6% (2018)
	Industry	15.0% (2018)
	Services	1.7% (2018)
	Municipal (including domestic)	2.7% (2014)

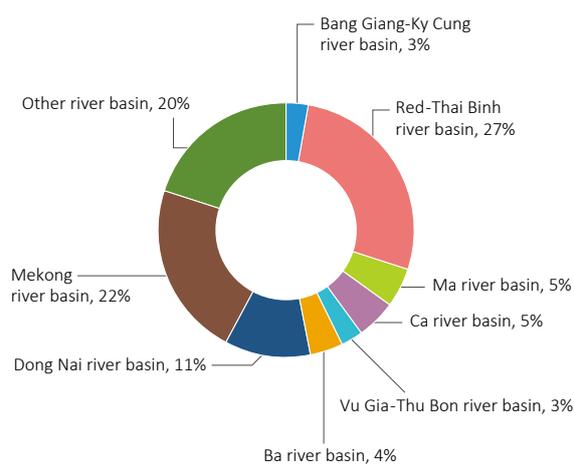
(Source: \*World Bank 2020, \*\*2030 WRG 2017)



**Figure 2.13.1** Han River in Da Nang, Viet Nam

### 2 | State of Water Resources

Viet Nam has a large river and canal network, including over 3,450 rivers and streams with lengths exceeding 10 km. There are 13 large rivers and 310 inter-provincial rivers belonging to eight large river basins, with an area of about 270,000 km<sup>2</sup> (accounting for 80% of the total area of the river basin). Of these, many rivers cross borders with other countries, such as the Mekong river systems (Mekong River), Red River, Bang Giang - Ky Cung River, Ma River, Ca River, and Dong Nai River. As a result, the country has an abundance of surface water resources. The total volume of the country's river basins is about 830–840 km<sup>3</sup>/year, but only about 310 km<sup>3</sup> (37%) is within the country, while the remaining 63% is generated from neighboring countries (MONRE 2018).



**Figure 2.13.2** River basin area as percentage of total area  
(Source: MONRE 2018)

Although Viet Nam enjoys abundant surface water resources in general, they are unevenly distributed across the country due partly to uneven rainfall distribution. The total volume of water being exploited is about 80.6 billion m<sup>3</sup> (approx. 10% of total national water volume), of which over 80% is used for agricultural purposes (about 65 billion m<sup>3</sup> /year). Water is also used for energy production, daily life, aquaculture and industrial production, tourism and services. There is a trend of rising water use in industry, fisheries and living. Water use for agricultural production is highest in the Mekong Delta and Red River Delta, accounting for 70% of water use. The catchment area with the highest industrial

water use rate is Hong- Thai Binh, accounting for nearly half of the total water use for Vietnam's industry (MONRE 2015). The structure of water use is expected to change by 2030, with 75% going to agriculture, 16% to industry, and 9% to domestic uses (MONRE 2018). In addition, Rapid urbanisation and the prolonged dry season due to the impacts of climate change is causing serious water shortages in many areas of the country, especially in the areas around Mekong river basin in Vietnam.

**Table 2.13.2** River basins in Viet Nam

Major river basins	Catchment area (km <sup>2</sup> )	Total annual flow (km <sup>3</sup> )
Red and Thai Binh	169,020	135
Bang Giang-Ky Cung	13,260	9.4
Ma	28,400	18
Ca	29,930	23.5
Gianh	4,680	8.14
Thach Han	2,550	4.68
Huong	3,300	5.64
Vu Gia-Thu Bon	10,350	20.1
Tra Khuc-Ve-Tra Bong	5,200	6.19
Kon-Ha Thanh- La Tinh	3,640	2.58
Sesan	11,450	12.9
Srepok	18,200	13.5
Ba	13,900	9.5
Dong Nai-Sai Gon	40,294	37
Mekong (or Cuu Long)	761,417	475
Group of river basins in southeast region	15,760	9.16

(Source: MONRE 2014)

It is predicted that Viet Nam will become one of the countries most vulnerable to climate change and is likely to face significant impacts, especially in its water resources, surface water resources in particular. Impacts from climate change will vary according to region, and in recent years the northern delta and central coastal regions have already been affected by longer dry periods and torrential rains, resulting in droughts and flooding, as well as rising sea levels, storms, flooding and coastal erosion. The southern region is relatively flat and geologically weak, and is prone to flooding and saltwater intrusion as a result of sea level rise, with about 45% of the region projected to be at risk by 2030 (MONRE 2018).

In addition to surface water, groundwater is also an important water supply source for domestic, industrial and agricultural activities. According to MONRE (2015), groundwater in Viet Nam is relatively plentiful due to the abundant rainfall which is distributed widely across the

country. Reserves are estimated at about 172.6 million m<sup>3</sup>/day. The total volume of groundwater exploitation is about 10.53 million m<sup>3</sup>/day, of which the Northern and Southern delta are the two most exploited areas with total capacities of about 5.87 million m<sup>3</sup>/day, accounting for 55.7% of the country's exploitation. Recently, due to overexploitation of groundwater in areas such as Hanoi and the Mekong delta, problems of falling water tables, associated land subsidence and salinity intrusion have been reported.

### 3 | State of Ambient Water Quality

Water pollution of river basins across the country results from different sources, but is mainly due to the discharge of untreated or partly treated domestic, industrial and agricultural wastewater, as well as wastewater from craft villages and hospitals. According to MONRE (2018), domestic wastewater accounts for more than 30% of the total wastewater discharged directly to rivers, lakes, or canals leading to rivers, and is often characterized by high levels of organic compounds, nutrients, suspended solids, and large amounts of coliforms.

