Glossary of Water and Water-Related Terms

WARPO
পানি সম্পদ পরিকল্পনা সংস্থা

Water Resources Planning Organization
Ministry of Water Resources
Government of the People's Republic of Bangladesh
WARPO Bhaban, 72 Green Road, Dhaka.
www.warpo.gov.bd

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Kabir Bin Anwar
Secretary, Ministry of Water Resources
Govt. of the People's Republic of Bangladesh

Message

Study of water is interdisciplinary, so is its governance and language is fluid where everyone has different method and style of interpretation for referring almost the same thing. The idea of landscape planning becomes waterscape planning when it is considered from the vantage point of delta management. A glossary is thus needed for providing consistency and clarity prior to translating an idea with words. The point of a glossary is to improve the quality of the translation, so the selection of words to be put in it needs to be handled with care. To this end, I find WARPO's effort in making of this glossary on water related terms useful. Water governance takes on many academic avenues so far, and there are other emerging areas like harnessing the potentials for the implementation of Bangladesh Delta Plan 2100 to establish safe and secured Bengal Delta. This is a dream we have inherited from our Father of the Nation Bangabandhu Sheikh Mujibur Rahman. I am delighted to note that my colleagues from WARPO celebrate the birth centenary of Bangabandhu with the publication of this booklet.

I wish wide use of this booklet by the water sector professionals, academics and anyone interested to ponder with the knowledge on 'flow of life'

Kabir Bin Anwar

WARPO
পানি সম্পদ পরিকল্পনা সংস্থা

Md. Mahmudul Hasan
Director General
Water Resources Planning Organization

Message

Being the secretariat of the Executive Committee of National Water Resources Council and custodian of the national water resources database (NWRD), Water Resources Planning Organization (WARPO) seeks to ensure integrated and coordinated development of country's water resources. Such an integrated approach requires shared understanding that stems from common interpretation of vocabulary related to different facets of water governance. WARPO strongly feels that there is a need for a common understanding on water and water related terms. And it's a delight to present this book of glossary that aims to cover a wide area of definition as well as technical and policy terms, ranging from hydrology and climate science to economic analysis of water resources. Combination of such terminology in a user friendly format will add to their usefulness and better understanding that can be used by researchers, academics, policy planners and other interested individuals.

We are grateful for the overall support and kind guidance from Mr. Kabir Bin Anwar, Secretary, Ministry of Water Resources. Mr. Mahmudul Islam, Additional Secretary, Ministry of Water Resources has been instrumental in recognizing the need for this glossary book and overall review process. I recognize the sincere effort from my WARPO colleagues in materializing this publication, and hope that this collection will be well received by its potential users.

Md. Mahmudul Hasan

Acknowledgements

We are indebted to Honorable Secretary of Ministry of Water Resources Mr. Kabir Bin Anwar for his overall support and guidance in the development of this glossary book. Insights of Mr. Mahmudul Islam, Additional Secretary, Ministry of Water Resources provided the necessary momentum for organizing our thoughts and designing of this publication. We could not have made it without the active engagement and support of Mr. Md. Mahmudul Hasan, Director General, Water Resources Planning Organization (WARPO). We are grateful to our colleagues in the Ministry of Water Resources, WARPO, Bangladesh Water Development Board (BWDB), Institute of Water Modelling (IWM), Centre for Environmental and Geographic Information Services (CEGIS) for their intellectual contribution in making of this collection of water and water related terms.

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GLOSSARY OF WATER AND WATER-RELATED TERMS

A

Ablation

The process by which ice and snow dissipate owing to melting and evaporation. On the other hand, ablation is the natural removal of snow or ice from the surface of a glacier or snowfield.

Absolute Humidity

Mass of water contained in a unit volume of moist air.

Absorption

The process by which substances in gaseous, liquid, or solid form dissolve or mix with other substances.

Absorption Loss

The loss of water by infiltration or seepage into the soil during the process of priming, i.e., during the initial irrigation of a field; Generally expressed as flow volume per unit of time.

Abutment (of a Dam)

The part of a valley side wall against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section to take the thrust of an arch dam where there is no suitable natural abutment. Right and left abutments are designated as one looks downstream.

Abutment Seepage

Reservoir water that moves through seams or pores in the dam's natural abutment material and exists as seepage.

Abyss

The great depths of the oceans, usually considered to be depths of 2000 to 6000 m, a region of low temperatures, high pressure and an absence of sunlight.

A Abyssal

The deepest parts of the ocean or on the bottom of deep oceans or relating to the bottom water of the ocean depth.

Abyssal Hills

Tract, sometimes extensive, of low (100-500 m) elevations on the deep sea floor.

Abyssal Plain

An abyssal plain is an underwater plain on the deep ocean floor, usually found at depths between 3,000 meters (9,800 ft) and 6,000 meters (20,000 ft). It is lying generally between the foot of a continental rise and a mid-ocean ridge, abyssal plains cover more than 50% of the earth's surface.

Abyssopelagic

Open water habitat of the abyss. Distinct from the benthic (seabed) habitat.

Abyssal Zone

The bottom of a deep ocean. The abyssal zone or abyssopelagic zone is a layer of the pelagic zone of the ocean. At the depths of 3,000 to 6,000 meters, this zone remains in perpetual darkness. It alone makes up over 83% of the ocean and covers 60% of the Earth.

Abstraction, Q [m^3/d, m^3/a]

The removal of water from a groundwater reservoir, usually by pumping.

Acceptance Capacity

Quantity of pollutants which a water body can accept without the pollution exceeding a given level.

Acid Mine Drainage

Water draining from areas that have been mined for coal or other mineral ores. The drainage water is acidic, sometimes having a pH less than 2.0, because of its contact with sulfur-bearing material.

Acid Rain

Precipitation that has a low pH (low pH is defined as anything less than 5.6). The precipitation becomes acidic when moisture in the air reacts with sulfur and nitrogen pollutants in the atmosphere.

Accretion

The slow addition to land by deposition of water-borne sediment or an increase in land along the shores of a body of water, as by alluvial deposit.

Acidity

The quantitative capacity of a water or water solution to neutralize an alkali or base. It is usually measured by titration with a standard solution of sodium hydroxide, and expressed in ppm or mg/l of its calcium carbonate equivalent.

Acid Drainage

Any drainage from mine workings, waste or tailings, with a low (acidic) pH.

Acid Rain

Rainfall with a pH of less than 7.0. One of the principle sources is the combining of rain (H_2O) and sulfur-di-oxide (SO_2), nitrous oxides (NO_x), and carbon-di-oxide (CO_2) emissions which are byproducts of the combustion of fossil fuels. These oxides react with the water to form sulfuric acid (H_2SO_4), nitric acid (HNO_3), and carbonic acid (H_2CO_3). Long-term deposition of these acids is linked to adverse effects on aquatic organisms and plant life in areas with poor neutralizing (buffering) capacity.

Acid Soil (Alkaline Soil, Neutral Soil)

A description of one aspect of a soil's chemical composition. Many plants will grow best within a range of pH rating from slightly acid to slightly alkaline. A pH rating of 7 means that the soil is neutral; a pH below 7 indicates acidity; a pH above 7 indicates alkalinity.

Acidification

The lowering of pH in soils or water. Commonly associated with changes caused by external processes such as acid precipitation and acidic runoff.

Active Conservation Storage

The portion of water stored in a reservoir that can be released for all useful purposes such as municipal water supply, power, irrigation, recreation, fish, wildlife, etc. Conservation storage is the volume of water stored between the inactive pool elevation and flood control stage.

Active (Usable) Storage Capacity

The total amount of reservoir capacity normally available for release from a reservoir below the maximum storage level. The total or reservoir capacity minus inactive storage capacity. More specifically, it is the volume of water between the outlet works and the spillway crest.

Adaptation

Climate change is now affecting every country on every continent. The pace of change is quickening as more people are turning to renewable energy and a range of other measures that will reduce emissions and increase adaptation efforts. For UNDP, adaptation means climate-resilient economic development and sustainable livelihoods, especially for vulnerable populations, the poor, women, and indigenous peoples. These communities are often the most vulnerable to climate change and are at greater risk to its impacts. A single shock, a storm or drought or slow onset impact, such as sea level rise can exacerbate existing vulnerabilities and increase the likelihood of locking communities already at risk into cycles of poverty.

