Section 2 Water

Ⅰ. Physical flow accounts

Water pollution emissions affect the ecology and the quality of water resources. In order to understand the types and flows of water pollutants generated and discharged by various sectors, the supply and use table comprehensively organizes the related flows to establish the physical flow accounts.

From the perspective of the supply side's overall flows, the biochemical oxygen demand (BOD), chemical oxygen demand (COD) and suspended solids (SS) discharged into the environment in 2016 mostly came from households; agriculture, forestry, fishing, and animal husbandry; and manufacturing. These three aggregated to account for more than 92% of the total. The BOD and COD discharged into the economy mostly came from agriculture, forestry, fishing, and animal husbandry; manufacturing; and households. These three aggregated to account for more than 93% of the total. In terms of the SS, it mostly came from mining and quarrying; agriculture, forestry, fishing, and animal husbandry; manufacturing; and households. These four aggregated to account for more than 92% of the total.

In terms of the use side's overall flows, the BOD, COD and SS absorbed by the environment in 2016 were 248 thousand, 638 thousand and 253 thousand metric tons, respectively. Moreover, the BOD, COD and SS absorbed by the various sectors themselves within the economy were 516 thousand, 1,227 thousand and 862 thousand metric tons, respectively.

Ⅱ. Emission accounts

Water pollution emissions refer to materials discharged into water resources during the course of production, consumption and accumulation. Of the various water pollutants, the BOD, COD and SS are the most prevalent. They are the key points in water pollution control, monitoring, and declaration; and are also the primary items in emission accounts.

(I) By pollutants

In 2016, 764 thousand metric tons of BOD; 1,865 thousand metric tons of COD; and 1,115 thousand metric tons of SS were generated from water pollution. With the help of various ongoing water pollution control projects, the emissions of BOD, COD and SS totaled 248 thousand, 638 thousand and 253 thousand metric tons, down 3.6%, 2.6% and 3.6% from 2015, respectively.

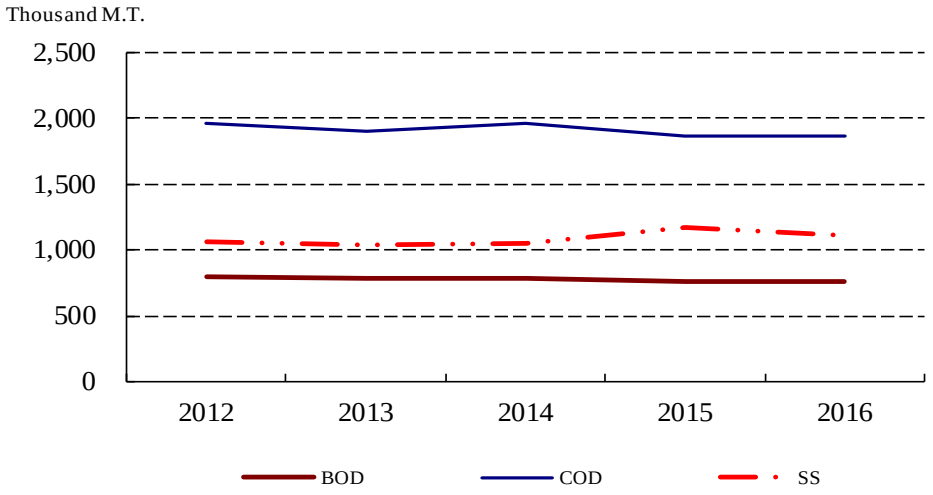
Table 1.2.2.1 Supply and use table for water pollution emissions, 2016

Unit: thousand M.T.