#### 3.1 Surface Water

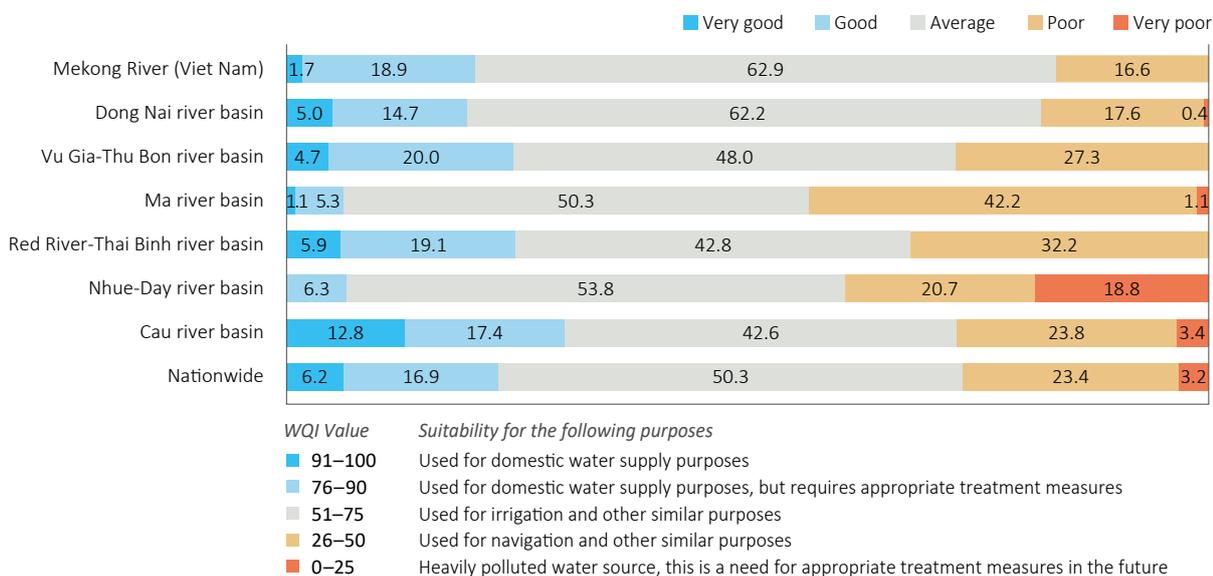
In general, the surface water quality in some major river basins has seen a slight improvement due to more efficient control over rising pollution loads. The Red-Thai Binh, Ma, Vu Gia-Thu Bon and Mekong river basins have relatively good water quality, and many segments of these rivers are used as raw sources for domestic water treatment plants. However, some river basins are still severely polluted and of relatively low quality, such as Nhue-Day river basin. Most river basins in Viet Nam's territory have high TSS values and turbidity, often exceeding QCVN 08- MT: 2015/BTNMT (A2), as well as the B1 level (see Table 2.13.3) during the flood season.

Major pollutants in the contaminated areas are included in organic pollution and micro-organism. Local pollution of oil, grease and heavy metals also occurs, especially in areas affected by waterborne traffic, industrial production, and mineral exploitation.

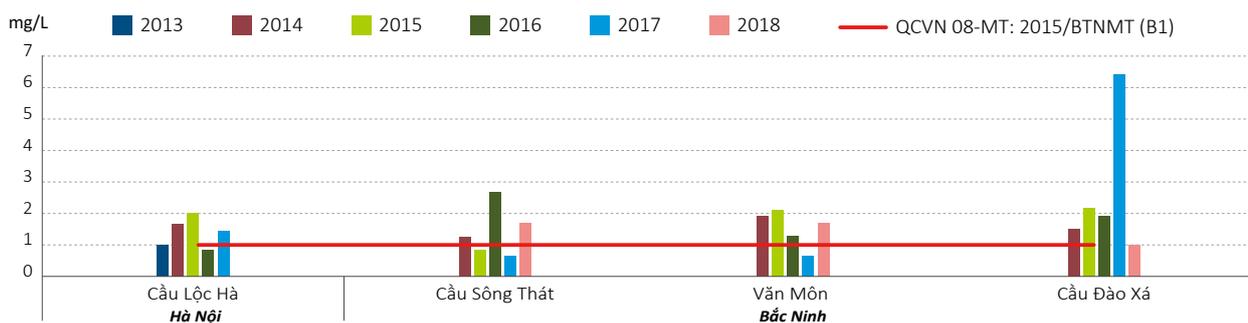
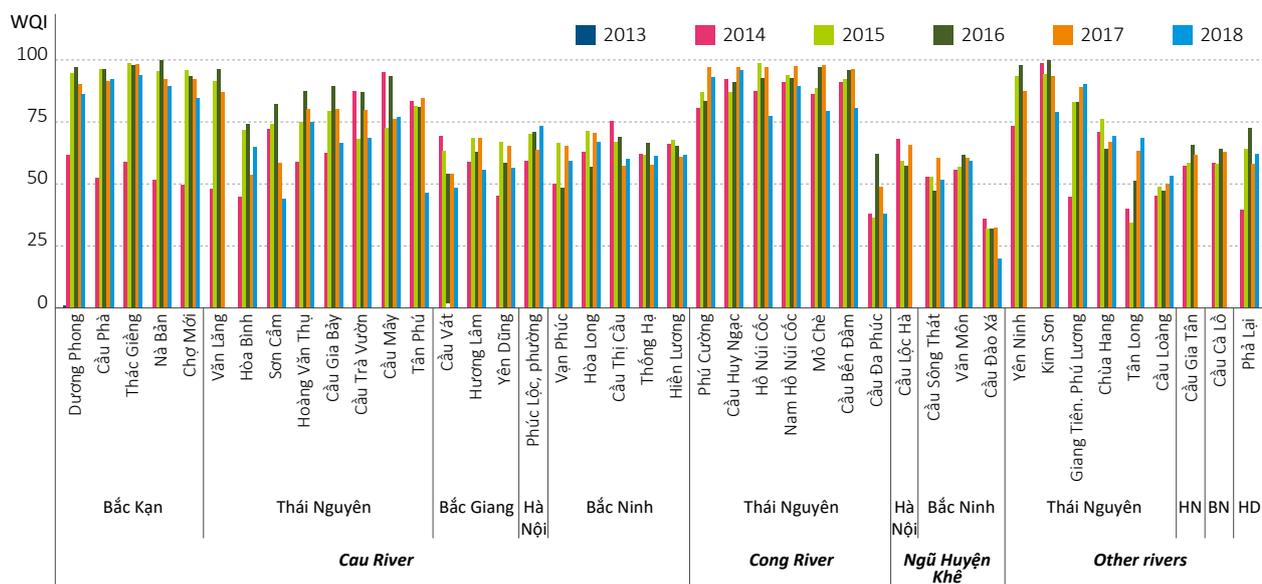
Water Quality Index values calculated based on the 2014–2018 water quality monitoring results of seven river basins showed that the ratio of river basins, which have been classified as "Average" quality, account the highest percentage in all river basins. The river basins with good and very good water quality (higher than the national average) are the Red river -Thai Binh river basin, Mekong river basin, and Cau river basin. The Nhue-Day river basin still has the poorest water quality with a ratio