Adaptation Tipping Point

Threshold conditions under which an action or strategy will no longer meet a set of pre-defined policy or strategic goals or standards.

Adaptation Pathway

A sequence of measures to achieve a set of pre-defined goals under changing external conditions, such as climate, socio-economic factors or other developments.

Adaptation (pathways) Map

Visualization of a set of adaptation pathways showing options for transferring from one pathway to another and the timing and/or conditions under which an adaptation tipping point of a policy action occurs.

Adaptive Delta Management

Adaptive delta management is an approach to deal with uncertainties in a transparent and sensible way to support decision making with regard to water policy, planning and infrastructural investments. It links current decision making to future choices. It builds further upon years of Integrated Water Resource Management experience in developing and developed countries.

Adhesion

Molecular attraction between the surfaces of two bodies in contact.

Adhesive water

Water which is held in the soil by molecular attraction and forms a film around the solid particles of the soil.

Advection

Mass transport caused by the bulk movement of flowing groundwater in which the mass is dissolved.

Aeration Zone

A portion of the lithosphere in which the functional interstices of permeable rock or earth are not filled with water under hydrostatic pressure. The interstices either are not filled with water or are filled with water that is no held by capillarity.

Aerobic

It means living, active, or occurring only in the presence of oxygen. In biology it is a descriptive term for organisms that require the presence of oxygen to live.

Afflux

Afflux is the rise in water level (above normal) on the upstream side of a bridge or obstruction. It happened when the effective flow area at the obstruction is less than the natural width of the stream immediately upstream of the obstruction.

After bay

The tail race of a hydroelectric power plant at the outlet of the turbines. The term may be applied to a short stretch of stream or conduit, or to a pond or reservoir.

Agglomerate

An ice covers of floe formed by the freezing together of various forms of ice.

Aggradation

Process of raising a land surface by the deposition of sediment.

Albedo

The portion of incoming radiation which is reflected by a surface. On the other hand, Albedo (al-bee-doh) is a measure of how much light that hits a surface is reflected without being absorbed. Something that appears white reflects most of the light that hits it and has a high albedo, while something that looks dark absorbs most of the light that hits it, indicating a low albedo.

Algal Bloom

Large, visible masses of algae that develop in bodies of water during warm weather. Algal blooms are the result of excessive levels of nutrients (generally phosphorus or nitrogen) in water.

Alkalinity

This is a measure of the capacity of water to neutralize an acid, how much acid can be added to water without causing a significant change in pH. Water does not have to be strongly basic (high pH) to have high alkalinity. In the water industry, alkalinity is expressed in mg/l of equivalent calcium carbonate (CaCo3).

Alliance for Water Stewardship (AWS)

The Alliance for Water Stewardship (AWS) is a multi-stakeholder organization dedicated to enhancing water stewardship capacity, and guiding, incentivizing and differentiating responsible water use.

Alluvial Plain

Plain formed by the deposition of alluvial material eroded from areas of higher elevation.

Alluvium

Sediments deposited by erosional processes, usually by streams.

Alum

A very sticky substance added to water during treatment that causes particles in the water to stick together.

Ambient

Refers to natural background conditions in the surrounding environment outside the zone in which water quality may be influenced by a discharge or source of contamination.

Ambient Water Quality Standards

The maximum allowable amount of a substance in rivers, lakes or groundwater, given as a concentration. Ambient water quality standards can also refer to other properties of the water, such as temperature or pH. Standards are set to protect against anticipated adverse effects on human health or welfare, wildlife or the functioning of ecosystems.

Anabranch

A diverging branch of a river which re-enters the main stream.

Anchor Ice

Submerged fragile ice attached or anchored to the river bottom, irrespective of its formation.

Anchor Ice Dam

An accumulation of anchor ice which acts as a dam and raises the water level.

Annual Runoff

Total volume of water that flows during a year, usually referring to the outflow of a drainage area or a river basin.

Anoxic

Denotes the absence of oxygen, as in bodies of water, lake sediments, or sewage. Anoxic conditions generally refer to a body of water sufficiently deprived of oxygen to where zooplankton and fish would not survive.

Antecedent Moisture

The degree of wetness of soil at the beginning of a runoff, determined by summation of weighted daily rainfall amounts for a period preceding the runoff.

Antecedent Moisture Condition

A description of the amount of water in storage at some point in time (usually the start of a hydrologic event) that is relevant to the event.

Antecedent Precipitation

Precipitation which occurred prior to a particular time over a specific area or drainage Basin. Usually applied as a measure of moisture in the top layer of the soil which would affect runoff from additional rainfall.

Antecedent Precipitation Index (API)

An index of moisture stored in a basin before a storm, calculated as a weighted summation of past daily precipitation amounts.

Antecedent Soil Water

Degree of wetness of a soil prior to irrigation or at the beginning of a runoff period, typically expressed as an index.

Aphotic

Define as without light. Relating to the region of a body of water that is not reached by sunlight and in which photosynthesis is unable to occur. The aphotic zone of the ocean is the water deeper than about 800 meters (2,625 feet), beyond which no light penetrates.

Apportionment Agreement

An inter-provincial or international contract specifying the sharing of water resources from trans-boundary sources.

Apron launching

An apron designed to settle and protect the side slopes of a scour hole after settlement.

Appropriation

The amount of water a user has the legal right to withdraw from a water source.

Aquatic

Term used to describe any organism growing in, living in, or frequenting water; some plants and animals that live in water are called aquatic species.

Aquaculture

Aquaculture is understood to mean the farming of aquatic organisms including fish, molluscs, crustaceans, aquatic plants, algae and other organisms. Aquaculture involves cultivating freshwater and saltwater populations under controlled conditions.

Aqueduct

Aqueduct is a bridge like structure that carries a water conduit or artificial canal across a valley or over a river.

Aquifer

A rock formation that is sufficiently porous and permeable to yield a significant quantity of water to a borehole, well or spring. The aquifer may be unconfined beneath a standing water table, or confined by an impermeable or weakly permeable horizon. On the other hand, it is a geologic formation lying in between the saturated soil or rock layer beneath the ground surface which can store and transmit water and from where water can be pumped.

Aquifer Mapping

Aquifer mapping can be defined as a scientific process, wherein a combination of geologic, geophysical, hydrologic and chemical field and laboratory analyses are applied to characterize the quantity, quality and sustainability of ground water in aquifers. Systematic aquifer mapping is expected to improve our understanding of the geologic framework of aquifers, their hydrologic characteristics, water levels in the aquifers and how they change over time, and the occurrence of natural and anthropogenic contaminants that affect the portability of ground water.

Aquifer System

Intercalated permeable and poorly permeable materials that comprise two or more permeable units separated by aquitards that impede vertical groundwater movement but do not affect the regional hydraulic continuity of the system.

Aquatic Ecosystem

An aquatic area where living and non-living elements of the environment interact. This includes the physical, chemical, and biological processes and characteristics of rivers, lakes, and wetlands and the plants and animals associated with them.

Aquatic Environment

The components of the Earth related to, living in, or located in or on water or the beds or shores of a water body including (but not limited to) all organic and inorganic matter, living organisms and their habitat (including fish habitat), and their interacting natural systems.

Aquatic Macro-Invertebrates

Macroscopic animals without backbones (invertebrates) that are large enough to be seen with the naked eye (macro, e.g., > 0.5 mm). At least one stage within its life cycle is bound to water (streams and rivers, lakes, groundwater). Examples of macro invertebrates include: aquatic worms, snails, clams, crayfish, leeches, and the larval and nymph stages of many insects (e.g., dragonflies, mosquitoes, and mayflies).

Aquiclude

A geologic formation which can absorb water but cannot transmit significant amounts is called aquiclude. Example: clays, shales etc.

Aquifuge

A geologic formation with no interconnected pores and hence can neither absorb nor transmit water is called aquifuge. Example: basalts, granite, etc.

Aquitard

A geologic formation of rather impervious nature, which transmits water at a slow rate compared to an aquifer, is called aquitard. Example: clay lenses interbedded with sand.

Arch Dam

A concrete arch dam is used in sites where the ratio of width between abutments to height is not great and where the foundation at the abutments is solid rock capable of resisting great forces. The arch provides resistance to movement. When combined with the weight of concrete (arch-gravity dam), both the weight and shape of the structure provide great resistance to the pressure of water.

