Banpu Public Company Limited

Water Management

Management Standard

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Introduction

Since water is an extremely important resource and can also be a problematic resource for all businesses. In fact, the availability of water is one of major variables for business operation.

From atmosphere, rain falls on the land and eventually finds its way back to the oceans. that water continually changes its form from water vapour to liquid water and ice as it moves through the hydrological cycle shown in figure 1. The volume of water on the move in this way has been estimated as 520,000 km^3/year, of which 412,000 km^3 returns to the oceans as direct precipitation and 108,000 km^3 falls on land.

The proportion of river runoff that is intercepted and used is small about 9% or an estimated 3,300 km^3. In high rainfall areas, much rain runoff into rivers or as floods and cannot used. In low rainfall areas, most of the rain often evaporates. Very little reaches drainage channels and watercourse to become usable water. (Maimbo et al.,2007)

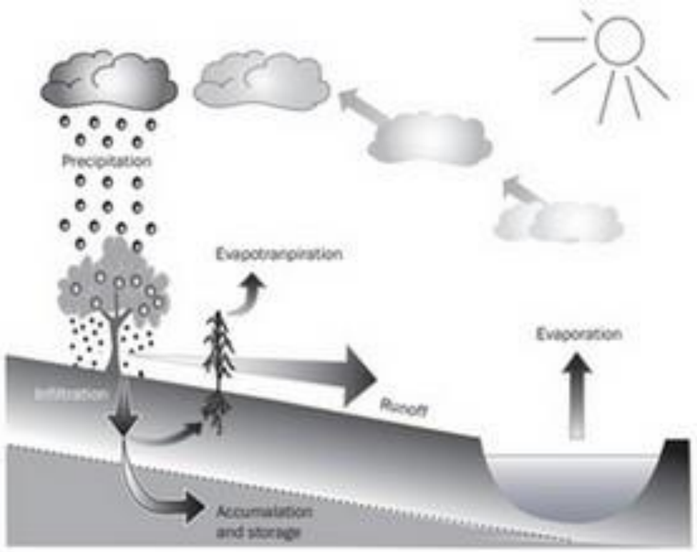

Figure 1: The Hydrological Cycle (Maimbo M. et.al., 2007)

The United Nations (UN) has set 17 Sustainable Development Goals that should be reached by 2030. These goals, often called Agenda 2030, address the global challenges faced with an aim to achieve a more sustainable future. Especially sustainable development goal (SDG) 6: “Ensure access to water and sanitation for all” point out the importance of sustainable use of water. Banpu is aware of the importance of water and therefore integrate water management into our environmental management system in order to ensure that water utilization of all operations is managed in accordance with the compliance regulations of all the countries where we operate.

This standard practice manual has developed from Banpu water management policy and Banpu Sustainable Water Management Framework which focuses on water accounting and management for holistic water minimization

Objective

1. To outline framework of water accounting and management,
2. To provide principle and practical guide for water accounting and management

Scope

This standard practice manual is applied to management control in Banpu, its subsidiaries from corporate level down to country / business unit (BU) level and site level.

Definitions

Water withdrawal
The sum of all water drawn from all sources for any use over the course of the reporting period. It includes water that has become available within operational area, for instance groundwater accessed during dewatering of the ore body, and excludes water diverted away from operational area.

Water discharges
The sum of treated or untreated wastewater, which a plant has no further use and discharged to a public area or a third-party even via pipe or truck over the course of the reporting period. Discharge water must meet discharge quality standard in each operational area.

Water consumption
The amount of water drawn from all sources for any use and not discharged back to a public area or a third- party over the course of the reporting period – includes: water evaporation, water used, water loss, and water change in storage. The term excludes bottling water.

Water reused
Reused water is worked water that is used in a task without treatment

Water recycles
Recycled water is worked water that is treated before using in a task.

Water diversion
The volume of water that is diverted away from, or actively managed by a site but not used for any operational purposes. Diversions may include:
• flood water which is discharged to an external surface water body
• rainwater which is directed away from the operation and may be collected in ponds or pits but is not intended for use in a task.
• dewatering volumes produced by aquifer interception discharged to surface water which may or may not pass-through primary treatment such as settling pond.

Surface water
All water naturally open to the atmosphere such as rivers, creeks, lakes and external surface water storages. The term excludes on-site water storage, seawater and brackish water.