of 18.8%. In the Ma river basin, Red River-Thai Binh river basin, and Dong Nai River basin, the ratio of average to poor water quality is very high, mainly due to the high

amount of suspended solids (especially during the rainy season) (MONRE 2018).



**Figure 2.13.3** Changes of WQI values of rivers belonging to Red River-Thai Binh river basin during 2014–2018  
NOTE: Water Quality Index (WQI) is calculated according to “Decision No. 879/QĐ-TCMT dated 1 July 2011” (Source: MONRE 2018)



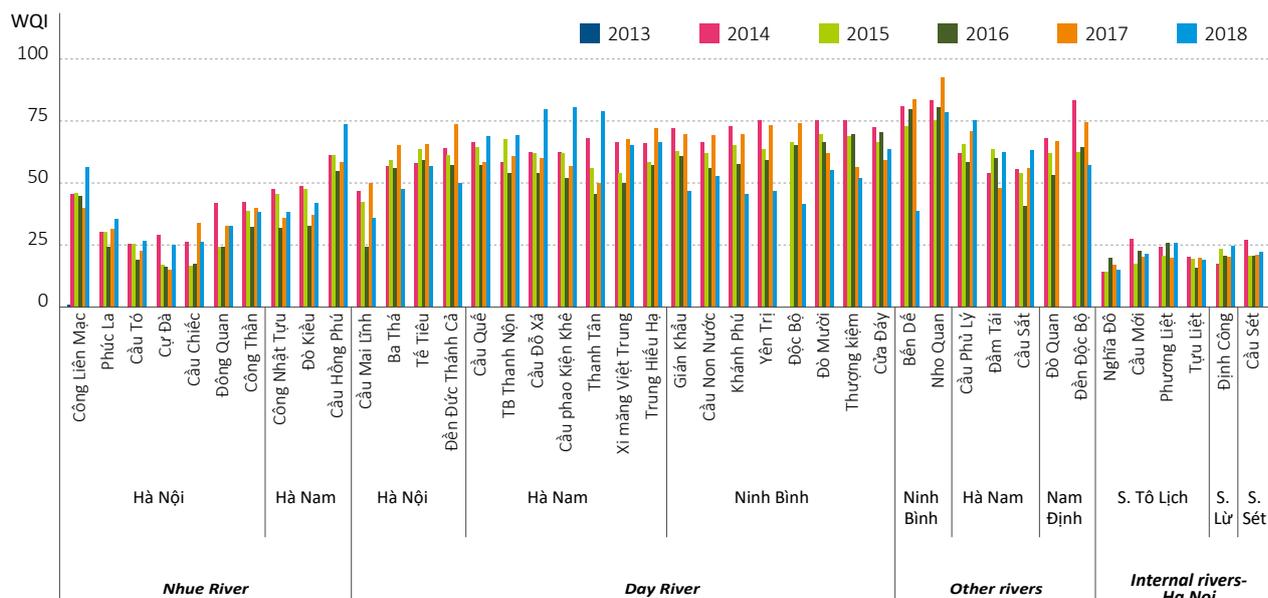


Figure 2.13.6 Changes of WQI values of rivers belonging to Nhue - Day river basin during 2014–2018 (Source: MONRE 2018)

Nhue-Day river basin is part of the Red-Thai Binh river basin, which expands over six provinces and cities in the Red River Delta region. During 2014–2018, river segments flowing through urban and production-intensive areas continued to be polluted by organic matter, nutrients, and microorganisms, and river water quality in 2016 dropped compared to previous years. Conversely, 2017 to 2018 saw water quality rise in some areas.

Meanwhile, water quality of the part of Nhue River flowing through Hanoi city has always showed low (low WQI value), mainly due to the significant impact of water pollution in the downstream area, especially during the dry season. Further, most of the rivers flowing through Hanoi have always been heavily polluted (with WQI less than 25), with no improvement from year to year. Other smaller rivers such as Lu river, Set river, and Kim Nguu river are also in the same condition, according to MONRE (2018).

Table 2.13.3 Classes of surface water quality standards

Class	Objective of use
A1	Good for domestic water supply and other purposes in A2
A2	Good for domestic water supply, but suitable treatment technology must be applied; conservation of aquatic life or other purposes in B1 and B2
B1	Good for irrigation and other purposes with demand for similar quality water and other purposes in B2
B2	Good for water transportation and other purposes with demand for low-quality water

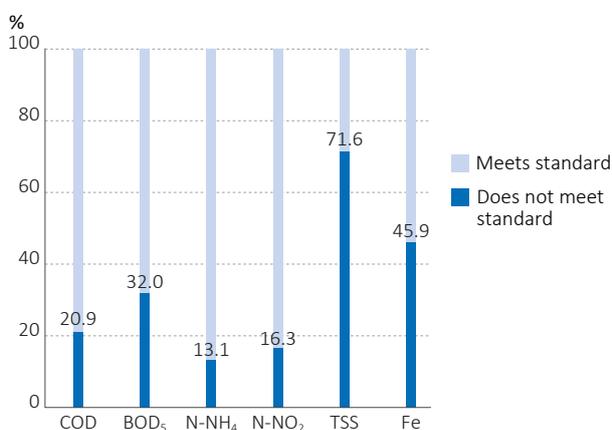


Figure 2.13.7 Ratio of values exceeding QCVN 08-MT: 2015/BTNMT (A2) of some selected parameters on Ca river basin during 2014–2018 (Source: MONRE 2018)