Area of Influence

The area covered by the drawdown curves of a given pumping well or combination of wells at a particular time.

Area Capacity Curve

A graph showing the relation between the surface area of the water in a reservoir, the corresponding volume, and elevation.

Arid Region

A region of low precipitation, characterized by a severe lack of available water, to the extent of hindering or even preventing the growth and development of plant life. In agriculture this term is used to indicate extremely dry areas where without irrigation no crops can be grown.

Arroyo

A water-carved channel or gully in arid country, usually rather small with steep banks, dry most of the time, due to infrequent rainfall and the shallowness of the cut which does not penetrate below the level of permanent ground water.

Artesian Aquifer

Groundwater that is under pressure so when tapped by a well, it is able to rise above the level at which it is first encountered. It may or may not flow out at ground level. The pressure in such an aquifer commonly is called artesian pressure, and the formation is an artesian or confined aquifer.

Artesian Basin

A body of groundwater more or less compact, moving through soils with more or less resistance.

Artesian Pressure

The pressure under which artesian water in an artesian aquifer is subjected, generally significantly greater than atmospheric.

Artesian Water

Groundwater that is under pressure when tapped by a well and is able to rise above the level at which it is first encountered. It may or may not flow out at ground level. The pressure in such an aquifer commonly is called artesian pressure, and the formation containing artesian water is an artesian aquifer or confined aquifer.

Artesian Well

A well tapping a confined aquifer. Water in the well rises above the top of the aquifer under artesian pressure, but does not necessarily reach the land surface; a flowing artesian well is a well in which the water level is above the land surface.

Artesian Zone

A zone where water is confined in an aquifer under pressure so that the water will rise in the well casing or drilled hole above the bottom of the confining layer overlying the aquifer.

A

Artificial Wetland

A man-made wetland in an area where a natural wetland did not exist before.

Artificial Recharge

The deliberate replenishment of the groundwater by means of spreading basins, recharge wells, irrigation, or other means to induce infiltration of surface water.

Assimilative Capacity

The amount of pollutants that a water body may absorb while continuing to meet water quality standards.

Astronomical Tide

The tidal levels and character which would result from gravitational effects, e.g. of the Earth, Sun and Moon, without any atmospheric influences.

A**tmospheric Window**

Atmospheric windows are wavelengths at which electromagnetic radiation (sunlight) from the sun will penetrate the earth's atmosphere.

Atoll

An atoll is a ring-shaped coral reef, island, or series of islets. An atoll surrounds a body of water called a lagoon. Sometimes, atolls and lagoons protect a central island. Channels between islets connect a lagoon to the Open Ocean or sea. Atolls develop with underwater volcanoes, called seamounts. The habitat inside the atoll, protected from the open sea by the sturdy reef, is called a lagoon.

Attenuation

The process where the flood crest is reduced as it progresses downstream.

Averting Behavior Model (ABM)

An assessment approach in which costs incurred by households to offset or mitigate environmental hazards (e.g., expenditures on water purifiers to remove pollution from ground water) are used to infer value of clean water.

A

Avulsion

The sudden movement of soil from one property to another as a result of a flood or a shift in the course of a boundary stream. On the other hand, a forcible separation or detachment.

B

B

Backflow

The backing up of water through a conduit or channel in the direction opposite to normal flow.

Backwater

The increase in water surface elevation relative to the elevation occurring under natural channel and floodplain conditions. A bridge or other structure that obstructs or constricts the free flow of water in a channel includes it.

Backwater Curve

The longitudinal profile of the surface of a liquid in a non-uniform flow in an open channel, when the water surface is not parallel to the invert owing to the depth of water having been increased by the interposition of an obstruction such as a dam or weir. The term is sometimes used in a generic sense to denote all water surface profiles or for profiles where the water is flowing at depths greater than the critical.

Backwater Effect

The effect which a dam or other obstruction or construction has in raising the surface of the water upstream from it.

Backwater Flooding

Upstream flooding caused by downstream conditions such as channel restriction and/ or high flow in a downstream confluence stream.

Bail Test

A test of media hydraulic properties (typically permeability and storativity) in which a volume of water is withdrawn instantaneously (bailed) from a well or piezometer and its response measured and analyzed.

B

Bankful Discharge

Discharge that, on the average, fills a channel to the point of overflowing.

Bank Revetment

Erosion-resistant materials placed directly on a steam bank to protect the bank from erosion.

Bar

Submerged or emerged embankment of sand, gravel, or other unconsolidated material built in shallow water by waves and currents.

Barrage

A barrage is artificial barriers constructed across a river or estuary consisting of a number of gates that can be opened or closed to control the amount of water passing through the structure, and thus regulate and stabilize water levels upstream for use in irrigation and other systems.

Bank

The margins of a channel. Banks are called right or left as viewed facing in the direction of the flow.

Bank Storage

The storage of water in an aquifer adjacent to and interconnecting with a surface water body so that a change in a stage of the adjacent surface water body causes a change in storage of water in the aquifer.

Bankfull Stage/Elevation

An established river stage/water surface elevation at a given location along a river which is intended to represent the maximum water level that will not overflow the river banks or cause any significant damages from flooding.

Baor

Baor means any kind of oxbow shaped lake where watercourse has become stagnant in course of time.

Base Flood

The national standard for flood plain management is the base, or one percent chance flood. This flood has at least one chance in 100 of occurring in any given year. It is also called a 100 year flood.

Base Flow

Stream flow coming from groundwater seepage into a stream or river. Groundwater flows underground until the water table intersects the land surface and the flowing water becomes surface water in the form of springs, streams/rivers, lakes and wetlands. Base flow is the continual contribution of groundwater to rivers and is an important source of flow between rainstorms.

Base Flood Elevation

The elevation of surface water resulting from a flood that has one percent chance of being equaled or exceeded in any given year.

Base Width

The time duration of a unit hydrograph.

Basin

An area having a common outlet for its surface runoff or a geographical region drained by a network of rivers and/or streams. On the other hand,an aquifer or aquifer system whose boundaries are defined by surface-water divides, topographic barriers or a structural basin in which the aquifers are isolated from adjacent aquifers.

Basin Boundary

The topographic dividing line around the perimeter of a basin, beyond which overland flow (i.e., runoff) drains away into another basin.

Basin Lag

The time it takes from the centroid of rainfall for the hydrograph to peak.

Basin Recharge

Rainfall that adds to the residual moisture of the basin in order to help recharge the water deficit, i.e., water absorbed into the soil that does not take the form of direct runoff.

Bathyal Zone

Marine ecologic realm extending down from the edge of the continental shelf to the depth at which the water temperature is 4° C (39° F). Both of these limits are variable, but the bathyal zone is generally described as lying between 200 and 2,000 m (660 and 6,600 feet) below the surface. At

bathyal depths, currents are exceedingly slow, and in many areas bathyal waters deeper than 1,000 m (3,280 feet) are essentially stagnant, resulting in low oxygen concentrations and impoverished faunal levels.

Bathymetry

Spatial depth distribution, usually defined as the submerged bed topography with respect to a sloping idealized water level surface for a certain specified constant discharge.

Bay

A bay is a recessed, coastal body of water that directly connects to a larger main body of water, such as an ocean, a lake, or another bay. Some large bays, such as the Bay of Bengal and Hudson Bay, have varied marine geology. The land surrounding a bay often reduces the strength of winds and blocks waves.

Beach

A sloping landform on the shore of larger water bodies, generated by waves and currents and extending from the water to a distinct break in landform or substrate type (e.g., a fore dune, cliff, or bank.) (2) A generic term for offshore bars, barrier bars, and beach terraces. (3) To run a ship up onto a beach or shore.

Bedrock

General term for consolidated (solid) rock that underlies soils or other unconsolidated material.

Bed Material

Material found in and on the bed of a stream (may be transported as bed load or in suspension).

Beel

Beels are natural depressions. On the other hand, abeel is a large static surface water body or natural low-lying wetland which gets inundated by rainwater or river water and which remains inundated over the year or partially or entirely remains dry for a certain period of a year.

Bed Load

Sand, silt, gravel, or soil and rock detritus carried by a stream on or immediately above its bed. The particles of this material have a density or

grain size such as to preclude movement far above or for a long distance out of contact with the stream bed under natural conditions of flow.

