

## TECHNICAL NOTES

### A. Conceptual Framework of the Water Flow Accounts

The Water Accounts of the Philippines is a publication presenting the physical flow accounts for water resources in the country. This is an update of the preliminary accounts released in a progress report last January 2019.

The System of Environmental-Economic Accounting (SEEA) Central Framework serves as the framework for this study. It is a multipurpose conceptual framework that quantitatively describes the interaction between the environment and the economy. Through this framework, environmental and economic data are organized to produce integrated information for policy use.

The SEEA Central Framework discusses three main accounts: (1) the stocks and the changes in stocks of environmental assets; (2) the economic activity and transactions related to the environment; and (3) the flows of resources within the economy and between the economy and the environment, which is the main focus of this study for water resources.

The physical flow accounts for water resources describe the flow of water to and from the environment and the economy, covering the entire process of water supply and use—from the initial abstraction of water from the environment into the economy, to the flows within the economy done by the different industries and households, and finally, return flows from the economy back to the environment. The flow accounts are divided into two parts: the supply table (Annex 1) and the use table (Annex 2).

The flow accounts also provide the inputs to calculate SDGs 6.4.1 Change in Water Use Efficiency and 6.4.1 Level of Water Stress. These two indicators focus on the amount of water abstracted and used to carry out various economic activities.

### B. Definition of Terms

Terms	Definition
<b><i>Abstraction</i></b>	The amount of water that is removed from any source, either permanently or temporarily, in a given period of time.
<b><i>Consumptive Use of Water</i></b>	The part of water withdrawn from its source that will not become available for reuse.
<b><i>Distributed Water</i></b>	Abstracted water received from other economic units, particularly from the <i>Water Supply</i> industry
<b><i>Evaporation of abstracted water</i></b>	The amount of evaporation when water is distributed between economic units after abstraction (e.g. during distribution via open channels or while in water storage)
<b><i>Groundwater</i></b>	Water collected in porous layers of underground formations, known as aquifers, which yield significant quantities of water to wells and springs

Terms	Definition
<b>Losses</b>	Volume of water lost between the point of abstraction and a point of use
<b>Non-consumptive use of water</b>	Water remains in or is immediately returned to the point of extraction and is still available for use.
<b>Returns</b>	The total volume of water that is returned to the environment by economic units
<b>Reused water</b>	Wastewater supplied to a user for further use with or without prior treatment, excluding the reuse (or recycling) of water within economic units
<b>Soil water</b>	Water suspended in the uppermost belt of soil or in the zone of aeration near the ground surface
<b>Surface water</b>	This covers all water that flows over and is stored on the ground surface, which includes water in artificial reservoirs, lakes, rivers and streams, and glaciers, snow, and ice
<b>Transpiration</b>	The amount of soil water absorbed by cultivated plants and subsequently released to the atmosphere
<b>Water Stress, Level of</b>	The ratio between total freshwater withdrawn by all major sectors and total renewable freshwater resources, after taking into account environmental water requirements
<b>Water Use Efficiency</b>	The value-added of a given major sector divided by the volume of water used
<b>Wastewater</b>	Water that is discarded and is no longer required by the owner or user

Sources: 1. UN System of Environmental-Economic Accounting 2012 Central Framework;  
2. UN Food and Agriculture Organization (FAO) SDG Indicators 6.4.1 and 6.4.2 Metadata

### C. Data Sources

The data for estimating the physical flow accounts and the related SDG indicators were obtained from the following:

Data	Data Sources
<ul style="list-style-type: none"> <li>Summary of Water Permit Grants (Water Allocated), by source and by use</li> </ul>	National Water Resources Board
<ul style="list-style-type: none"> <li>Annual National Accounts</li> <li>Livestock and Poultry Inventory</li> </ul>	Philippine Statistics Authority
<ul style="list-style-type: none"> <li>Water Production</li> <li>Billed Volume</li> <li>Losses / Non-Revenue Water</li> <li>Water Prices</li> </ul>	Metropolitan Waterworks and Sewerage System Local Water Utilities Administration, Maynilad Water Services Inc., Manila Water Company, Inc.

Data	Data Sources
<ul style="list-style-type: none"> <li>Livestock and poultry daily water requirements</li> </ul>	DOST-Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development
<ul style="list-style-type: none"> <li>Parameter on water needed for irrigation (volume per hectare irrigated)</li> </ul>	National Irrigation Administration
<ul style="list-style-type: none"> <li>Total Renewable Water Resources</li> <li>Environmental Flow Requirements</li> </ul>	FAO Aquastat Database

## D. Estimation Methodology of the Accounts and Indicators

Account Entry	Data Item	Calculation, if applicable
<b>a. Abstraction for Own Use</b>		
Agriculture, Forestry and Fishing	<ul style="list-style-type: none"> <li>Water permit grants (fishery, irrigation)</li> <li>Daily water requirements of livestock</li> </ul>	Livestock: Daily water requirements* number of animals (from inventory)
Mining and quarrying, Manufacturing, and Construction	<ul style="list-style-type: none"> <li>Water permit grants (industrial)</li> </ul>	
Electricity, gas, steam and air-conditioning supply	<ul style="list-style-type: none"> <li>Water permit grants (power)</li> </ul>	
Other Industries	<ul style="list-style-type: none"> <li>Water permit grants (municipal, recreation, others) <i>minus</i> water for distribution</li> </ul>	
Households	<ul style="list-style-type: none"> <li>HFCE-Water</li> <li>Water prices</li> </ul>	Used the ratio of unorganized and organized activities of the Water Supply industry to determine households' abstraction for own use
<b>b. Distributed Water</b>		
Industries	<ul style="list-style-type: none"> <li>Water expenses of different industries and households (Supply and Use Table, Intermediate Consumption)</li> <li>Water prices</li> <li>Produced water</li> </ul>	<ol style="list-style-type: none"> <li>Used the 2018 Supply and Use Table (SUT) to get the ratio of water supply to total intermediate consumption (IC)</li> <li>Used ratio from (1) to get IC-Water for 2010 to 2019</li> <li>Converted water expenses to physical units using water prices</li> </ol>