### 3.2 Coastal Water

In general, coastal water quality in Vietnam is relatively good and most monitoring parameters are within the limits set by National Technical Regulation on Coastal Water Quality QCVN 10-MT: 2015/BTNMT). In most monitored areas QCVN 10-MT: 2015/BTNMT (aquaculture and bathing) limits were even bettered in terms of COD, NH<sub>4</sub><sup>+</sup> during 2011–2015, especially in northern and southern coastal areas. However, cases of organic pollution are rising due to increased discharge of untreated wastewater and solid waste directly into the sea in coastal provinces, and levels of organic pollution in the northern coastal areas is higher than in the central and southern regions, but showed

a falling tendency during 2011–2015. Tho Quang boat (Da Nang) has become one of the hotspots of marine pollution in recent years.

### 3.3 Groundwater

According to MONRE (2015), although groundwater quality may vary geographically, it is generally considered relatively good. Normally, groundwater has a pH value arranging from 6.0–8.0, is termed as soft water (hardness <1.5 mg/l), and concentrations of organic compounds, microorganisms and heavy metals are often within permissible levels, i.e., National Technical Regulation on Groundwater Quality QCVN 09-MT:2015/BTNMT.

However, cases of groundwater pollution are occurring in certain areas, especially the Northern Delta (e.g., Red River Delta). Major pollutants exceeding permissible levels include Total Dissolved Solids (TDS), ammonium, heavy metals (Mn, As, Cd, Pb) and salt intrusion. Saltwater intrusion has been reported in some areas, especially in the three most vulnerable – coastal central provinces, lower basin of Dong Nai river, and coastal provinces of the Mekong delta. Ammonium content in groundwater has also frequently exceeded the limits of quality standards in some points of regions across the country, the highest being in the Northern Delta (VEA 2015).

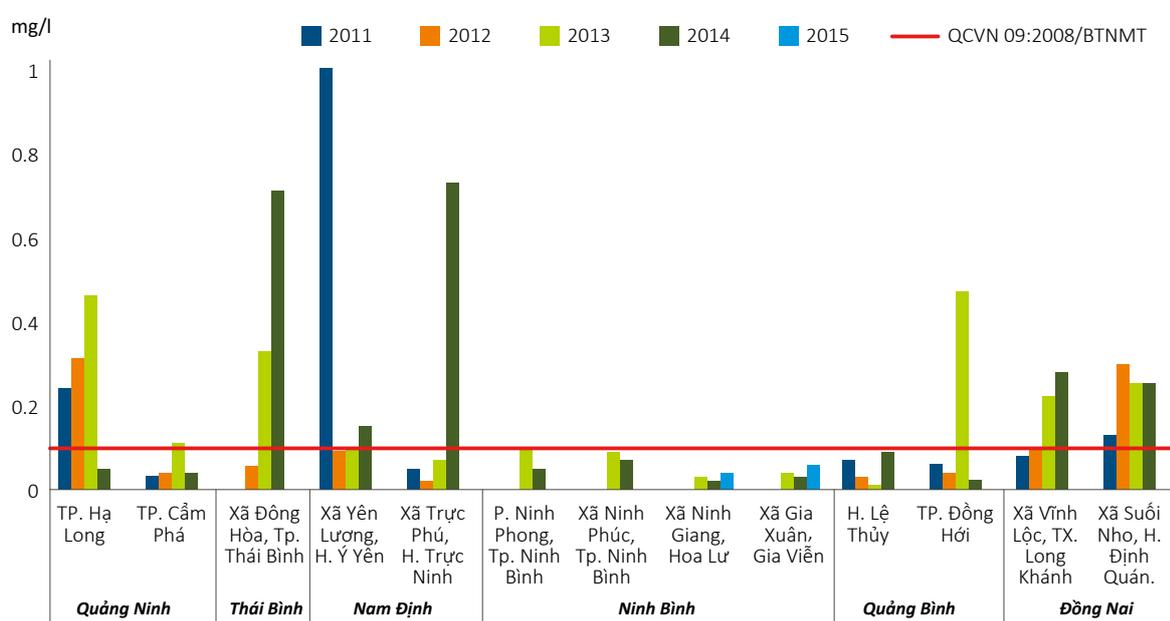


Figure 2.13.8 Ratio of ammonium content in underground water in some localities in the period 2011–2015 (Source: VEA 2015)

## 4 | State of Wastewater Treatment

### Domestic wastewater

Domestic wastewater includes wastewater sources from household activities, businesses and service industries (restaurants, hotels, resorts, etc.). The percentage of domestic wastewater of total wastewater discharged directly into rivers, lakes and canals is very high, exceeding 30%. Based on the data, the southeast region and Red River Delta (especially in big cities like Hanoi and Ho Chi Minh) areas exhibit the highest amounts of domestic wastewater discharge into receiving water bodies. The estimated ratio of domestic wastewater collected and properly treated in Class IV urban areas (or higher) is about 12.5%, an increase of 5% compared to 2011–2015, with 45 centralized wastewater treatment plants across the country with approx. 926,000 m<sup>3</sup>/day

total capacity. In big cities such as Hanoi, only about 20.62% of the city’s total generated domestic wastewater is treated, which drops to 10% or higher in Ho Chi Minh city. Currently, construction is planned for about 80 additional centralized wastewater treatment systems under ongoing projects, with a total design capacity of about 2.4 million m<sup>3</sup>/day (MONRE 2018).

### Industrial wastewater

In addition to domestic wastewater, other sources of wastewater discharges such as from industry, services, craft villages also affect the urban water environment. In the inner parts of some cities like Hanoi, there are still some small-scale production units and craft villages (e.g., food processing, slaughtering cattle), mainly comprised of households, which have not invested in waste and wastewater treatment systems. The southeast

region, where a large number of industrial zones are concentrated, is considered to produce the largest volume of industrial wastewater generation, followed by the Red River Delta, which also has a large number of industrial zones and industrial production establishments in operation.