Beginning of the Breakup

Date of definite breaking, movement, or melting of ice cover or significant rise of water level.

Beginning of Freezup

Date on which ice forming a stable winter ice cover is first observed on the water surface.

Benthic

Organisms living at the bottom of a fresh or salty body of water.

Benthic Invertebrates (Zoo benthos)

Animals that live on river and lake bottoms. Many of these inhabitants are immature stages of insects such as mayflies, stoneflies, caddisflies, and midges. Other types of animals include aquatic earthworms or bristle worms, roundworms, snails and leeches. The variety and abundance of benthic invertebrates in a river reflects the habitat the river provides.

Benthos

Plants and animals that live on, in, or attached to the stream, river, lake, or sea bottom.

Berm

A narrow shelf, bank, or ledge at the top or bottom of a slope; in coastal geomorphology a sedimentary feature (ridge) built along the coast, above the level of high tide, by storm wave action.

Best Management Practices (BMPs)

Structural, nonstructural, and managerial techniques recognized to be the most effective and practical means to reduce surface water and groundwater contamination while still allowing the productive use of resources. Management or construction practices designed to be effective and reduce the impact on the environment.

Bifurcation

Point where a channel or river splits into two channels or rivers.

B Biochemical Oxygen Demand (BOD)

A measure of the amount of dissolved oxygen required to completely oxidize the available organic wastes, a quantitative measure of the degree to which organic compounds consume oxygen in water, based on a five-day test in which loss of oxygen in a sample results from bacterial respiration and chemical processes, a traditional water quality measurement applied to wastewater such as treated sewage.

Biodiversity

The variety and variability among living organisms or the variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.

Biodegradable

Material that will decompose under natural, biological conditions and processes.

Biodegradation

The transformation of a material to another material by organisms (commonly microbes).

Bio-indicators

Organisms that are used to detect changes in environmental pollutant levels, such organisms are usually sensitive to changes in their surroundings.

Biophysical

That part of the natural environment which includes physical, chemical and biological components such as air, soil, water quality, plants and animals.

Bioremediation

A process to reduce contaminant levels in soil or water by using microorganisms or vegetation.

Bio-solids

An organic material resulting from the treatment of wastewater, often applied to the land as an amendment.

Biosphere

The total assemblage of living organisms on the Earth.

Biota

The animals, plants, and microorganisms that live in a specific area or the total assemblage of plants and animals in an area. The biota is the sum of the plant life (flora) and animal life (fauna).

Bio-indicator

An organism and/or biological process whose change in numbers, structure, or function points to changes in the integrity or quality of the environment.

Black Ice

Transparent ice formed in rivers and lakes, or on roads and bridges.

Blackwater

Wastewater from toilets, latrines, privies, water containing feces or body fluids and water from sinks used for food preparation or disposal of chemical or biological ingredients.

Bloom (Phytoplankton)

A population burst of phytoplankton that remains within a defined part of the water column.

Blue Economy

Blue economy refers to economic activities associated with ocean, sea, harbor, ports and coasts. It simply means economic contribution of marine resources. Focus of Blue Economy includes: (1) Benefit from Ocean: Optimizing the benefits received from marine environments (e.g. fishery, bio prospecting, oil and Extraction). (2) Ocean based mainstream development: Generation of inclusive growth and decent jobs for all and promoting national equity. (3) Employment: Development of seas beyond national jurisdiction, including the refinement of international governance.

Blue Green Algae

Prokaryotic organisms with a bacteria like cell structure, lacking a nucleus and other organelles, these species manufacture photosynthetic pigments but lack chloroplasts, the specialized photosynthetic organelles in higher plants; in some situations an increase in blue-green algae can indicate an environmental stress such as pollution.

B

Blue Water

Fresh surface and groundwater, in other words, the water in freshwater lakes, rivers and aquifers.

Blue Water Availability

Natural run-off (through groundwater and rivers) minus environmental flow requirements. Blue water availability typically varies within the year and also from year to year.

Blue Water Footprint

Volume of surface and groundwater consumed as a result of the production of a good or service. Consumption refers to the volume of freshwater used and then evaporated or incorporated into a product. It also includes water abstracted from surface or groundwater in a catchment and returned to another catchment or the sea. It is the amount of water abstracted from groundwater or surface water that does not return to the catchment from which it was withdrawn.

Blue Water Footprint Impact Index

An aggregated and weighed measure of the environmental impact of a blue water footprint at catchment level. It is based on two inputs: (i) the blue water footprint of a product, consumer or producer specified by catchment and by month; and (ii) the blue water scarcity by catchment and by month. The index is obtained by multiplying the two matrices and then summing the elements of the resultant matrix. The outcome can be interpreted as a blue water footprint weighed according to the blue water scarcity in the places and periods where the various blue water footprint components occur.

Borehole

A hole drilled into the earth into which well casings or piezometers may be installed.

Border Ice

An ice sheet in the form of a long border attached to the bank or shore.

Brackish Ice

Ice formed from brackish water.

Brackish Water

Salty water (>0.5‰ salt) with less salt than seawater or mixed fresh and salt water.

Braided River

A braided river channel consists of a network of smaller channels separated by small and often temporary islands called braid bars. Braided streams are common wherever a drastic reduction in stream gradient causes the rapid deposition of the stream's sediment load. Braided channels are also typical of river deltas.

Braided Stream

Characterized by successive division and rejoining of stream flow with accompanying islands. A braided stream is composed of anabranches.

Braiding

Formation of a river course with multiple river channels, divided by bars that have a size on the order of the channel width.

Brackish

Water that is neither fresh water nor marine but a mixture of the two or intermediate in salinity, usually found in estuaries where the amount of salinity is constantly fluctuating.

Brine

Highly salty and heavily mineralized water containing heavy metal and organic contaminants.

Brash Ice

Accumulation of floating ice made up of fragments not more than 2 meters across, the wreckage of other forms of ice.

Breach

The failed opening in a dam.

Breakup

The time when a river whose surface has been frozen from bank to bank for a significant portion of its length begins to change to open water flow condition. Breakup is signaled by the breaking of the ice and often associated with ice jams and flooding.

Breakup Date

Date on which a body of water is first observed to be entirely clear of ice and remains clear thereafter.

B

Breakup Jam

Ice jam that occurs as a result of the accumulation of broken ice pieces.

Breakup Period

The period of disintegration of an ice cover.

Brook

A natural stream of water, smaller than a river or creek, especially a small stream that breaks directly out of the ground, as from a spring or seep.

Buffer

A compound or solution capable of resisting a change in PH. A buffer is a solution that can resist PH change upon the addition of an acidic or basic component. It is able to neutralize small amounts of added acid or base, thus maintaining the PH of the solution relatively stable.

Buffering Capacity

Ability to neutralize acidic input or the ability of a substance to resist an increase or decrease in PH. Buffer capacity (β) is defined as the moles of an acid or base necessary to change the PH of a solution by 1, divided by the PH change and the volume of buffer in liters; it is a unit less number.

Buffer Value

The difference between the maximum value of a stock of ground water under uncertainty and its maximum value under certainty where the supply of surface water is stabilized at its mean. Thus, this value arises from the ability of ground water to provide supplemental water supplies during short-term periods of drought or other supply disruptions.

Bulk Hydraulic Conductivity

This term is used to represent the average hydraulic conductivity of a section of aquifer, and is made up of matrix and fracture components.

Buoyancy

The tendency of a body or fluid to rise when immersed in fluid because of density differences.

Bypass flow

Movement of recharge water (usually intermittently) through fractures in the unsaturated zone of a dual-porosity aquifer.

C

Canal

A canal is a long, man-made strip of water used for irrigation or boat access to a bigger body of water.

Capillarity

The degree to which a material or object containing minute openings or passages, when immersed in a liquid, will draw the surface of the liquid above the hydrostatic level. Unless otherwise defined, the liquid is generally assumed to be water. On the other hand, the phenomenon by which water is held in interstices above the normal hydrostatic level, due to attraction between water molecules.

Capillary Action

The means by which liquid moves through the porous spaces in a solid, such as soil, plant roots, and the capillary blood vessels in our bodies due to the forces of adhesion, cohesion, and surface tension. Capillary action is essential in carrying substances and nutrients from one place to another in plants and animals.