Precipitation and runoff
Precipitation includes rainwater, snow and hail which can separate from surface water consumed.
• Runoff is precipitation which flows towards a river on the ground surface (surface runoff) or within the soil (subsurface runoff or interflow).
• Rainwater can be excluded from water withdrawal/discharge volumes if the resulting error in their water balance is less than 5%. (www.cdp.net)

Groundwater
Water beneath the earth's surface that fills pores or cracks between porous media such as soil, rock, coal, and sand, often forming aquifers. Mine water (seeping water) and water that is entrained in the ore can be considered as groundwater.
- Renewable groundwater sources can be replenished within 50 years and are usually located at shallow depths.
- Non-renewable groundwater has a negligible rate of natural recharge on the human timescale (more than 50 years) and is generally located at deeper depths than renewable groundwater. This is sometimes referred to as "fossil" water.

Brackish water
Water from estuaries containing dissolved salts at a concentration greater than that of freshwater, and significantly less than that of seawater.

Seawater
Water from oceans, seas and estuaries in which the concentration of salts is high and far exceeds normally acceptable standards for municipal, domestic or irrigation use. Seawater has a typical concentration of salts above 35,000 mg/L TDS.

Third-party water
Water supplied by municipal water suppliers, public or private utilities, and wastewater from any other organization to a site.

Freshwater
Water with a low concentration of salts, or generally accepted as suitable for the production having concentrations of dissolved solids equal to or less than 1,000 mg/L.

Other water
Water with concentration of total dissolved solids more than 1,000 mg/L

Primary treatment
Primary treatment involves the physical removal of suspended solids and floating material, typically by sedimentation. A preliminary treatment may often be applied involving the physical removal of large debris, large particles, oils, and grease, typically through screens and grit chambers.

Secondary treatment
Secondary treatment involves the degradation of organic matter and reduction of solids through biological treatment. The removal of nutrients (nitrogen and/or phosphorus) can also be achieved at this level of treatment using a combination of chemical and biological treatments. Secondary treatment follows primary treatment.

Tertiary treatment
Tertiary treatment involves the additional treatment needed to remove suspended, colloidal and dissolved constituents (nutrients, heavy metals, inorganic and other contaminants) remaining after secondary treatment through a number of processes including granular media filtration, biological nitrification-denitrification, biological phosphorus removal, chlorination, etc. Tertiary treatment follows secondary treatment.

Process / Content

Water Quality Management
Since the limitation of law and regulation is different in each country, all business functions should conduct water quality monitoring followed the national laws and regulations such as the monitoring frequency, analytical method, monitoring parameter/substances and also threshold limit. Prioritizing the significant parameter or substance should be conducted in accordance with the International Standards such as International Finance Corporation (IFC) guideline and the national laws and regulations that the significant parameter shall be addressed in both requirements. The identified significant parameter or substance of each business is as follows.

Parameter/Substance		Unit	Power BU	Mining BU	Gas BU
pH	-	-	/	/	/
Oil & Grease	-	mg/l	/	-	-
Total Suspended Solid	TSS	mg/l	/	/	/
Chemical oxygen demand	COD	mg/l	/	-	/
Iron	Fe	mg/l	-	/	/

Reporting water withdrawn and discharged by source and destination contributes to an understanding of overall scale of potential impacts, risk and efficiency related to water use of operation. Therefore, all operations shall breakdown the water withdrawal and water discharge for each of the original sources and destination by following categories as GRI requirement:

i) Freshwater (≤ 1000 mg/l Total Dissolved Solids)
ii) Other water (> 1000 mg/l Total Dissolved Solids)

Rainwater and seawater will be categorized as fresh water and other water respectively. If water withdrawal is supplied by a third party, water withdrawal quality (TDS) from the original source (raw water) should be provided, especially for the operation located in water stress area.

If any environmental incident happens, it will be managed as HSEC incident Reporting. See the details of HSEC incident Reporting in *BP-GCS-WP-003 Corporate Incident Reporting, Investigation and Follow-up Procedure.*

Water accounting framework
Water accounting is a framework which provides measurement, monitoring and reporting protocols, to support public and investor confidence in the amount of water being traded, extracted for consumptive use, and recovered and managed for environmental and other public benefit outcomes. (MCA, 2014)

It is different between water accounting and reporting. Accounting related to the consolidation of water balance information as framework description. Reporting related to the presentation of water balance information in designed formats. The water system concept model for water accounting as shown in figure 2 and for giving water reporting period (e.g., a year) can be calculated and presented based on ICMM guideline as the equation:

Water withdrawal = storage + Water discharge + [Water consumption] or

storage = Water withdrawal – Water discharge – [Water Used + Water Loss + Water Evaporation]

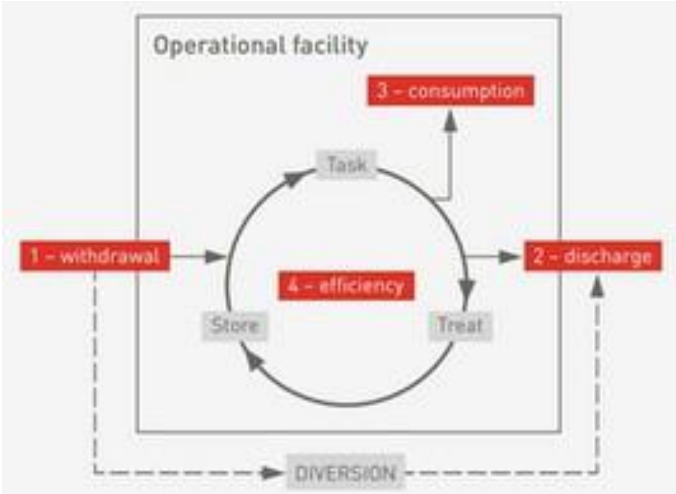

Figure 2 Water system concept model for accounting purposes
Source: ICMM (2017)

Water accounting development
This section shows how to develop the statements within the water accounting framework, the following provides an example list of information that will be needed prior to developing an account,
- Water Flow Diagram
- A list of tasks with an average yearly water demand
- A list of water source, volumes and water quality
- Discharge or any other water flows that leave the site boundary with any water quality monitoring data
- Estimates, simulations or measurements (if available) for:
    - Seepage
    - Rainfall and runoff
    - Evaporation
    - Loss
- Flow volumes around water treatment plants
- Other Flow volumes from
- thickeners (if applicable) to process water store
- any return flows from tasks to stores
- tailings storage facility to process water store (specific for mining business)
- ore dewatering (specific for mining business)
- Information on stores i.e.,
    - Store volumes at beginning and end of reporting period
    - Water quality of stores
    - Surface areas of stores and catchment areas (including the proportion of undisturbed land)

Water Reporting Metrics
Water reporting included input and output in terms of the volume and source of destination as applicable. Input such as rainfall or runoff, and output such as discharge or seepage (if any).

In this regard, if the water in storage location has been identified as having a significant water-related impact, the organization is required to report water storage. The water storage level will be specified and recorded at the start and end of specific reporting period (e.g., 1 year) or call “change in water storage”. water reporting shall be conducted under GRI 303 and water accounting framework as shown in table 1 and detail as table 2

Table 1 Water Reporting Framework

Environmental topic	**Water Reporting Indicator**	**Reference GRI**
Water		
	Interactions with water as a shared resource include identifying water-related risk and impact assessment and water mitigation and monitoring measures	303-1
	Management of water discharge-related impacts	303-2
	Total withdrawal from all areas in megaliter	303-3
	Total withdrawal from all areas with water stress in megaliter	303-3
	Total water discharge to all areas in megaliter	303-4
	Total water discharge to all areas with water stress in megaliter	303-4
	Total water consumption from all areas in megaliter	303-5
	Total water consumption from all areas with water stress in megaliter	303-5
	Change in water storage in megaliter, if water storage has been identified as having significant water-related impact	303-5

Table 2 Detail of water reporting under GRI 303 and water accounting framework (Input-output statement)

Metrics	Source/destination/type	Inputs/outputs
Withdrawal	Surface water	Precipitation & runoff
		Rivers & creeks
		External surface water storage
	Groundwater	Aquifer interception
		Bore fields
		Entrainment
	Sea water	Estuary
		Sea/ocean
	Third party supply	Contract/municipal
		Wastewater
	Total withdrawal (inputs)	
Discharge	Surface water	Discharge
		Environmental flows
	Groundwater	Seepage
		Reinjection
	Sea water	Discharge to estuary
		Discharge to sea/ocean
	Supply to third party	
	Total discharge (outputs)	
Consumption (other)	Other	Water Used
	Other	Water Loss
	Other	Water Evaporation
	Other	Other
	Total consumption (other)	
Change in water storage	Δ storage = water withdrawal – water discharge – water consumption	

