GEMI Local Water Tool™ (LWT) for Oil and Gas: Definitions and Calculations

Users are recommended to refer to comprehensive glossaries on water-related terms that have been developed by WBCSD in Water for Business (2010) or the Glossary of Hydrology, UN World Water Assessment Program (http://hydrologie.org/glu/aglo.htm).

For additional information or to make suggestions, please contact info@gemi.org.

Selected terms employed in the GEMI LWT™ for Oil and Gas is defined below:

1. Definitions of Terms

Barrel of oil equivalent (BOE): For liquids, one BOE equals one barrel of oil or condensate. For gases, BOE equals approximately 5,800 standard cubic feet (Scf) of gas.

Beneficial use: Discharges directly to external organizations for specific use by industry, agriculture, human use or constructed wetlands.

Chemical Oxygen Demand (COD): Mass concentration of oxygen equivalent to the amount of a specified oxidant consumed by dissolved or suspended matter when a water sample is treated with that oxidant under defined conditions. Measurement units: mg/l.

Dashboard: An overview of key metrics and indicators for the user to quickly assess the performance of an operation.

Degradation: A concept related to the lowering in quality of a water body.

Degradative water use: Describes the quality change in water used and released back into the same watershed.

Depletion: Continued withdrawal of water from groundwater or other water body at a rate greater than the rate of replenishment.

Drilling and Completion Operations: The activities of a company including seismic, drilling, completion, hydraulic fracturing, ice roads, pad development and people camps.

Ecosystem: An integrated system formed by the interaction of a community of living organisms, the non-living physical environment, and the processes that affect them.

Effluent: see water discharge.

External Stress Severity Level: describes the current conditions of a specific water source. It is a result of natural physical conditions and cumulative anthropogenic (human, industry, agriculture) impacts. Each External Stress Severity Issue and Level is defined on the "Droplist" worksheet.

Gas Processing Operations: The activities of a company including Liquefied Natural Gas (LNG) Plants, LNG Regasification Plants, gas treating, and Liquefied Petroleum Gas.

Freshwater: The constituent content of freshwater should be defined by local regulations. In the absence of local regulations, User should determine best definition for a site based on company policies and global guidelines. A limit of 1,000 mg/L of TDS (the limit set by the World Health Organization for drinking water) is the guidance for categorization of fresh and non-fresh for surface and groundwater. IPIECA's definition of Freshwater states that the total dissolved solids (TDS) concentration of this water type is up to 2000 mg/l.

Groundwater: Subsurface water occupying the saturated zone.

Impact: A company's individual impact on a particular water sources is defined as the extent to which the volume and/or quality of water used by a company in a specific watershed affects the availability of water for other uses or harms health or ecosystems in any other way.

Influent source: origin of water withdrawal.

Internal Importance Level: describes the business criticality of each Influent Source and Receiving Waterbody or Entity. Each Internal Importance Level is defined on the "Droplist" worksheet.

Light/Medium Crude Oil: is defined as having an API gravity higher than 23.3 °API. (less than 920 kg/m3)

Management plan (method): Defines how a company is addressing, implementing and monitoring performance on an issue.

Municipal supply: Supply of drinking quality water by a public organization.

Non-communicating underground reservoir: a confined subsurface water source with no hydrologic connection to other waterbodies.

Non-Freshwater: Water that is not considered fresh. See Freshwater definition.

Oil Sands Operations: The activities of a company to produce and upgrade oil or bitumen from surface mining or in-situ fields.

Operation: The site-level business function. Examples include refining, manufacturing, or mining.

Opportunity: Potential top line business enhancements created by voluntary sustainable water management actions.

Performance indicator: Qualitative or quantitative information about results or outcomes associated with an effort that is comparable and demonstrates change over time.

Petrochemical Operations: The activities of a company to convert hydrocarbons into chemicals and other products.

Petroleum Value Chain Operations: Drilling and Completion, Production, Oil Sands, Transport and Terminals, Gas Processing, Refining, Petrochemicals, and Retail.