Capillary Fringe

The soil area just above the water table where water can rise up slightly through the cohesive force of capillary action. This layer ranges in depth from a couple of inches, to a few feet, and it depends on the pore sizes of the materials. The capillary fringe is also called the capillary zone.

Capillary Potential

The work required to move a unit mass of water from the reference plane to any point in the soil column.

Capillary Rise

The height above the water table to which water will rise because of capillarity.

Capillary Water

Water located just above the water table, in the aeration zone, that moves upward from the water table by capillary action. This water can move slowly and in any direction. While most plants rely upon moisture from precipitation that is present in the unsaturated zone, their roots may also tap into capillary water or into the underlying saturated zone.

C Capillary Zone

The soil area just above the water table where water can rise up slightly through the cohesive force of capillary action. This layer ranges in depth from a couple of inches, to a few feet, and it depends on the pore sizes of the materials. The capillary zone is also called the capillary fringe.

Carbon Cycle

Biogeochemical cycle by which carbon is exchanged among the biosphere, pedosphere, geosphere, hydrosphere and atmosphere of the Earth.

Cascade

A waterfall descending over a steep, rocky surface.

Catchment

The area of land drained by a single stream or river. Catchment and watershed are equivalent terms.

Catchment Area

It is an extent or an area of land where surface water from rain, melting snow or ice converges to a single point at a lower elevation, usually the exit of the catchment, where the waters join another waterbody such as river, drainage canals, lake, reservoir etc.

Catchment Basin

The entire geographical area drained by a river and its tributaries; an area characterized by all runoff being conveyed to the same outlet.

Causeway

A raised roadway, as across water or marshland.

Channel (watercourse)

An open conduit either naturally or artificially created which periodically or continuously contains moving water, or forms a connecting link between two bodies of water. River, creek, run, branch, anabranch, and tributary are some of the terms used to describe natural channels. Natural channels may be single or braided. Canal and floodway are some of the terms used to describe artificial channels.

Channel Inflow

Water, which at any instant, is flowing into the channel system form surface flow, subsurface flow, base flow, and rainfall that has directly fallen onto the channel.

Channel Lead

An elongated opening in the ice cover caused by water current.

Channel Routing

The process of determining progressively timing and shape of the flood wave at successive points along a river.

Channelization

The modification of a natural river channel; may include deepening, widening, or straightening.

Chemical Oxygen Demand (COD)

A measure of chemically oxidizable material in water. The most common application of COD is in quantifying the amount of oxidizable pollutants found in surface water (e.g. lakes and rivers) or wastewater. Chemical Oxygen Demand is an important water quality parameter because, similar to Biological Oxygen Demand (BOD), it provides an index to assess the effect discharged wastewater will have on the receiving environment. The COD test is often used as an alternate to BOD due to shorter length of testing time

Chlorination

Process of purifying/disinfecting water by adding chlorine or a mechanical device specifically designed to feed chlorine or other solutions (e.g. hypochlorides) into a water supply.

Chlorinity

A measure of the chloride content, by mass, of seawater (grams per kilogram of seawater, or per mile). Originally chlorinity was defined as the weight of chlorine in grams per kilogram of seawater after the bromides and iodides had been replaced by chlorides. To make the definition independent of atomic weights, chlorinity is now defined as 0.3285233 times the weight of silver equivalent to all the halides.

C Circular Economy

Circular economy aims to design out waste and pollution, keep products and materials in use, and regenerate natural systems. Operational principles of circular economy include: adjusting inputs to the system to regeneration rates, adjusting outputs from the system to absorption rates, closing the system, maintaining resource value within the system, reducing system's size, designing for circular economy and educating for circular economy.

Clearwater Flooding

A form of groundwater flooding caused by the water table in an unconfined aquifer rising above the land surface in response to extreme rainfall.

Climate

Climate is the average measurements of temperature, wind, humidity, snow, and rain in a place over the course of years.

Climate change

It is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). Climate change in IPCC (Intergovernmental Panel on Climate Change) usage refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), where climate change refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.

Climate Change Adaptation

Climate change adaptation is a response to global warming that seeks to reduce the vulnerability of social and biological systems to relatively sudden change and thus offset the effects of global warming. IPCC defines climate change adaptation as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation".

UNFCCC describes climate change adaptation as Practical steps to protect countries and communities from the likely disruption and damage that will result from effects of climate change.

Closure

Shield made of strong material, such as metal or wood, used to temporarily close openings in levees, floodwalls, and dry flood proofed buildings.

Coagulation

The use of chemicals to make suspended solids clump together into larger aggregates, flocs, for easier filtration or sedimentation, coagulation in water treatment uses alum to congregate solids in the water into a mass that can be readily trapped by a filter.

Coastal Flooding

Flooding that occurs from storms where water is driven onto land from an adjacent body of water. These can be hurricanes, 'nor' westers' or tropical storms, but even a severe winter storm or thunderstorm can cause this type of flooding.

Combined Sewer

A sewer system that carries both sanitary sewage and storm water runoff, when sewers are constructed this way, wastewater treatment plants have to be sized to handle storm water flows and often some of the water receives little or no treatment during overflows or bypasses during extreme storm events.

Commercial water use

Water used for motels, hotels, restaurants, office buildings, other commercial facilities, and institutions. Water for commercial uses comes both from public-supplied sources, such as a county water department, and self-supplied sources, such as local wells.

Community

In ecology, the species that interact in a common area.

Compliance Assurance

Activities that ensure regulated parties comply with legislation, including the Water Act. These activities include promoting compliance through education and prevention initiatives, and compelling compliance through enforcement responses.

C

Conductivity

A measure of the ability of waters to conduct electricity. It increases as the amount of dissolved minerals (ions) increases.

Condensation

Stage of the water cycle when water transforms from a vapor into a liquid and becomes suspended in the atmosphere, visually represented by clouds; the opposite of evaporation.

Confluence

The junction of two or more streams. A confluence (also conflux) occurs where two or more flowing bodies of water join together to form a single channel. A confluence can occur in several configurations: at the point where a tributary joins a larger river (main stem); or where two streams meet to become the source of a river of a new name (such as the confluence of the Monongahela and Allegheny rivers at Pittsburgh, forming the Ohio); or where two separated channels of a river (forming a river island) rejoin at the downstream end.

Cone of Depression

The zone around a well in an unconfined aquifer that is normally saturated, but becomes unsaturated as a well is pumped, leaving an area where the water table dips down to form a cone shape. The shape of the cone is influenced by porosity and the water yield or pumping rate of the well. The land surface overlying the cone of depression is referred to as the area of influence.

Cone of Influence

The depression, roughly conical in shape, produced in a water table, or other piezometric surface, by the extraction of water from a well at a given rate. The volume of the cone will vary with rate of withdrawal of water.

Confined Aquifer

An aquifer that exists where the groundwater is bounded between layers of impermeable substances like clay or dense rock. When tapped by a well, water in confined aquifers is forced up, sometimes above the soil surface. This is how a flowing artesian well is formed. On the other hand,if a porous formation underneath is sandwiched between two impervious strata and is recharged by a natural source at a higher elevation so that the water is under pressure in the aquifer, such an aquifer is called artesian aquifer/ confined aquifer

Confining Layer

Geologic material with little or no permeability or hydraulic conductivity such as clay or dense rock. Water does not pass through this layer or the rate of movement is extremely slow.

Conjunctive Use

Conjunctive use involves the coordinated and planned operation of both surface water and ground water resources to meet water requirements in a manner whereby water is conserved. The basic difference between the usual surface water development with it's associated ground water development and a conjunctive operation of surface water and ground water resource is that the separate firm yields of the former can be replaced by larger and more economic joint, yields of the later.

Connate Water

Water entrapped in the interstices of a sedimentary rock at the time the rock was formed. This term is now commonly used for water with long residence times, but which are not necessarily the 'original' waters as per the original definition.

Consolidation

The reduction of porosity or increase in bulk density caused by an increase in the effective stress, typically concomitant with a decrease in the fluid pressure and the expulsion of water from the voids.

Consumptive Use

The use of a resource that reduces the supply (removing water from a source like a river, lake or aquifer without returning an equal amount). Examples include the intake of water by plants, humans, and other animals and the incorporation of water into the products of industrial or food processing.