	Pollutants discharged into the environment			Pollutants discharged into the economy		
	BOD	COD	SS	BOD	COD	SS
Total supply	248.0	637.5	253.2	516.1	1,227.3	861.5
Water supply and remediation activities	3.2	9.6	4.6	5.0	11.8	39.2
Other sectors	244.8	627.9	248.7	511.2	1,215.5	822.4
Agriculture, forestry, fishing and animal husbandry	27.2	74.1	35.6	180.3	290.6	197.5
Mining and quarrying	1.8	5.5	2.7	3.6	8.9	261.9
Manufacturing (including electricity and gas supply)	15.7	53.0	15.5	148.7	537.3	175.5
Accommodation and food service activities	0.8	2.4	0.8	2.0	3.9	1.7
Education	0.0	0.3	0.1	0.1	0.2	0.1
Human health and social work activities	0.5	1.7	0.5	1.8	3.1	1.4
Other service activities	0.3	1.0	0.4	0.5	1.1	0.6
Public administration	8.5	28.3	8.5	20.4	50.1	24.5
Households	189.9	461.6	184.6	153.8	320.3	159.1
Total use	248.0	637.5	253.2	516.1	1,227.3	861.5
Total collective amount				516.1	1,227.3	861.5
Water supply and remediation activities						
Other sectors						
Agriculture, forestry, fishing and animal husbandry						
Mining and quarrying						
Manufacturing (including electricity and gas supply)						
Accommodation and food service activities						
Education						
Human health and social work activities						
Other service activities						
Public administration						
Households						
Flows into the environment	248.0	637.5	253.2			

Note: In the table, the shaded section indicates a lack of data; the light green part indicates an inability to distinguish data from different industries. So, they show their total respectively, temporarily.

Figure 1.2.2.1 The amount of water pollution generated



(Ⅱ) By pollution sources

1. Agricultural wastewater

The animal husbandry is the major source of agricultural wastewater. The bulk of the pollution emissions come from pigs farming. In 2016, the BOD, COD and SS from the emissions of agricultural wastewater were 27 thousand, 74 thousand and 36 thousand metric tons, down 12.8%, 8.0% and 10.9% from 2015, respectively.

Table 1.2.2.2 Water pollution emissions

Unit: thousand M.T.

	BOD				COD				SS			
	Total	Agricul-tural	Indus-trial	Muni-cipal	Total	Agricul-tural	Indus-trial	Muni-cipal	Total	Agricul-tural	Indus-trial	Muni-cipal
2012	267.9	23.2	21.2	223.4	680.0	67.9	69.9	542.1	274.1	30.7	22.9	220.5
2013	265.4	25.4	21.3	218.6	674.0	71.0	69.9	533.1	272.1	33.2	22.9	216.0
2014	260.8	25.6	21.1	214.1	664.2	69.6	70.5	524.0	267.1	33.0	22.4	211.7
2015	257.3	31.2	21.2	204.9	654.6	80.5	69.6	504.5	262.8	39.9	23.3	199.5
2016	248.0	27.2	20.7	200.1	637.5	74.1	68.1	495.4	253.2	35.6	22.8	194.9

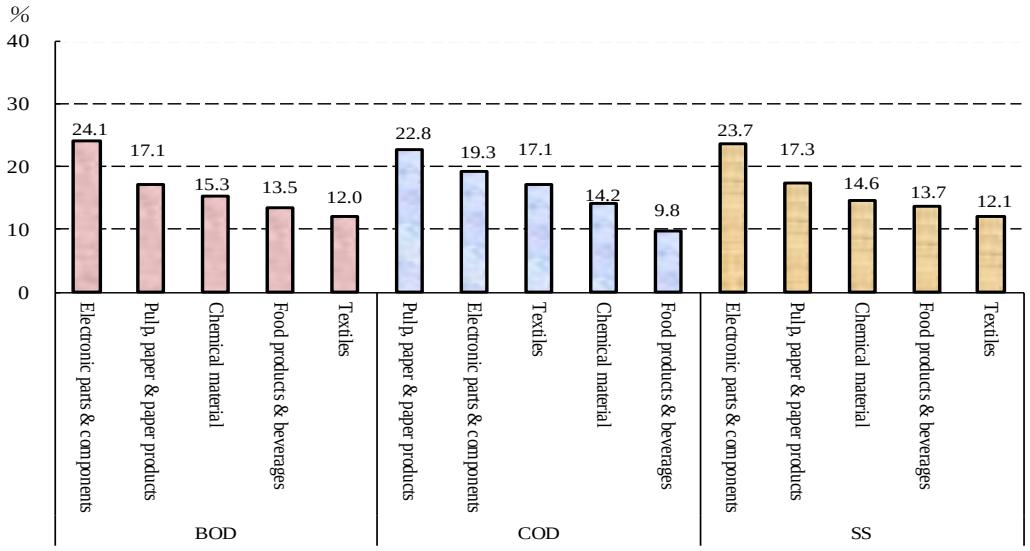
2. Industrial wastewater

Industrial wastewater usually has high levels of pollution or toxicity; if it is discharged without any treatment, it will impose a heavy burden on the environment