Pollutant/pollution: A substance/the addition of a substance that impairs the suitability of water for a considered purpose.

Potable water: Water that is suitable for drinking.

Precipitation: Liquid or solid products of the condensation of water vapor from clouds or deposited from air on the ground.

Process: specific activities within an operation. One site/operation may have multiple processes which use or discharge water. For example, a manufacturing operation may have a cooling process, a cleaning process and a chemical reaction process.

Produced Water: Water that is brought to the surface during production of hydrocarbons.

Product: Any material of commercial value which is extracted, processed, refined, manufactured or transported by an oil company.

Production Operations: The activities of a company to extract naturally occurring fossil fuel resources including oil production (primary, secondary/steam, tertiary, shale) or gas (conventional, coal bed methane, shale, hydrates, in-situ combustion). Hydraulic fracturing is considered to be a production operation.

Quality: The quality of a specific water body is defined by the suitability or condition of the water for a particular use based on its physical, chemical, and biological characteristics.

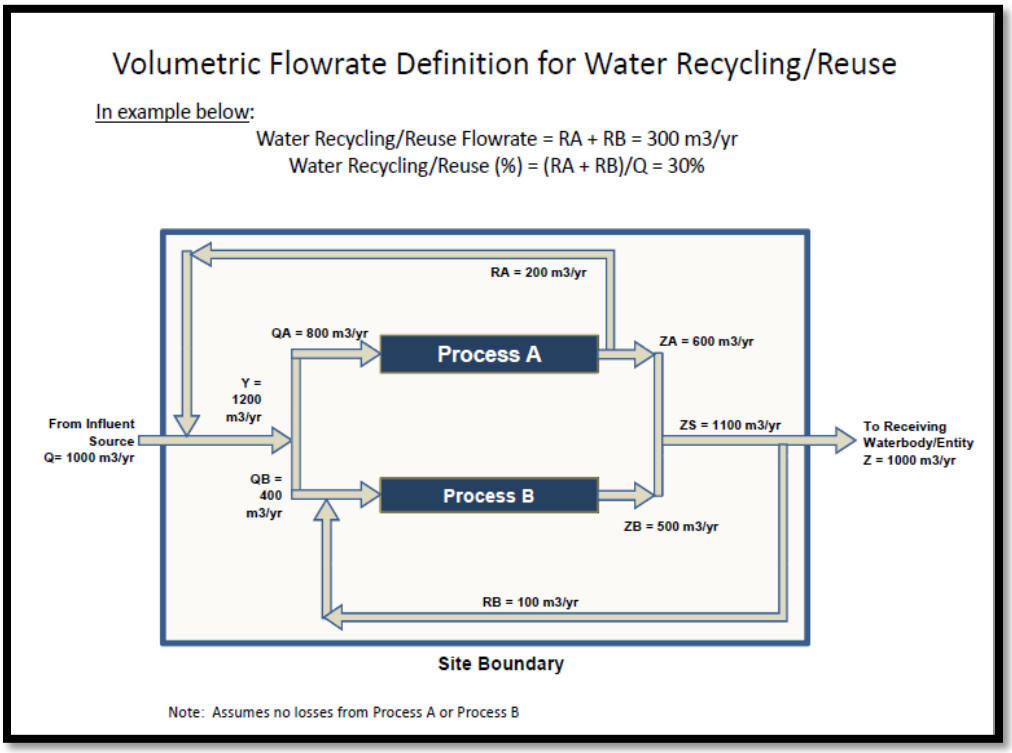
Rainwater: Rainwater volume should be entered under Module 1_Influent if it is used onsite as a water source. If it just falls onsite and is not used, then it does not need to be entered.

Receiving waterbody or entity: Destination of water discharges.

Recycled water: The amount of used water/wastewater employed through another cycle back in the same process or in a higher use in the process cycle before discharge for final treatment and/or discharge to the environment.