Contaminate

To introduce a substance into waters that would cause the concentration of that substance to exceed the maximum contaminant level.

Contiguous Zone

The contiguous zone is a band of water extending farther from the outer edge of the territorial sea to up to 24 nautical miles (44.4 km; 27.6 mi) from

the baseline, within which a state can exert limited control for the purpose of preventing or punishing infringement of its customs, fiscal, immigration or sanitary laws and regulations within its territory or territorial sea.

Continental Shelf

A broad, relatively shallow submarine terrace of continental crust forming the edge of a continental landmass. The geology of continental shelves is often similar to that of the adjacent exposed portion of the continent, and most shelves have a gently rolling topography called ridge and swale. Continental shelves make up about 8 percent of the entire area covered by oceans.

Continental Slope

The continental slope is defined as the zone extending from the shelf break and terminating at the continental rise where the gradient becomes less than 1:40 or where the slope is bounded by a deep-sea trench or a marginal plateau. Although the slope is commonly the steepest physiographic province of the continental margin, a single simple definition cannot be given. Its width ranges from 20 to 100 kilometers; its upper limit at the shelf break normally starts in water depths between 100 and 200 meters; its lower boundary falls in the depth range 1400 to more than 3200 meters.

Continental Rise

The continental rise is an underwater feature found between the continental slope and the abyssal plain. This feature can be found all around the world, and it represents the final stage in the boundary between continents and the deepest part of the ocean.

Conveyance

Geometrical property of a cross-section that determines the relation between the discharge and cross-sectional average flow velocity.

Contaminant

A substance that causes harm by contact or association, sewage or other materials that will render water unfit for its intended use, anything added to a substance that makes the substance impure or unfit for its intended use.

Contamination

Introducing a substance into water that causes harm by contact or association, the introduction into water of sewage or other materials that will render the water unfit for its intended use.

Connate Water

Water trapped in the pores of a rock during formation of the rock. The chemistry of connate water can change in composition throughout the history of the rock. Connate water can be dense and saline compared with seawater. Formation water, or interstitial water, in contrast, is simply water found in the pore spaces of a rock, and might not have been present when the rock was formed. Connate water is also described as fossil water.

Control Dam

A dam or structure with gates to control the discharge from the upstream reservoir or lake.

Coral

Corals are marine invertebrates within the class Anthozoa of the phylum Cnidaria. They typically live in compact colonies of many identical individual polyps. Corals species include the important reef builders that inhabit tropical oceans and secrete calcium carbonate to form a hard skeleton. A coral "group" is a colony of myriad genetically identical polyps. Each polyp is a sac-like animal typically only a few millimeters in diameter and a few centimeters in length.

Coral Reef

A coral reef is an underwater ecosystem characterized by reef-building corals. Reefs are formed of colonies of coral polyps held together by calcium carbonate. Most coral reefs are built from stony corals, whose polyps cluster in groups.

Creek

Small stream of water which serves as the natural drainage course for a drainage basin; a flowing stream normally smaller than a river and larger than a brook. The term is often relative according to size and locality.

Crest

The highest stage or level of a flood wave as it passes a point. On the other hand, the top of a dam, dike, spillway, or weir, to which water must rise before passing over the structure.

Critical Load

The load of pollutants that will fully consume the assimilation capacity of the receiving water body.

Critical Flow

A condition of flow where the mean velocity is at one of the critical values; ordinarily at Belanger's critical depth and velocity. Another important usage is in reference to the Reynolds' critical velocities which define the point at which the flow changes from streamline or no turbulent to turbulent flow.

Critical Depth

The depth of water flowing in an open channel or conduit, partially filled, corresponding to one of the recognized critical velocities.

Critical Rainfall Probability

The probability that the actual precipitation during a rainfall event has exceeded or will exceed the flash flood guidance value.

Crop Water Requirement

The total water needed for evapotranspiration, from planting to harvest for a given crop in a specific climate regime, when adequate soil water is maintained by rainfall and/or irrigation so that it does not limit plant growth and crop yield.

Cross Drainage Work

A cross drainage work is a structure carrying the discharge from a natural stream across a canal intercepting the stream.

Cross-section

A section normal to the trend of a channel or flow.

Cryology

The science of ice in all its forms. Such as snow, ice.

Culvert

A culvert is a conduit used to enclose a flowing body of water. They generally enable flow through an embankment, road or some other type of hydrological impediment.

Cumulative Impacts

Environmental impacts (usually negative) caused by multiple human activities; and/or natural events which are either repeated or occur in combination. Examples include the combined effect of tube wells is lowering the groundwater of a large regional aquifer; water pollution in large rivers and combined impacts of flood control, drainage and irrigation on river flows and flooding.

Current

Movement in a body of water caused by major ocean circulation or tides, by waves along shorelines, and by gravity-induced flow in rivers.

Current meter

An instrument used to measure flow velocity.

Current Preference

A measure to explain the preference of aquatic macro invertebrate taxa for particular flow conditions. Taxa are, for example, divided into those preferring high current velocities (rheobiont, rheophilous) or others preferring low flow conditions (limnophilous, limnobiont), or even standing water (limnetic).

Cut-off

A direct channel, either natural or artificial, connecting two points on a stream, thereby shortening the original length of the channel and increasing its slope.

D

Daily Flood Peak

The maximum mean daily discharge occurring in a stream during a given flood event.

Dam

A dam is a barrier across a stream that impounds or undergrounds the stream. The purpose of dam is flood protection, irrigation, human consumption, industrial use, navigability and hydropower generation etc.

Darcy's law

One of the main physical laws in groundwater hydraulics, stating that the volume of flow passing through a section in a porous medium during a given time interval is proportional to the hydraulic gradient and the hydraulic conductivity of the saturated medium.

Data Model

The two main GIS data models are rasters (grids) and vectors. Rasters are sets of pixels with a specific cell size. Vectors represent points, lines and polygons.

Decommissioning

The process of permanently closing a facility/site; includes rehabilitation and plans for future maintenance of affected land and water.

Deep Tube Well

Deep tubewells are defined as the cased wells into which a pump is installed. A diesel or electric motor is mounted above the well and connected to a centrifugal pump by a shaft. Submersible pumps are also used in DTWs for lifting water from deeper depths. These pumps are expensive and require considerable technical skills for installation and operation. There fore historically they have usually been owned by government or group of farmers or cooperatives. The average command area irrigated by a DTW in Bangladesh is about 26 ha.

Degradation

The process by which a streambed is lowered in elevation by removal or scouring of sediment. This term is also used to refer to a damaged condition of habitat (hydro morphological degradation, physico-chemical degradation).

Delta

An alluvial deposit consisting of rock particles, sediment and debris, dropped by a stream or river as it enters another body of water, the fan-shaped deposit where a river discharges to a larger, slower moving water body, important for wetland habitat values. In terms of irrigation, delta is the depth of water required to raise a crop over a unit area. The total quantity of water required for any crop during its base period (B) for its full-fledged nourishment when expressed in depth of water (i.e. in 'cm' or in 'inches') is called its Delta. The total quantity of water (i.e. volume of water) is divided by the total irrigated area to obtain Delta of crop of the irrigated area.

Delta Plan (DP 2100)

Bangladesh Government has approved Bangladesh Delta Plan 2100 (BDP 2100) with the aspiration of achieving 'safe, climate resilient and prosperous Delta' by 2100. BDP 2100 is indeed the combination of long-term strategies and subsequent interventions for ensuring long term water and food security, economic growth and environmental sustainability while effectively reducing vulnerability to natural disasters and building resilience to climate change and other delta challenges through robust, adaptive and integrated strategies, and equitable water governance.

DEM

Digital Elevation Model (DEM) is a bare earth elevation model representing the surface of the Earth. DEMs filter out non-ground points such as bridges and trees.

Demand Management

An approach that aims to conserve water by using a variety of policy instruments to reduce water use and increase efficiency. This approach recognizes that water is a finite resource and water management should be aimed at reducing the demand for water, such as water conservation, drought rationing, rate incentive programs, public awareness and education, drought landscaping, etc.

Dendritic

The form of the drainage pattern of a stream and its tributaries when it follows a treelike shape, with the main trunk, branches, and twigs corresponding to the main stream, tributaries, and sub-tributaries, respectively, of the stream.