In Vietnam, industrial wastewater has been carefully controlled and treated, especially industrial wastewater generated from industrial zones; however, percentages of properly treated wastewater meeting national effluent standards varies. As of early 2020, 274 industrial zones operated nationwide, of which 244 had centralized wastewater treatment systems, accounting for 89%. Provinces with large numbers of industrial zones/parks are those such as Ho Chi Minh City, Hanoi, Binh Duong, Ba Ria - Vung Tau, Dong Nai, Long An, Quang Ninh, Bac Ninh. There are 191/244 industrial parks with automatic water quality monitoring stations, accounting for 78.3%. According to Decree 38/2015/ND-CP on Waste and Scrap Management, all factories, production, business and service establishments located outside industrial zones/parks and which discharge large amounts of wastewater (1,000 m<sup>3</sup>/day or higher) must install automatic continuous wastewater monitoring systems, and transmit all real time data directly to the Department of Natural Resources and Environment as regulated.

#### Wastewater pollution from agricultural activities

Currently, agricultural wastewater is also a matter of great concern as it represents one of the main factors influencing water resources in areas with thriving agricultural economies, such as Mekong Delta and Red River Delta. Wastewater from agricultural activities often contains pesticides and fertilizers, which are toxic to the environment and human health. It is estimated that each year about 70,000 kg (solid form) and over 40,000 liters of pesticides (liquid form), as well as about 70,000 kg of untreated chemical bags enter the environment, increasing the level of pollution of surface water and groundwater (World Bank 2017). In addition, wastewater from livestock production also significantly contributes to environmental burdens due to its volume – the total for 2018 was estimated at approx. 6.66 million m<sup>3</sup>/day (MONRE 2018) – as well as contents, comprising large amounts of suspended solids, organic substances, nutrients and microorganisms.

## 5 | Frameworks for Water Environmental Management

### 5.1 Legislation

Article 53 of the new Constitution 2013 states that “The land, water resources, mineral resources, wealth lying underground or coming from the sea and the air, other natural resources, and property invested and managed by the State are public properties, coming under ownership by the entire people represented and uniformly managed by the State.” The Constitution is the basis of environmental and water resources protection in the country.

The Law on Water Resources 2012 (Decree No. 17/2012/QH13) also highlights issues relating to the protection of water resources, including responsibilities for the prevention of water deterioration and depletion, and control of water quality. In addition, the Law on Environmental Protection 2014 (No. 55/2014/QH13) provides statutory provisions on environmental protection activities; measures and resources used for the purpose of environmental protection, including river water environmental protection; and rights, powers, duties and obligations of regulatory bodies, agencies, organizations, households and individuals who are tasked with environmental protection.

Several other relevant laws, such as the Mineral Law, Land Law and Biodiversity Law, and decrees, decisions, circulars and strategies on water resources management have also been promulgated to complete the national legislation related to water environmental management in Viet Nam.