of water body. In 2016, the BOD, COD and SS from the emissions of industrial wastewater were 21 thousand, 68 thousand and 23 thousand metric tons, respectively. Compared with 2015, the BOD, COD and SS were down 2.2%, 2.2% and 2.3%, respectively. The BOD, COD and SS mainly all came from manufacturing, which all accounted for more than 67% of them.

In terms of manufacturing, the manufacture of electronic parts and components had the largest emissions of water pollution BOD in 2016, accounting for 24.1% of all BOD emissions by manufacturing, followed by the manufacture of pulp, paper and paper products which accounted for 17.1%. The manufacture of pulp, paper and paper products had the largest emissions of COD, with a share of 22.8%, followed by the manufacture of electronic parts and components, which accounted for 19.3%; the manufacture of electronic parts and components was responsible for the most emissions of SS, followed by the manufacture of pulp, paper and paper products, accounted for 23.7% and 17.3% of the total SS, respectively.

Figure 1.2.2.2 Under the manufacturing division categories more emissions as a % of the manufacturing, 2016

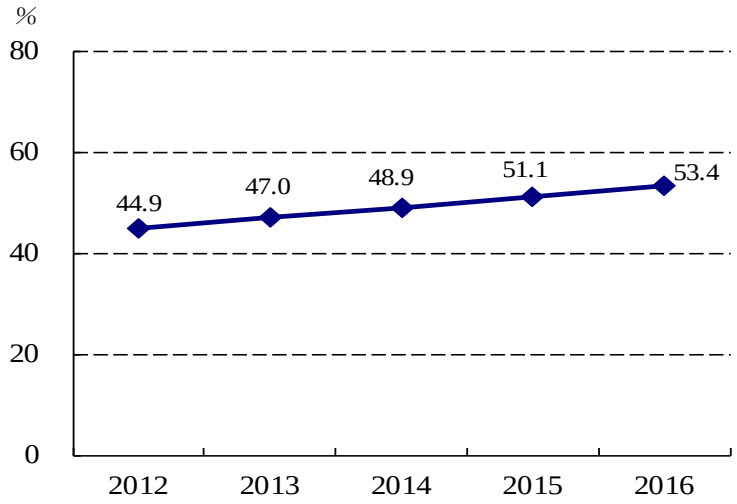


3. Municipal sewage

Sewage generated by households and the services sectors contains materials such as feces & urine, kitchen waste, and detergents. The main treatment methods include adding plumbing connections to sewers and the installment of septic tanks, etc. In 2016, the sewage treatment rate (the saturation rate of public sewage sewer; saturation rate of specialized sewage sewer; and installment rate of building's sewage treatment

facilities) reached 53.4%, up 2.3 percentage points from the end of 2015. In 2016, the BOD, COD and SS from the discharges of municipal sewage were 200 thousand, 495 thousand and 195 thousand metric tons, down 2.4%, 1.8% and 2.3% from 2015, respectively.

Figure 1.2.2.3 Sewage treatment rate, end of year



Ⅲ. Quality accounts

(Ⅰ) Rivers and streams

The monitoring results for 54 major rivers and streams in 2016 indicated that, in ratios (achievement rates) meeting water quality standards for all monitoring items, the pH values were still the highest, at 97.8%; however, only 29.4% of rivers and streams met the standards for total phosphorus. Among these, the achievement rates for Fengshan Chi, Houlung Chi, Choshui Chi, Peikang Chi, Akungdiaun Chi, Tungkang Chi, and Hoping Chi were zero. Besides, the achievement rate for coliform group was only 34.3%, with lower rates detected at Erhjen Chi (3.4%) and Tungkang Chi (3.5%). Owing to the unique properties of the soil, the achievement rate for manganese (Mn) was only 42.5%, and this was required improvement via water quality purification process.