Density Current

A flow of water maintained by gravity through a large body of water, such as a reservoir or lake, and retaining its unmixed identity because of a difference in density.

Depression Storage

The volume of water contained in natural depressions on the land surface, such as puddles.

Depth of Scour

The vertical distance a streambed is lowered by scour below a reference elevation.

Desalination

The process of salt removal from sea or brackish water, the removal of salts from saline water to provide fresh water, which is an increasingly popular way of providing fresh water to coastal populations.

Designated Water Use

A water use that is to be protected at a specific location for such purposes as use by aquatic life or wildlife, for irrigation or stock watering, in industrial activities, for recreation or as drinking water.

Design Flow (design flood)

The discharge that is selected as the basis for the design or evaluation of a hydraulic structure.

Design Discharge

Discharge at a specific location defined by an appropriate return period to be used for a design purpose.

Dew

Deposit of water drops on objects at or near the ground, produced by the condensation of water vapour from the surrounding clear air.

Dewater

The process of permanently closing a facility/site; includes rehabilitation and plans for future maintenance of affected land and water.

Diagenesis

The physical and chemical processes that alter sediment from the time of their deposition until the onset of metamorphism.

Diatom

A group of phytoplankton species utilizing silica as a structural component of the cell wall, a dominant component of the plankton population in many areas.

Diffusion

The movement of a substance from an area of high concentration to an area of low concentration.

Digital Terrain Model (DTM)

DTM is a bare earth representation of the Earth's surface that is augmented natural features such as ridges and break lines.

Dike/ Dyke (levee)

A long low embankment dam. The term is usually applied to auxiliary dams used to close off areas that would otherwise be flooded by the reservoir.

Dilution

The process of mixing a liquid, usually water, that has a lower concentration of a substance or pollutant with effluent containing the substance or pollutant, or the pollutant or substance itself, such that the final concentration after mixing is lower than that in the effluent or of the pure substance.

Dilution Factor

The number of times that a polluted effluent volume has to be diluted with ambient water in order to arrive at the maximum acceptable concentration level.

Direct Water Footprint

The direct water footprint of a consumer or producer (or a group of consumers or producers) refers to the freshwater consumption and pollution that is associated to the water use by the consumer or producer. It is distinct from the indirect water footprint, which refers to the water consumption and pollution that can be associated with the production of the goods and services consumed by the consumer or the inputs used by the producer.

D Discharge

The release of water which may or may not contain waste into the environment, often via a pipe or ditch into a stream, the volume of water that passes a given point within a given period of time, an all-inclusive outflow term, describing a variety of flows such as from a pipe to a stream or from a stream to a lake or ocean, usually expressed in cubic feet per second.

Discharge Area

The area or zone where groundwater emerges from the aquifer. The outflow maybe into a stream, lake, spring, wetland, etc.

Discharge Co-efficient

Ratio of the observed or actual discharge to the theoretically computed discharge.

Disinfection

The process of destroying microorganisms in water by the application of a disinfectant, killing most of the harmful and objectionable bacteria in sewage or drinking water usually accomplished by introduction of chlorine or exposure to ultraviolet radiation which sterilizes the bacteria.

Dispersion

The movement and spreading of contaminants from the point of introduction in an aquifer or surface water body.

Disposal Well

A deep well used for the disposal of liquid wastes.

Dissolution (or solution)

The process in which a solid or liquid becomes dissolved in (ground) water.

Dissolve

The process by which solid particles separate from the mass and mix molecule by molecule with a liquid and appear to become part of the liquid.

Dissolved Metals

In a liquid, metals which pass through a filter of a designated pore size are assumed for environmental purposes to be dissolved.

Dissolved Oxygen, DO

The amount of oxygen gas dissolved in a given quantity of water at a given temperature and atmospheric pressure, usually expressed as a concentration in parts per million, ppm, or as a percentage of saturation.

Dissolved Oxygen Deficit/ DO Deficit

The difference between the oxygen saturation value in water as calculated for the measured conditions at the point and time of sampling, and the actual oxygen concentration, the measure is useful because it corrects for temperature, salinity, and atmospheric pressure which influence the saturation level, a high deficit can be an indicator of a water quality problem.

Dissolved solids

Inorganic material dissolved in water or liquid wastes, excessive dissolved solids make water unsuitable for drinking or industrial uses.

Disposal

The relocation and/or containment, of unwanted materials.

Distillation

The separation of different substances in a solution by boiling off those of a lower boiling point first. For example, water can be distilled and the steam condensed back into a liquid that is almost pure water. Impurities remain in the concentrated residue. Distillation can be used to remove inorganic chemicals, some nonvolatile organic chemicals, and bacteria.

Diversion of Water

The impoundment, storage, consumption, taking or removal of water for any purpose. This does not include removal for the sole purpose of removing an ice jam, drainage, flood control, erosion control or channel realignment. The transfer of water from a stream, lake, aquifer, or other source of water by a canal, pipe, well, or other conduit to another watercourse or to the land, as in the case of an irrigation system. Also, a turning aside or alteration of the natural course of a flow of water, normally considered physically to leave the natural channel.

Doctrine of Prior Appropriation

System for allocating water to private individuals used in many parts of the world. The prior appropriation doctrine is based on the concept of 'First in Time, First in Right'. The first person to take a quantity of water and put it to 'beneficial use' has a higher priority of right than a subsequent user. The right of appropriation is generally acquired by filing a claim in accordance with state laws. Under drought conditions, higher priority users are satisfied before junior users receive water. Appropriative rights can be lost through non-use; they can also be sold or transferred apart from the land.

Domestic Water Use

Water used for household purposes, such as drinking, food preparation, bathing, washing clothes, dishes and dogs, flushing toilets and watering lawns and gardens, most domestic water is delivered to homes by a public water supply facility.

Drain

A conduit, channel, or other structure constructed or used to carry water or wastewater by gravity or pumping.

Drainage

The natural movement of surface water over a land area to a river, lake or ocean (surface drainage). On the other hand, removal of water from a soil using buried pipelines that are spaced regularly and perforated (subsurface drainage).

Drainage Area

The drainage area of a stream or river at a specified location is that area, measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff normally drains by gravity into the stream above the specified location.

Drainage Basin

The land area where precipitation runs off into streams, rivers, lakes and reservoirs, a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge, large drainage basins contain many smaller drainage sub-basins.

Drainage Density

Drainage density is the total length of all the streams and rivers in a drainage basin divided by the total area of the drainage basin. It is a measure of how

well or how poorly a watershed is drained by stream channels. It is equal to the reciprocal of the constant of channel maintenance and equal to the reciprocal of two times the length of overland flow.

Drawdown

A lowering of the ground water surface caused by pumping from an aquifer or lowering the water surface in a reservoir by releasing water either through the turbine or outlet pipes or over the spillway. The drawdown in a pumped well consists of two components: the aquifer losses and the well losses. A well-performance test is conducted to determine these losses. Aquifer losses are the head losses that occur in the aquifer where the flow is laminar. They are time-dependent and vary linearly with the well discharge. Well loss is the head loss caused by flow through a screen and inside a well.

Drought

A period of abnormally dry weather sufficiently prolonged from the lack of precipitation to cause a serious hydrologic imbalance.

Drainage Divide

A boundary between adjacent drainage basins or watersheds.

Dredging

Removal of any soil by bank-sided or floating equipment below water level irrespective of the method employed.

Drip Irrigation

A common irrigation method where pipes or tubes filled with water slowly drip onto crops. Drip irrigation is a low-pressure method of irrigation and less water is lost to evaporation than high-pressure spray irrigation.

Driver

An anthropogenic activity (e.g. agriculture, industry) or climate change phenomenon (climate warming, changes in precipitation) that may have an environmental effect.

Drinking Water

A water supply, treated or untreated which is intended for human consumption and uses and which is considered to be free of toxins and pathogenic bacteria, cysts or viruses, potable water, fit to drink, potable

water that has or is to be treated additionally, to enhance aesthetic quality and/or reduce mineral content plus other known or unknown, undesirable substances: by one or more point-of-use water processing devices or systems or purified bottled water.

Dry Pond

Relief systems that provide a diversion of excess flow from a storm sewer trunk to an impoundment for temporary storage. A dry pond is often a playground or other open space not normally covered by water. A dry pond reduces flooding downstream.

