

## Section 2 Water Resources

### I . Physical asset accounts

Water resources in Taiwan come primarily from natural precipitation. After rainwater falls onto the surface of the ground, most of it will enter into reservoirs to be stored for reuse; flow into rivers to be drawn for utilization; or seep into underground aquifers to be drafted for use, except for a small amount of evaporation. Therefore, reservoirs, river basins and groundwater are the three major sources of water resources.

#### ( I ) Reservoirs

As of the end of 2016, there were 95 publicly known reservoirs in the country, with a total storage capacity of 2.90 billion cubic meters and 1.91 billion cubic meters of effective capacity. Zengwen Reservoir in the southern area was the largest with 0.46 billion cubic meters of effective capacity, 24.2% of the total effective capacity. It was followed by Feicui Reservoir in the northern area with 0.33 billion cubic meters of effective capacity, 17.5% of the total effective capacity.

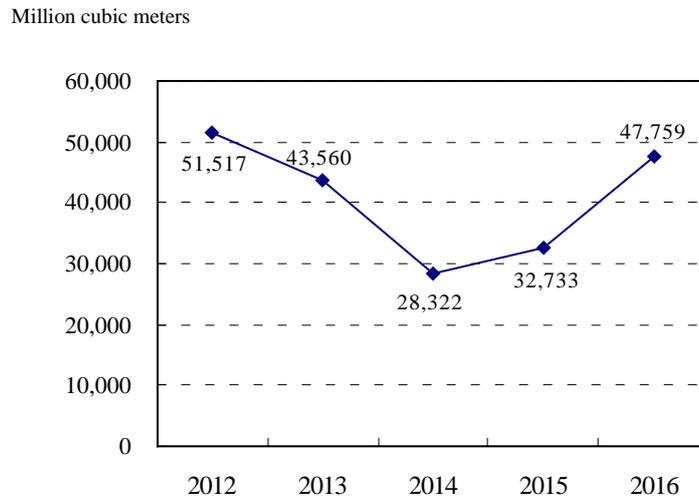
**Table 1.3.2.1 Storage capacity of reservoirs, end of 2016**

Unit: million cubic meters

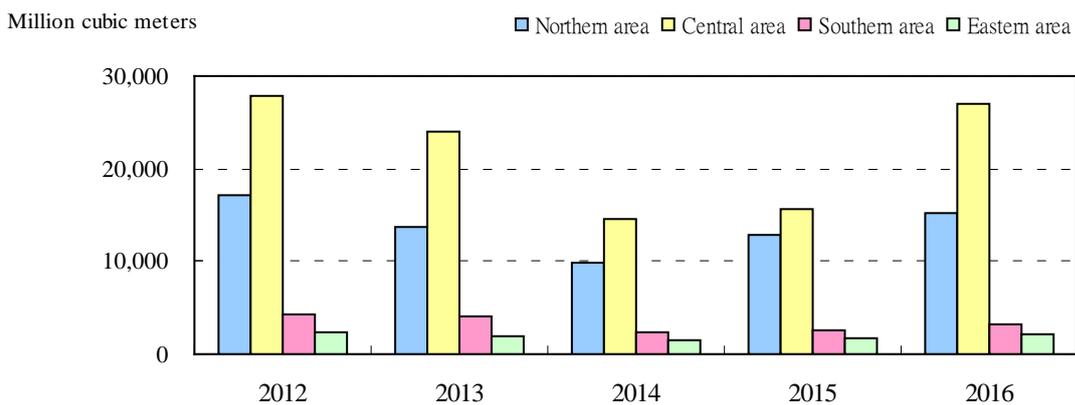
	Total	Northern area	Central area	Southern area	Eastern area	Outer islands
Number of reservoirs	95	16	21	23	6	29
Total storage capacity	2,903.0	783.0	890.6	1,217.5	1.4	10.5
Effective capacity	1,911.0	587.6	571.0	742.2	1.1	9.1

In 2016, total combined water inflow for these reservoirs was 47.76 billion cubic meters. This was up 45.9% from 2015, when the total water inflow was 32.73 billion cubic meters. In terms of areas of the country, the central area led all areas in water inflow, with 27.09 billion cubic meters, 56.7% of the total water inflow. This was followed by the northern area with 15.26 billion cubic meters, 32.0% of the total water inflow. Both combined to account for about 89% of the total water inflow.