Recycled/Reused volumetric flowrate: Recycled/reused water should be counted only once because water is extracted from its original source only once.

Recycled/Reused water (%): Total of Recycled and Reused Water as a percentage of Total Water Withdrawal.



Refining Operations: The activities of a company to convert hydrocarbons or biofuels into fuel, lubricants, asphalts and other derivatives.

Reinjection: Injection of produced water back into the reservoir for pressure maintenance for further production.

Reporting: Disclosing relevant information and data to internal and external stakeholders such as management, employees, governments, regulators, shareholders, the general public, local communities or specific interest groups.

Reservoir: term used to signify an underground volume of gas and/or liquid.

Retail Operations: The activities of a company to sell products and services at commercial stations.

Reused water: The amount of used water/wastewater employed in another function in a lower use in the process cycle before discharge for final treatment and/or discharge to the environment. Reuse includes wastewater used for irrigation within a facility boundary. Reuse includes harvesting of rainwater within a facility boundary.

Risk: A company's risk from using water from a particular water source is defined as potential business liabilities faced by the site as a result of impacts and external water-related drivers and constraints. "Risk" in this tool is not synonymous with a specific regulatory or financial reporting requirement such as that required by the U.S. Securities and Exchange Commission.

Site: A unique location of a business operation.

Source: Origin of water withdrawal.

Stress: The tension resulting from the imbalance of insufficient supply and strong demand.

Subsurface Discharge: Effluent discharge point below ground. The receiving entity may be disposal to a closed saline/non-freshwater body or it may be injected to a freshwater aquifer that is used by others.

Surface water: Water that flows over or is stored on the ground surface.

Total Dissolved Solids (TDS): Total weight of dissolved mineral constituents in water per unit volume of water in the sample. Measurement unit: mg/l.

Total Petroleum Hydrocarbons (TPH): any mixture of hydrocarbons that are found in crude oil or gas. Chemicals that occur in TPH include hexane, benzene, toluene, xylenes, naphthalene, and fluorene, other constituents of gasoline, of jet fuels, of mineral oils, and of other petroleum products.

Turbidity: Condition of a liquid due to fine, visible material in suspension, which impedes the passage of light through the liquid. The units of turbidity from a calibrated nephelometer are called Nephelometric Turbidity Units (NTU).

Water consumption: per Calculation Methodologies below, water consumption is the difference between water withdrawal and water discharge. Consumption removes water from a water system and makes it unavailable for further use.

Water discharge: Water effluents discharged outside a reporting organization boundary to subsurface waters, surface waters, sewers that lead to rivers, oceans, lakes, wetlands, treatment facilities, and groundwater.

Water withdrawal (or use): The sum of all water drawn into the boundaries of the reporting organization from external sources.

Water intensity: The ratio between water withdrawal or water consumption and a defined unit of production

Watershed: Area having a common outlet for its surface runoff. Synonyms include: catchment, drainage area, and river basin

2. Calculation Methodologies

A) Freshwater Withdrawal and Consumption

1) Total freshwater withdrawal (A1):

The sum of all freshwater drawn into the boundaries of the reporting organization from the following sources for any use over the course of the reporting periods:

a) Surface water

b) Groundwater

c) Municipal supply (including potable water purchased from other industries)

d) External wastewater

e) Produced water from a company's own operations

f) Rainwater and precipitation captured by the Site

2) Total Freshwater Consumed by Facility (A3):

The quantity of freshwater:

a) Evaporated for cooling purposes

b) Evaporated from water storage facilities

c) Lost via transmission

d) Used directly in the organization's products

e) Onsite uses, including water lost in re-injection for oil or gas production, irrigation and road maintenance

Freshwater consumption is the difference between freshwater intake and freshwater discharge. Consumption removes water from a water system and makes it unavailable for further use.