Account Entry	Data Item	Calculation, if applicable
Households	<ul style="list-style-type: none"> <li>• Water expenses of households (Supply and Use Table, Household Final Consumption)</li> <li>• Water prices</li> <li>• Produced water</li> </ul>	<ol style="list-style-type: none"> <li>1. Used the SUT to get the ratio of water supply to total Household Final Consumption Expenditure (HFCE)</li> <li>2. Used ratio from (1) to get HFCE-Water for 2010 to 2019</li> <li>3. Converted water expenses to physical units using water prices</li> </ol>
<b>c. Return Flows of Water</b>		
Industries	<ul style="list-style-type: none"> <li>• Parameters on wastewater generation</li> </ul>	Total Water Supply * Water-use coefficient, by industry
Households	<ul style="list-style-type: none"> <li>• Total water supplied to households</li> </ul>	
<b>d. Losses</b>	<ul style="list-style-type: none"> <li>• Non-revenue water</li> </ul>	
<b>e. Evaporation, Transpiration, Water incorporated into products</b>	Balancing item for total supply and total use	

### **SDG Indicators**

The following indicators are derived following the steps outlined below.

#### **a. 6.4.1 - Water Use Efficiency**

1. From the National Accounts of the Philippines, compute the gross value added (GVA) of the following major sectors:
  - a) Irrigated agriculture (irrigated crops, livestock and poultry, aquaculture, support activities)
  - b) Mining and Quarrying, Manufacturing, Electricity and Steam, Construction (MIMEC)
  - c) Water Supply, Sewerage and Waste Management, Services
2. For each industry, divide the GVA by the volume of water used to calculate the water use efficiency (WUE). This excludes water for hydropower generation as this is non-consumptive use.
3. Get the weighted average WUE, using the volume of water as the weights.

#### **b. 6.4.2 - Level of Water Stress**

1. From the Water Flow Accounts, determine the Total Freshwater Withdrawals (TFWW). This excludes water for hydropower generation as this is non-consumptive use.

2. From the FAO Aquastat Database, get the Total Renewable Water Resources (TRWR) and Environmental Flow Requirements (EFR) for the Philippines.
3. The level of water stress is computed as:

$$\textit{Level of Water Stress} = \frac{\textit{TFWW}}{\textit{TRWR} - \textit{EFR}}$$

### **E. Data Limitations**

The current publication focuses only on surface water and groundwater abstraction. Due to data unavailability, soil water and other sources such as desalinated seawater, harvested rainwater, and reused water are yet to be included in future publications.

In addition, due to limited data on wastewater collection & treatment and reuse of water, return flows of water are estimated using industry parameters or water-use coefficients from international sources.

**Annex 1. Structure of Supply Table, Physical Flow Accounts for Water Resources**

	Agriculture, Forestry and Fishing	Mining and quarrying, Manufacturing, Construction	Electricity, gas, steam and air-conditioning supply	Water collection, treatment and supply	Sewerage	Other Industries	Households	Flows from the environment	Total Supply
<b>(I) Sources of Abstracted Water</b>									
Inland water resources									
Surface water									
Ground water									
Soil water									
Other water resources									
Precipitation									
Sea water									
<b>Total supply abstracted water</b>									
<b>(II) Abstracted water</b>									
For distribution									
For own-use									
<b>(III) Wastewater and reused water</b>									
Wastewater									
Wastewater to treatment									
Own treatment									
Reused water produced									
For distribution									
For own use									
<b>Total supply wastewater and reused water</b>									
<b>(IV) Return flows of water</b>									
To inland water resources									
Surface water									
Ground water									
Soil water									
<i>Total</i>									
To other sources									
<b>Total return flows</b>									
<i>of which: Losses in distribution</i>									
<b>(V) Evaporation of abstracted water, transpiration and water incorporated into products</b>									
Evaporation of abstracted water									
Transpiration									
Water incorporated into products									
<b>TOTAL SUPPLY</b>									

**Annex 2. Structure of Use Table, Physical Flow Accounts for Water Resources**

	Agriculture, Forestry and Fishing	Mining and quarrying, Manufacturing, Construction	Electricity, gas, steam and air-conditioning supply	Water collection, treatment and supply	Sewerage	Other Industries	Households	Accumulation	Flows to the environment	Total Use
<b>(I) Sources of Abstracted Water</b>										
Inland water resources										
Surface water										
Ground water										
Soil water										
<i>Total</i>										
Other water resources										
Precipitation										
Sea water										
<i>Total</i>										
Total use abstracted water										
<b>(II) Abstracted water</b>										
Distributed water										
Own-use										
<b>(III) Wastewater and reused water</b>										
Wastewater										
Wastewater received from other units										
Own treatment										
Reused water produced										
Distributed reuse										
Own-use										
Total supply wastewater and reused water										
<b>(IV) Return flows of water</b>										
To inland water resources										
To other sources										
Total return flows										
<b>(V) Evaporation of abstracted water, transpiration and water incorporated into products</b>										
Evaporation of abstracted water										
Transpiration										
Water incorporated into products										
TOTAL USE										