In terms of the items for specific goals in the National Environmental Protection Plan, the achievement rates for dissolved oxygen (DO), BOD, SS, and ammonia nitrogen (NH_3-N) were 89.8%, 72.4%, 68.4%, and 63.4%, respectively. All of these

reached their target values. For heavy metals, the achievement rates all met the target values of 97%, with the exception of Mn and copper (Cu).

Table 1.2.2.3 Achievement rates of water quality for rivers & streams

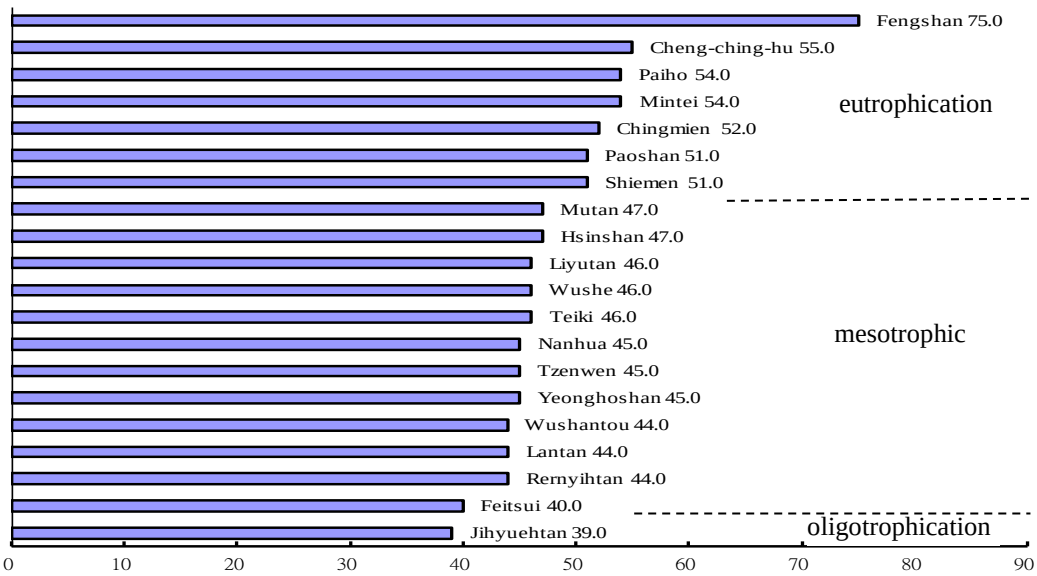
Unit: %

	DO	BOD	SS	NH_3-N	pH values	Coliform group	Total phosphorus	Cu	Mn
2012	88.9	73.8	66.1	57.7	99.2	35.1	23.0	91.4	36.1
2013	87.7	64.7	67.9	58.1	98.7	36.2	29.9	93.4	38.6
2014	87.9	65.8	68.7	57.9	97.2	35.7	23.9	93.4	36.6
2015	87.2	68.6	71.8	59.1	97.9	39.9	20.9	94.5	35.2
2016	89.8	72.4	68.4	63.4	97.8	34.3	29.4	96.4	42.5
Target values in the National Environmental Protection Plan	**79**	**61**	**63**	**60**	—	—	—	**97**	**97**

(Ⅱ) Reservoirs

Reservoirs are the major sources of water for the people's livelihood. According to the level of eutrophication at 20 major reservoirs under monitoring, 7 reservoirs reached a state of eutrophication (CTSI>50) in 2016. Among these, Fengshan Reservoir was the most serious, with a eutrophication index 75.0, followed by Cheng-ching-hu Reservoir at 55.0; in addition, 12 reservoirs including Mutan Reservoir had a state of mesotrophic (CTSI between 40 and 50); only Jihyuehtan Reservoir was oligotrophication phenomena (CTSI < 40).