B) Non-Freshwater Withdrawal and Consumption

1) Total Non-Freshwater Withdrawal (B1):

The sum of all non-freshwater drawn into the boundaries of the reporting organization from the following sources for any use over the course of the reporting periods:

a) Seawater

b) Surface water – brackish or saline source

c) Groundwater and produced water – brackish or saline source

d) External wastewater – untreated or partially treated wastewater from municipal or other external industrial source

2) Total Non-Freshwater Consumed by Facility (B2):

The quantity of non-freshwater:

a) Evaporated for cooling purposes

b) Evaporated from water storage facilities

c) Lost via transmission

d) Onsite uses, including water lost in re-injection for oil or gas production, irrigation and road maintenance

Non-Freshwater consumption is the difference between non-freshwater intake and non-freshwater discharge. Consumption removes water from a water system and makes it unavailable for further use.

C) Total Water Withdrawal and Consumption

1) Total Water Withdrawal (Meets GRI EN8 Definition) (C1):

The sum of Total Freshwater Withdrawal and Rainfall (A2) and Total Non-Freshwater Withdrawal (B1) for any use over the course of the reporting period.

2) Total Water Consumed by Facility (C2):

The quantity of fresh (A3) and non-freshwater (B2):

a) Evaporated for cooling purposes

b) Evaporate from water storage facilities

c) Lost via transmission

d) Used directly in the organization's products

e) Onsite uses, including water lost in re-injection for oil or gas production, irrigation and road maintenance

D) Freshwater Discharge

1) Freshwater Discharge (D1):

Water effluents from fresh sources (A3) discharged outside a reporting organization boundary over the course of the reporting period to subsurface waters, surface waters, sewers that lead to rivers, oceans, lakes, wetlands, treatment facilities, and groundwater through:

- A defined discharge point (point source discharge) – including sales of water to an external facility
- Over land in a dispersed or undefined manner (non-point source discharge)
- Wastewater removed from the reporting organization via truck

Discharge of collected rainwater and domestic sewage are regarded as wastewater discharge.

E) Non-Freshwater Discharge

1) Total Water Discharge (relevant to GRI EN 21 – but Not Exactly Same) (E1):

Water effluents from non-freshwater sources (B2) discharged outside a reporting organization boundary over the course of the reporting period to subsurface waters, surface waters, sewers that lead to rivers, oceans, lakes, wetlands, treatment facilities, and groundwater through: A defined discharge point (point source discharge) – including sales of water to an external facility

- Over land in a dispersed or undefined manner (non-point source discharge)
- Wastewater removed from the reporting organization via truck

Discharge of collected rainwater and domestic sewage are regarded as wastewater discharge.

F) Total Water Discharge

1) Total Water Discharge (GRI EN 21) (F1):

The sum of fresh (D1) and non-freshwater (E1) effluents discharged outside a reporting organization boundary over the course of the reporting period to subsurface waters, surface waters, sewers that lead to rivers, oceans, lakes, wetlands, treatment facilities, and groundwater through:

- A defined discharge point (point source discharge) – including sales of water to an external facility
- Over land in a dispersed or undefined manner (non-point source discharge)
- Wastewater removed from the reporting organization via truck

Discharge of collected rainwater and domestic sewage are regarded as wastewater discharge.
(Note: this definition includes rainwater and domestic sewage. GRI EN21 does not include these.)

G) Internal Recycling and Reuse

1) Recycling (G1):

The amount of used water/wastewater employed through another cycle back in the same process or in a higher use in the process cycle before discharge for final treatment and/or discharge to the environment.

2) Reuse (G2):

The amount of used water/wastewater employed in another function in a lower use in the process cycle before discharge for final treatment and/or discharge to the environment. Reuse includes wastewater used for irrigation within a facility boundary. Reuse includes harvesting of rainwater within a facility boundary.

3) Total Recycled and Reused Water (Meets GRI EN10 with G4) (G3):

The total amount of recycled (G1) and reused (G2) water/wastewater.

4) Percentage of Total Recycled and Reused Water (Meets GRI EN10 with G3) (G4):

The Total Recycled and Reused water (G3) as a percentage of Total Water Withdrawal (C1).