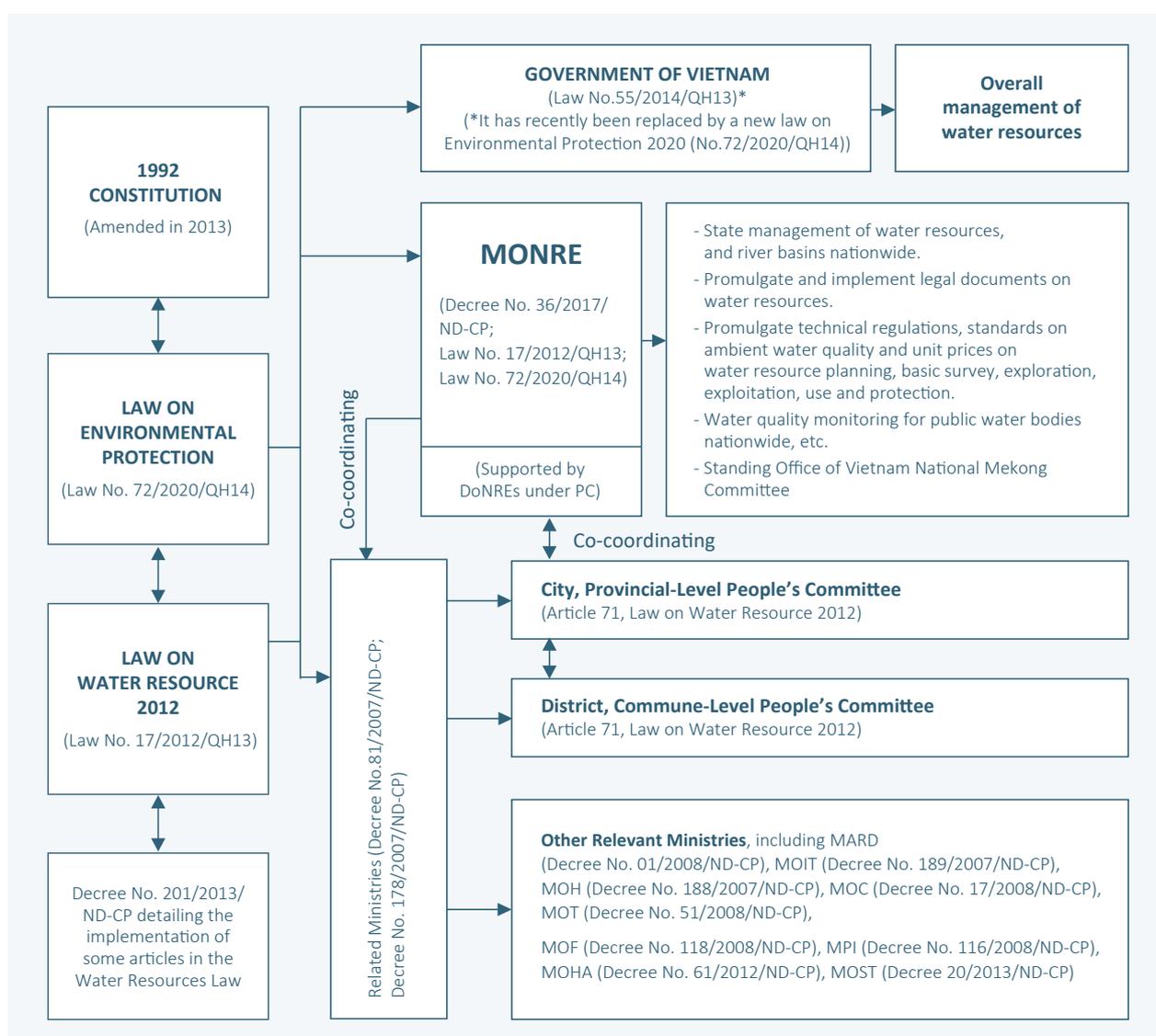
## 5.2 Institutional Arrangement

State responsibilities for water resources management of the government, ministries and ministerial-level agencies, city and the provincial people’s committee, district and commune people’s committee are clearly stated in the Law on Water Resources 2012 and Law on Environmental Protection 2014, which has recently been replaced by a revised Law on Environmental Protection 2020 (No. 72/2020/QH14), which set out how the government is to perform uniform or overall state management of water resources.

The Ministry of Natural Resources and Environment (MONRE) is the main ministry responsible for overall state management of water resources, including the planning for environmental protection, verification of

reports on strategic environmental assessments, assisting the government in designing, implementing and providing guidelines for responses to climate change, providing instructions on environmental remediation and improvement, implementation of national environmental monitoring, promulgation of technical regulations, standards on water quality and obligation for water quality monitoring of public water bodies, and management of river basins nationwide (Figure 2.13.9).

Other ministries that may influence or affect water resources management include the Ministry of Agriculture and Rural Development, Ministry of Industry and Trade, Ministry of Health, Ministry of Science and Technology, Ministry of Construction, Ministry of Transport, and Ministry of Finance, Ministry of Planning



Note: MONRE: Ministry of Natural Resources and Environment; MARD: Ministry of Agriculture and Rural Development; MOC: Ministry of Construction; MOHA: Ministry of Home Affairs; MOH: Ministry of Health; MOST: Ministry of Science and Technology; MPI: Ministry of Planning and Investment; MOF: Ministry of Finance; MOIT: Ministry of Industry and Trade; MOT: Ministry of Transport; PC: City or Provincial People’s Committee.

**Figure 2.13.9** State responsibilities for water resources management in Viet Nam

(Source: Prepared by IGES based on information from the relevant decrees)

and Investment, and Ministry of Home Affairs (Table 2.13.4). In implementation, local governments play an important role in environmental management. The Department of Natural Resources and Environment

(DoNRE) under the city or provincial people's committee takes a leading role in the promotion of environmental conservation activities through implementing environmental regulations and providing guidance.

**Table 2.13.4** Responsibilities of other relevant ministries for water resources management

Relevant Ministries	Responsibilities
Ministry of Agriculture and Rural Development (MARD)	Manages rural water supply and sanitation; manages water for irrigation and aquatic production; flood, storm and disaster prevention; fishery, cultivation land management; management of hydraulic engineering and dikes.
Ministry of Construction (MOC)	Manages urban public works; design and construction of urban water supply, drainage and urban wastewater works.
Ministry of Health (MOH)	Manages drinking water quality; responsible for preparing and supervising water quality standards and regulations (drinking and domestic).
Ministry of Science and Technology (MOST)	Appraises the draft and publicizes the water quality standards prepared by MONRE.
Ministry of Finance (MOF)	Prepares policies on taxes and fees for water resources; allocates state budget.
Ministry of Planning and Investment (MPI)	Checks and provides instructions to other ministries and sectors on the preparation and implementation of the strategies on socio-economic development; allocates, plans and invests; coordinates international relations.
Ministry of Transport (MOT)	Manages and develops transportation on water; manages aquatic engineering and port systems.
Ministry of Industry and Trade (MOIT)	Develops hydropower via the Viet Nam Electricity Corporation (EVN).

(Source: Prepared by IGES based on information from the relevant decrees defining functions and responsibilities of each relevant ministry)

### 5.3 Ambient Water Quality Standards

#### Ambient water quality standards

Ambient water quality standards are established for surface water, coastal water and groundwater. The Center for Environmental Monitoring (CEM) under the Viet Nam Environment Administration (VEA), was established under Decision No. 188/QĐ-IDU on 23/3/2010 of the VEA, and assists the VEA in organising, implementing tasks of national environmental monitoring, construction and environmental data management, applications for information technology in environmental monitoring, and building reporting on environmental quality in the functional framework of the VEA. The CEM is a leading center in the national environmental monitoring network. Since 2005, a number of regular monitoring programs have been carried out by the Center for Environmental Monitoring. In order to improve efficacy in managing monitoring data, from 2003, CEM started developing software dedicated to this task, and in 2009–2011, under the framework of an investment project to build an information network system, the software was developed into a new system and modified to handle additional requirements.

#### Water quality monitoring framework

At the national level, according to MONRE, the periodic surface water monitoring program continues to operate. It involves around 360 monitoring points for monitoring

a number of the river basins, including Cau, Nhue – Day, Red River-Thai Binh, Ma, Ca, Vu Gia- Thu Bon, and Dong Nai river basin about 4–5 times a year. Other ministries also maintain their own annual environmental quality monitoring programs, with approximately 100 monitoring points of surface water in urban areas, areas affected by industrial production activities, with a monitoring frequency of 3–6 times/year.

At the local level, most provinces and cities have approved environmental monitoring network planning or the environmental monitoring plan in their areas, with numbers of monitoring points and annual monitoring frequency varying greatly (5–30 points; 2–6 times/year) among localities according to local conditions and requirements, as well as state of funding approval.