To monitor and indicate the performance of water management, Banpu has presented in terms of water consumption volume or water consumption intensity which is calculated from water used divided by total production, the calculation can be shown as follows,

$$\text{Water consumption intensity} \quad = \frac{\text{Water Consumption}(\text{m}^3)}{\text{Unit of Product}}$$

Water-Related Risk Management

Water-related risk and impact are identified annually in order to understand risks, impact and prepare water mitigation and monitoring measures for all Business Unit. This assessment is conducted through Aqueduct Water Risk Atlas of World Resource Institute against Aqueduct's thresholds for water stress area. In addition, the Water Footprint of Product (WFP) is also conducted to internal manage water uses following ISO14046 guideline.

Water management hierarchy

The water management hierarchy for holistic water minimization is presented to identified improvement potentials, which is divided into five level. The top level 1 is highest priority option and level 5 is the least preferred as shown in figure 2

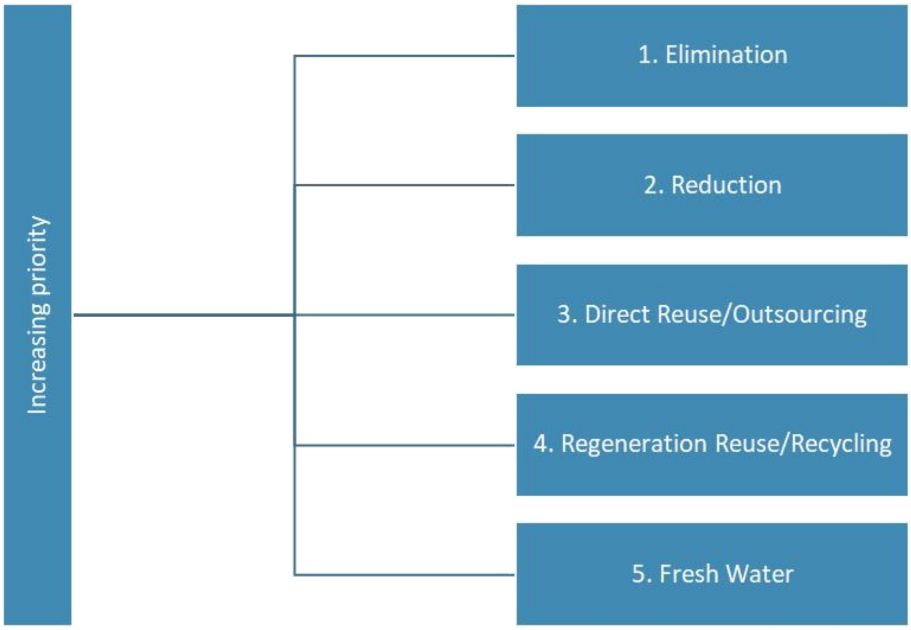

Figure 2 The Water Management Hierarchy (Joakim, 2020)

1. Elimination is the first option, refers to entirely eliminating water use in some process (if possible). Eliminating is viewed as the ultimate goal, but many cases a total eliminating of water use is not possible.
2. Reduction is the second option to purse when eliminating is not possible. Reduction in the water management hierarchy covers actions or attempts to reduce water use in processes that are the source of water use.
3. Direct reuse/outsourcing is the third option. Direct reuse of water is the process where water is used in several process without treatment in between. The definition of outsourcing in the water management hierarchy means that possibility to use external water source.
4. Regeneration reuse/recycling is similar to direct reuse, except from that the water requires treatment before being reused/recycled.
5. Fresh water is the least preferable option and should only be considered when wastewater cannot be reused or recycled.

Reference

-GRI 303, Water and Effluents, 2018
-International Council on Mining and Metals (ICMM), A practical guide to consistent water reporting, 2017
-International Finance Corporation (IFC), Environmental, Health, and Safety Guidelines for Mining, 2007
-International Finance Corporation (IFC), Environmental, Health and safety Guideline for Thermal Power Plants, 2008
-International Finance Corporation (IFC), Environmental, Health and safety Guideline for Onshore oil and gas development, 2007
-Joakim Koski, A Standardized Approach for Water Reduction Measures in Industrial Companies, 2020
-Minerals Council of Australia, Water Accounting Framework for Minerals Industry, 2014
-Maimbo M., Alex R and Alex R, World Agroforest Centre, Green water Management Handbook, 2007
-www.cdp.net, Water Security 2020 Reporting Guidance, 2020