Figure 1.2.2.4 Level of eutrophication of reservoirs (CTSI), 2016



(Ⅲ) Coastal areas

Taiwan has an abundance of resources for coastal areas, and these have both recreational and economic value. In recent years, water quality at coastal areas has been acceptable. Since 2004, the monitoring results for heavy metal items such as cadmium (Cd), Cu, lead (Pb), zinc (Zn), and mercury (Hg) all met water quality standards of water body, with a qualified rate of 100%. The qualified rates for DO and pH values in 2016 were 99.3% and 99.5%, respectively; this was mainly due to the influence of the qualified rates (only 85.0% and 75.0%, respectively) for coastal areas near the Erren River and Dapengwan.

Table 1.2.2.4 Water quality qualified rates of coastal areas

Unit: %

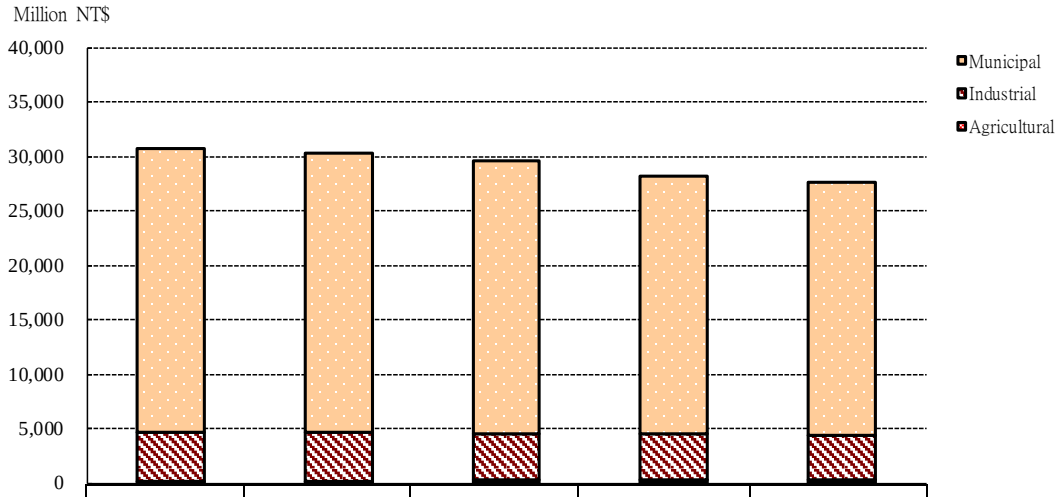
	DO	pH values	Cd	Cu	Pb	Zn	Hg
2012	97.9	99.3	100.0	100.0	100.0	100.0	100.0
2013	99.8	99.8	100.0	100.0	100.0	100.0	100.0
2014	99.6	99.5	100.0	100.0	100.0	100.0	100.0
2015	99.0	100.0	100.0	100.0	100.0	100.0	100.0
2016	99.3	99.5	100.0	100.0	100.0	100.0	100.0

Ⅳ. Degradation accounts

Degradation accounts mainly focus on the monetary values needed to control and eliminate pollutants that are currently not under control. Currently, BOD has been chosen as the target. The degradation accounts for water pollution are estimated based on its reduction costs per unit and amount of emissions.

In 2016, total degradation for water pollution was NTD 27.66 billion, down 1.7% from 2015. Among these, the municipal sewage was the largest at NTD 23.24 billion, 84.0% of total degradation; this was followed by industrial wastewater at NTD 4.19 billion, 15.1% of the total. Agricultural wastewater was only NTD 0.23 billion. Compared with 2015, the municipal sewage, industrial wastewater, and agricultural wastewater were down 1.5%, 2.2%, and 13.5%, respectively.

Figure 1.2.2.5 Degradation value of water pollution



	2012	2013	2014	2015	2016
Total	30,734	30,344	29,587	28,136	27,661
Municipal	26,126	25,749	25,010	23,591	23,244
Industrial	4,416	4,384	4,357	4,278	4,185
Agricultural	192	210	220	268	231