In addition to periodic monitoring activities, investment and expansion of automatic continuous monitoring systems have also taken place at both central and local levels. According to statistics, there are currently 23 continuous automatic surface water environmental monitoring stations at the central level and over 80 at the local level.

Monitoring data is used to review and revise policies and countermeasures for improving water quality and conservation measures. MONRE issues the National State of the Environment Report annually, in which major data is made public.

## 5.4 Effluent Standards

### Effluent standards

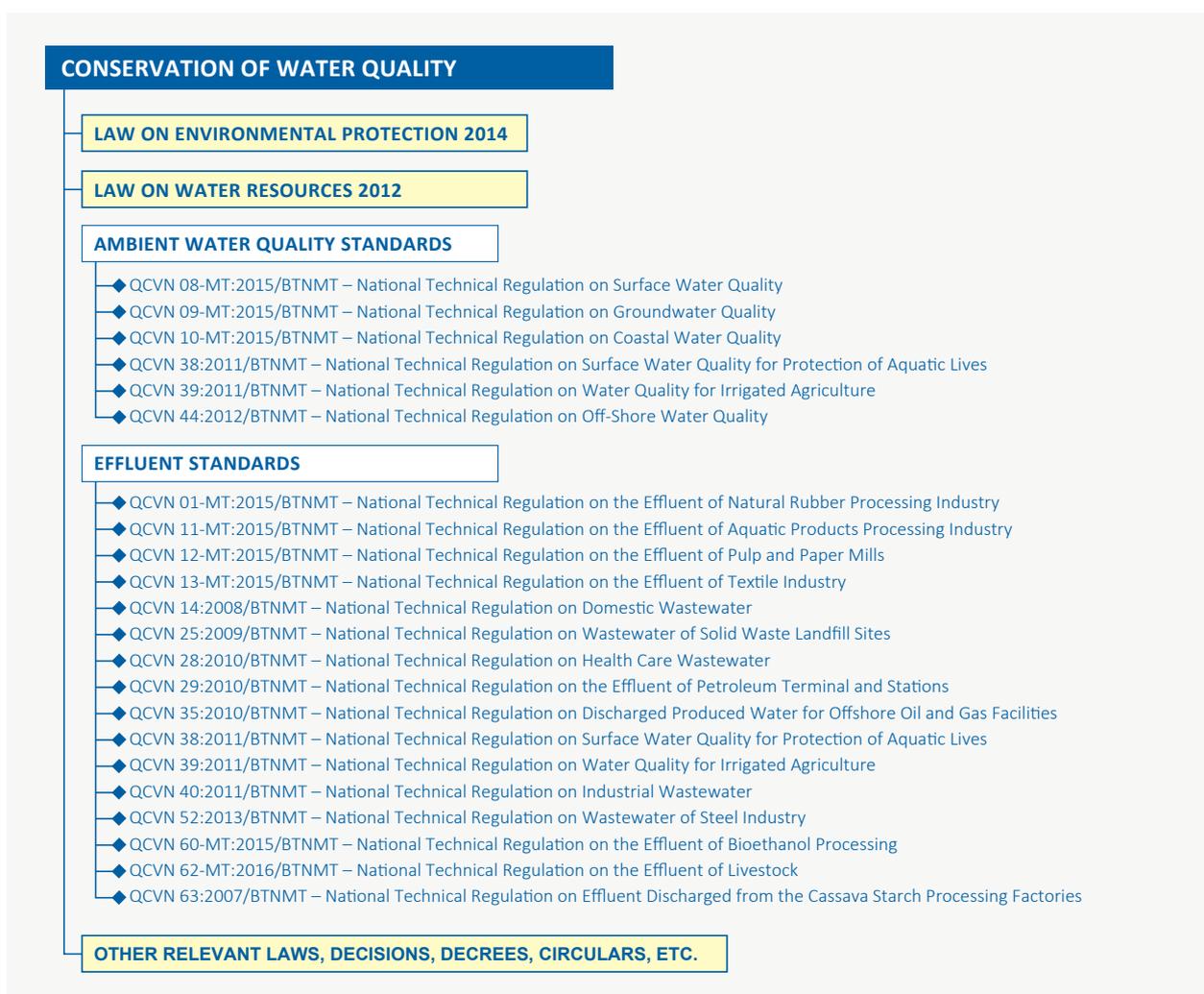
There are various effluent standards in Viet Nam as shown in Figure 2.13.10, including for domestic, industrial and medical wastewater. In general, industries are required to carry out environmental impact assessments (EIA) and have to commit to self-monitoring four times a year, in accordance with a circular issued by the national government. Twice a year MONRE, VEA or/and DoNRE conduct inspections of compliance with industrial effluent standards, which are carried out based on prior announcement and not more than twice a year. If a violation is suspected, “environmental police” from the Ministry of Public Security are authorized to conduct compulsory investigations without prior notice, and therefore have more opportunities to identify possible non-compliance. As mentioned earlier, currently 191 out of 244 industrial parks are equipped with automatic

water quality monitoring stations, accounting for 78.3%. Meanwhile, no automatic monitoring systems are available in small-scale industrial clusters or craft villages.

### Effluent inspection procedures

Wastewater discharge activities from production, business, service establishments and industrial parks must be periodically monitored, according to the approved environmental impact assessment report, for which environmental protection plans have been determined. Meanwhile, industrial zones and parks must install automatic continuous wastewater monitoring systems and transmit data directly to the local Department of Natural Resources and Environment.

According to Decision No. 1620/QĐ-BTNMT of 21st July 2016, on approval of inspection plans for projects, factories or business establishments with wastewater discharges, those organizations engaged in production



**Figure 2.13.10** Relevant laws, standards for conservation of water quality in Viet Nam

(Source: Prepared by IGES based on information from the relevant Laws, Standards, Decisions, Decrees, Circulars, etc.)

and business activities that discharge wastewater into the receiving environment (industrial establishments with wastewater discharge flowrates of 200 m<sup>3</sup>/day or more and at risk of causing environmental pollution in sea or river basins) must be regularly inspected by both central and local authorities. Further, according to Article 37 of Circular 25/2019/TT-BTNMT of December 31, 2019 (MONRE), project owners, or production, business or service facility owners are responsible for preparing regular annual environmental monitoring and protection reports (covering work activities, environmental protection measures, environmental monitoring, solid waste and hazardous waste management, and management situation of scrap imported under the guidance in Appendix IV of the Circular). These annual reports (January 1 to end of December 31) must be sent to the competent agency/authority (Ministry of Natural Resources and Environment) before January 31 of the following year. Concurrently, establishment owners or enterprises must maintain all related documents for sharing with competent state agencies when they visit for inspections and examination.