**Figure 1.3.2.1 Total water inflow for reservoirs**



**Figure 1.3.2.2 Total water inflow of reservoirs in all areas**

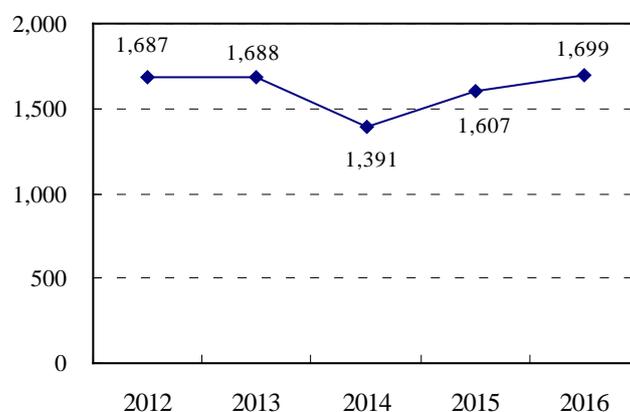


Note: The water inflow was under 10 million cubic meters in outer islands.

Even though reservoir water inflow varies greatly for each year, the volume of stored water is in a stable state roughly; this is thanks to controls on water consumption, and adjustments in flow discharge and flood flushing volume. At the end of 2016, the volume of stored water reached 1.70 billion cubic meters. This was up 5.7% from the end of 2015, when the stored water was 1.61 billion cubic meters. The southern area led here, with 0.62 billion cubic meters, up 7.3%; this was followed by the northern area with 0.57 billion cubic meters, up 6.2%. The central area accounted for 0.51 billion cubic meters, up 3.2%; however, the volume of stored water in the eastern area and outer islands was relatively very little.

**Figure 1.3.2.3 Volume of stored water of reservoirs, end of year**

Million cubic meters



**Table 1.3.2.2 Physical asset accounts for reservoirs, 2016**

Unit: million cubic meters

	Total	Northern area	Central area	Southern area	Eastern area	Outer islands
Stored water at the beginning of a year	1,607.4	536.1	489.3	574.2	0.1	7.8
Water inflow	47,758.5	15,261.7	27,086.1	3,240.0	2,160.8	9.9
Water used for power generation						
Discharge	24,557.5	3,695.5	18,059.5	1,990.8	811.7	—
Backflow	3,453.4	878.9	1,419.0	1,155.6	—	—
Domestic, agricultural & industrial water consumption	7,601.3	2,214.2	3,580.5	1,799.1	0.3	7.2
Other flow discharge and flood flushing	19,368.8	9,972.9	7,013.8	1,032.6	1,348.7	0.8
Loss of water	264.3	0.8	365.3	-103.2	—	1.3
Stored water at year's end	1,699.2	569.3	505.1	616.0	0.1	8.8

Note: Stored water at year's end = stored water at the beginning of year + water inflow - flow discharge of water used for power generation + backflow of water used for power generation - domestic, agricultural & industrial water consumption - other flow discharge and flood flushing volume - loss of water. However, due to the varying characteristics of the reservoirs (e.g., there is no water storage at run-of-the-river reservoirs, and thus no opening (closing) stored water statistics are available), the equation may not fully equal out.

Other than power generation, water stored at reservoirs is mostly provided for domestic, agricultural & industrial consumption. In 2016, it was substantial in water inflow, resulting in a significant increase in the volume of water consumption for power generation. So, there was also a significant increase in water supplies for the aforementioned consumption purposes; such water supplies rose to 7.60 billion cubic meters. Compared with 2015 (5.82 billion cubic meters ), it was up 30.6%.

### 1. Domestic water consumption

Within water consumption for all purposes, domestic water consumption is the one that's the most closely related to people's everyday lives. In 2016, reservoirs for domestic water consumption reached 3.33 billion cubic meters, up 18.8% from 2015. In terms of areas, the northern area led this supply with 1.69 billion cubic meters. It was followed by the southern and central areas with 0.98 billion and 0.66 billion cubic meters, respectively. The eastern area and outer islands only supplied 0.3 million and 7.1 million cubic meters, respectively.

**Table 1.3.2.3 Status of reservoirs for domestic water consumption**

Unit: million cubic meters

	Total	Northern area	Central area	Southern area	Eastern area	Outer islands
2012	3,315.7	1,720.5	644.9	944.2	0.3	5.8
2013	3,436.5	1,824.1	650.0	955.8	0.3	6.3
2014	3,547.1	1,866.9	689.1	983.4	0.3	7.3
2015	2,800.2	1,206.7	656.1	931.5	0.3	5.7
2016	3,326.6	1,686.7	656.5	975.9	0.3	7.1

### 2. Agricultural & industrial water consumption

In 2016, reservoirs supplied a total of 4.27 billion cubic meters of water for agricultural & industrial purposes. Agricultural water consumption amounted to 4.00 billion cubic meters while industrial water consumption was 0.27 billion cubic meters. Compared with 2015, agricultural water consumption was up 46.0% while industrial water consumption was down 1.3%. In terms of areas, the central area was the largest consumer of agricultural water, with 2.82 billion cubic meters; this was followed by the southern area, with 0.69 billion cubic meters. As for industrial water consumption, the southern area was the most prominent with 0.14 billion cubic

meters; this was followed by the central and northern areas, at 0.10 billion and 0.03 billion cubic meters, respectively.