During 2014–2018, the Ministry of Natural Resources and Environment presided over and coordinated with other ministries and localities in carrying out inspections and examinations of over 3,000 establishments, industrial parks and industrial complexes nationwide. Sanctions were issued for 1,400 violating organizations, with fines exceeding 200 billion VND (MONRE 2018).

## 5.5 Other Policies on Water Environmental Management

In recent years, environmental management in Vietnam has focused more on the use of economic tools, including taxes, environmental fees or other forms of sanctions or compensation as measures to complement other conventional standard-based approaches.

### Tax policy related to the water environment

The current tax policy is based on the viewpoint of limiting activities that adversely affect the environment in general and the water environment in particular, as well as activities having a direct or indirect impact on environmental protection. The 2009 Law on Natural Resources Tax stipulates that “natural water, including surface water and underground water, except natural water used for agriculture, forestry, fisheries, and salt production” is subject to natural resources tax. The law also stipulates that “natural water used for agriculture, forestry, fishery and salt production” is not subject to

tax; and that “Natural water used for hydropower production by households and individuals to produce for domestic use and Natural water exploited by households and individuals for domestic use” are subject to natural resource tax exemption. Implementing a natural resources tax on natural water contributes to encouraging exploitation and rational use of natural resources in order to help better protect natural resources.

### Environmental protection fee for wastewater

The environmental protection fee for wastewater has been regulated by the Government of Vietnam and implemented since 2003, and regulations on such fees have undergone two changes to date. According to Decree No. 154/2016/ND-CP, the environmental protection fee for wastewater continues to apply to domestic and industrial wastewater. Collection of the fees has been assigned to local authorities, with the Department of Natural Resources and Environment collecting the fees for industrial wastewater, and clean water service providers (i.e., People’s Committees of communes, wards and towns) collecting the fees for domestic wastewater.

### Sanctioning of administrative violations in the field of environmental protection and water resources

Administrative violations related to water environment are specified in two documents: Decree No. 155/2016/ND-CP, related to environmental protection, and Decree No. 33/2017/ND-CP, related to water resources and minerals.

## 6 | Recent Developments in Water Environmental Management

The revised Law on Environmental Protection 2020, which has recently been approved by the National Assembly on 17th November 2020, consisting of 16 chapters with 171 articles regulating environmental protection activities and stipulating the rights, duties and responsibilities of agencies, organizations, resident communities, households and individuals in environmental protection activities. This Law will come into effect from January 1, 2022.

In addition, one of the most recent development in water environment management is Decision No. 622/QĐ-TTg on 10th May 2017 by the Prime Minister, related to the issuance of the National Action Plan for

Implementation of the 2030 Sustainable Development Agenda. Viet Nam’s sustainable development goal to 2030 consists of 17 goals and 115 targets, corresponding to the global SDGs elaborated in the document “Transforming our world: The 2030 Agenda for Sustainable Development” adopted by the United Nations General Assembly in September 2015. These targets cover all the UN SDGs targets with several modifications and adjustments suitable in the context of Viet Nam. Concerning the water and sanitation related goal, SDG 6, MONRE, MARD, MoC and MoF have been assigned as lead organizations in implementing the related targets – specifically, MONRE is responsible for targets 6.1d, 6.3b, 6.4, 6.5, and 6.6; MoC for 6.1a, 6.2, and 6.3a; MARD for 6.1b; and MoF for 6.1c, 6.3c.

## 7 | Challenges and Future Plans

Over the last 2 decades, a number of efforts made have been made by both central and local governments as well as donor agencies to improve the water quality and environmental landscape of lakes and rivers, especially in big cities and provinces such as Hanoi, Da Nang and Ho Chi Minh City, but despite this, the issue of surface water pollution in lakes, rivers and canals remains. Surface water quality in many cities continues to decline, due to contamination from organic substances, nutrients and microbial contamination, as these areas receive large amounts of untreated or improperly treated wastewater from both domestic and industrial sources.

Below gives a list of the challenges that remain as well as recommended necessary actions to be considered:

Remaining challenges	Necessary actions proposed
<b>Institutional challenges</b>	<ul style="list-style-type: none"> <li>i. Reviewing, supplementing and completing legal policies on water environmental protection</li> <li>ii. Assignment and consolidation of state management system for water environment protection</li> <li>iii. Develop and promote the implementation of river basin planning, zoning planning, water exploitation and use</li> </ul>
<b>Enforcement challenges</b>	<ul style="list-style-type: none"> <li>i. Strengthen activities of water pollution control, inspection, examination and enforcement of compliance with the law on water environment protection</li> <li>ii. Apply economic tools, scientific and technological solutions in water environment protection</li> <li>iii. Effective investment to thoroughly solve hotspots of water pollution in river basins; waste source control; effective prevention and control to minimize contamination of the water environment</li> <li>iv. Raising awareness and enhancing community participation and responsibility in water environmental management and protection</li> <li>v. Promote international cooperation activities in water environmental management and protection, especially transboundary issues</li> </ul>
<b>Resource and financial challenges</b>	<ul style="list-style-type: none"> <li>i. Promote international cooperation activities</li> <li>ii. Attract private investment</li> </ul>
<b>Technical challenges</b>	<ul style="list-style-type: none"> <li>i. Promote international cooperation activities</li> <li>ii. Screen production types and production technologies in attracting investment, ensuring not to attract outdated production technologies into Vietnam; choose environmentally friendly technologies for hazardous waste and organic matter pollution</li> </ul>