**Table 1.3.2.4 Status of reservoirs for agricultural & industrial water consumption**

Unit: million cubic meters

	Agricultural water consumption						Industrial water consumption					
	Total	Northern area	Central area	Southern area	Eastern area	Outer islands	Total	Northern area	Central area	Southern area	Eastern area	Outer islands
2012	4,274.3	528.5	2,685.3	971.1	89.4	0.0	285.0	37.7	106.2	141.1	—	—
2013	4,323.2	505.1	2,782.3	960.7	75.1	0.0	276.2	36.1	105.2	134.9	—	—
2014	3,917.2	486.9	2,422.2	932.5	75.6	0.0	281.6	37.7	108.9	135.1	—	—
2015	2,742.6	312.6	1,876.8	553.3	—	0.0	275.5	35.8	104.8	134.8	—	—
2016	4,002.9	495.4	2,819.5	688.0	—	0.0	271.8	32.1	104.5	135.2	—	—

### 3. Water used for power generation

Rainfall is abundant in Taiwan, and river slopelands run steep, with plentiful water power resources. Hydro power was the staple for the power generation system in Taiwan in the early years after Retrocession. However, as times have progressed, hydro has ceased to be the main driver of power source development. According to the statistics by the Ministry of Economic Affairs, pumped-storage hydroelectricity only accounted for 1.5% of the total generation in 2016, lower than thermal power (79.9%), nuclear power (13.5%), and renewable energy power generation (5.1%). In 2016, due to an increase in water inflow, water consumed for power generation also increased to 24.56 billion cubic meters. This was up 43.4% from 2015.

#### (II) River basins

Owing to increasing rainfall in various areas in 2016, the volume of water from river runoff increased to 88.06 billion cubic meters. This was from a level of 54.22 billion cubic meters in 2015, an increase of 62.4%. This was also higher than mean annual river runoff (64.57 billion cubic meters) over the years (from 1949 to 2015). In terms of areas, the eastern area led in river runoff, with 26.29 billion cubic meters. This was followed by the southern, northern, and central areas with 24.33 billion, 19.49 billion, and 17.94 billion cubic meters, respectively.

**Table 1.3.2.5 General status of river runoff in water resources areas, 2016**

Unit: billion cubic meters

	Total	Northern area	Central area	Southern area	Eastern area
Drainage area (square kilometers)	36,000	7,347	10,507	10,002	8,144
Annual river runoff	88.1	19.5	17.9	24.3	26.3
Mean annual river runoff over the years (from 1949 to 2015)	64.6	15.0	15.3	17.4	16.8

**(III) Groundwater**

In addition to reservoirs and river basins, groundwater is another source of supply for water resources. It is especially important for areas where the supply of surface water is insufficient. However, groundwater is a limited resource and is not inexhaustible. It is worth noting that the recharge volume is only about 5.06 billion cubic meters annually; this leads to the draft volume exceeding the natural recharge in some regions.

In 2016, the volume of drafted groundwater reached 5.46 billion cubic meters, for an overdraft of 1.58 billion cubic meters. This was down 3.4% from 2015. In terms of the nine major groundwater regions designated by the Water Resources Agency of the Ministry of Economic Affairs, overdrafting has been occurring in the Zhuoshui River alluvial fan, the Jianan Plain, and the Pingdong Plain for many years; the overdraft volume in these regions in 2016 reached 0.66 billion, 0.54 billion, and 0.38 billion cubic meters, respectively. Compared with 2015, the three regions declined by 3.6%, 3.1%, and 3.6%, respectively. In addition, the overdrafting was also seen at Kinmen, the outer islands.

**Table 1.3.2.6 Overdrafting of groundwater**

Unit: million cubic meters

	2012	2013	2014	2015	2016
Total	1,714.2	1,692.8	1,631.9	1,634.5	1,579.1
Zhuoshui River alluvial fan	723.4	713.7	687.0	687.7	662.8
Jianan Plain	580.0	573.4	555.2	555.7	538.7
Pingdong Plain	409.8	404.4	389.3	389.7	375.6
Outer islands	1.1	1.3	0.3	1.4	1.9

## II. Depletion accounts

The depletion accounts for water resources mainly explore the depletion of groundwater while estimating its depletion value is based on the water price per unit, the cost per unit to draft groundwater, and the overdraft volume of groundwater. However, as it is currently impossible to grasp the actual price of groundwater, the price of tap water is therefore used instead. After estimation, the depletion value for groundwater reached NTD 12.56 billion in 2016, down 3.7% from 2015.

**Table 1.3.2.7 Depletion of groundwater**

Unit: million cubic meters, million NT\$

	Draft	Overdraft volume	Depletion value
2012	5,623.4	1,714.2	13,721
2013	5,596.9	1,692.8	13,526
2014	5,524.8	1,631.9	13,039
2015	5,527.3	1,634.5	13,041
2016	5,461.1	1,579.1	12,557