Dry Valley

A valley in which the waters of the stream/river that originally cut the valley now flow below the present land surface as groundwater. The groundwater flow direction may no longer parallel that of the former stream.

Dune

Bedform which scales with water depth. A dune is a hill of loose sand built by Aeolian processes (wind) or the flow of water. Dunes occur in different shapes and sizes, formed by interaction with the flow of air or water.

Duty (Irrigation)

Duty is the area of land that can be irrigated with a unit volume of water supplied across the base period. Duty of a water simply expresses the number of hectare of land that can be irrigated for the full growth of the given crop by supplying 1 cumec water continuously during the entire base period of that crop. It is generally represented by 'D'. Its unit is hectare/cumec. For example, if water flowing at the rate of 1 cumec, runs continuously for B days of the crop matures 100 hectares then Duty of that crop is 100 hectare/cumec to the base of B days.

Dyke

An impermeable linear structure for the control or containment of over bank flow.

d50

One of the measures of sediment particle size used to characterize sediment. It is the particle size from a sieving process where 50% of the material is finer and 50% of the material is coarser.

E

ECAs

Ecologically Critical Areas. An ecologically critical area is an environmental protection zone in Bangladesh. Specific areas in Bangladesh could be deemed ecologically critical areas as a result of the Environmental Conservation Act, 1995.

Ecosystem

A marine, freshwater or terrestrial system or combination of systems, of living and non-living components with particular inter-relationships that form specific habitat. Ecosystem boundaries are often specified for particular projects or a biological community of interacting organisms and their physical environment.

Ecological Quality

The ecological quality of a water body, are based either on the physical, chemical (priority substances including), or biological elements of the system.

Ecological Zone

The term used by FAO to delineate ecologically distinct geographical entities with respect to the principal wooded vegetation.

Economic Water Scarcity

Economic water scarcity is caused by a lack of investment in water infrastructure or insufficient human capacity to satisfy the demand of water in areas where the population cannot afford to use an adequate source of water. Symptoms of economic water scarcity include a lack of infrastructure, with people often having to fetch water from rivers or lakes for domestic and agricultural uses (irrigation). Although much emphasis is put on improving water sources for drinking and domestic purposes, evidence suggests that much more water is used for other uses such as bathing, laundry, livestock and cleaning than for drinking and cooking alone.

Eco-Region

An eco-region is a relatively large area of land or water that contains a geographically distinct assemblage of natural communities. An eco-region is associated with characteristic combinations of geology, topography, climate, landform, flora, and fauna that characterize that region.

Ecosystem Service

The benefit humans obtain from ecosystems. Ecosystem services are provisional (e.g. the provision of food or water), regulating (e.g. the cycling of water and nutrients), supporting (e.g. the formation of soils) or cultural (e.g. recreation and amenity). The concept of ecosystem services is anthropocentric, as opposed to the ecocentric concepts of ecosystem processes and ecosystem functions.

Ecotone

Ecotone is a transition zone between two biomes, such as forest and grassland, where two communities meet and integrate.

Effective Precipitation

The portion of the total precipitation that is retained by the soil so that it is available for crop production.

Effective Rainfall (millimeter)

The proportion of rainfall that is available for run-off and groundwater recharge after satisfying actual evaporation and any soil moisture deficit.

Effective Porosity

The ratio, usually expressed as a percentage, of the volume of water or other liquid which a given saturated volume of rock or soil will yield under any specified hydraulic condition, to the given volume of soil or rock.

Effluent

The outflow water or waste water from any water processing system or device, softeners, filters or reverse osmosis units, the product water of a given water treatment system, sewer pipes or industrial outfall; alternatively a general term in waste water treatment for the final water which is discharged from a treatment plant, usually into a natural flowing river or stream.

Effluent Treatment Plants (ETPs)

Effluent Treatment Plant or ETP is one type of waste water treatment method which is particularly designed to purify industrial waste water for its reuse and its aim is to release safe water to environment from the harmful effect caused by the effluent. Industrial effluents contain various materials, depending on the industry. Some effluents contain oils and

grease, and some contain toxic materials (e.g., cyanide). Effluents from food and beverage factories contain degradable organic pollutants. Since industrial waste water contains a diversity of impurities, specific treatment technology called ETP is required. The ETP Plant works at various levels and involves various physical, chemical, biological and membrane processes to treat waste water from different industrial sectors like chemicals, drugs, pharmaceutical, refineries, dairy, ready mix plants & textile etc.

Effluent River Conditions

A reach of a river is effluent with respect to groundwater if the river gains water from the underlying aquifer.

Effluent Seepage

Diffuse discharge of ground water to the ground surface.

Effluent Stream

Any watercourse in which all, or a portion of the water volume came from the phreatic zone, or zone of saturation by way of groundwater flow, or base flow.

El Niño -Southern Oscillation (ENSO)

El Niño meaning 'the little boy'. The El Nino is an important oceanographic phenomenon which has significant contribution to regional sea level changes. El Niño events are associated with a warming of the central and eastern tropical Pacific. El Niño is an abnormal weather pattern caused by the warming of the Pacific Ocean near the equator, off the coast of South America. The sun warms the water near the equator, which can make more clouds and, therefore, more rain. However, normally there are trade winds, which blow that warm water west. During El Niño, though, those trade winds weaken, or even reverse, which lets the warm water that is usually found in the western Pacific remain or flow east. This warm water displaces the cooler water that is normally found near the surface of the eastern Pacific, setting off atmospheric changes that affect weather patterns in many parts of the world. The effects of El Niño are strong and can wreak havoc on weather systems around the world. The changes vary drastically around the globe.

Embankment

Any dam or wall, dyke or any other similar structures made of earth or stone or other similar element built to prevent a river against flooding an area.

Emergent plant

A plant rooted in shallow water with much of the stem and most of the leaves above water.

R) have 30m resolution (bands 1-5, 7). The panchromatic (band 8) has 15 m resolution. The thermal band is 60 m resolution.

Environmental Flow

According to 'The Brisbane Declaration and Global Action Agenda on Environmental Flows (2018) "Environmental flows describe the quantity, timing, and quality of freshwater flows and levels necessary to sustain aquatic ecosystems which, in turn, support human cultures, economies, sustainable livelihoods, and well-being". In this definition, "Aquatic ecosystems include rivers, streams, springs, riparian, floodplain and other wetlands, lakes, coastal waterbodies, including lagoons and estuaries, and groundwater-dependent ecosystems".

Environmental Impact Assessment (EIA)

Environmental Impact Assessment (EIA) is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse. The International Association for Impact Assessment (IAIA) defines an environmental impact assessment as "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made".

Environmental Management Plan (EMP)

A plan for environmental activities during project implementation designed to ensure sound environmental management, minimizing/mitigating adverse environmental impacts and maximizing beneficial environmental effects within an overall aim of sustainable development.

Environmental Quality

A measure of the status of the environment, overall or in relation to a media (air, water, land) or the needs of its inhabitants, including humans.

Ephemeral Stream

A stream that flows in response to runoff producing precipitation events and thus discontinuing its flow during dry seasons. Such flow is usually of short duration.

Ephemeral Wetland

An area that is periodically covered by standing or slow moving water and that has a basin typically dominated by vegetation of the low prairie zone, similar to the surrounding lands. Because of the porous conditions of the soils, the rate of water seepage from these areas is very rapid, and surface water may only be retained for a brief period in early spring.

Epibenthic

Located at the surface of the sediments, generally referring to algae.

Erosion

The wearing away of the land surface by wind, water, ice or other geologic agents, occurs naturally from weather or runoff but is often intensified by human land use practices, erosion is a source of sediments, suspended sediments, TDS (Total Dissolved Solids), particulate matter turbidity and solutes in natural waters.

Estuarine Water

Deepwater tidal habitats and tidal wetlands that are usually enclosed by land but have access to the ocean and are at least occasionally diluted by freshwater runoff from the land. Such as bays, mouths of rivers, salt marshes.

Estuary

Refers a water course which constantly and periodically flows from land towards sea and mixes with seawater, the extent of which is assessable. The lower portion of a river where the ocean and the river mix, the semi-enclosed zone along a coastline where fresh water meets and mixes with the ocean, such as a bay, mouth of a river, salt marsh or lagoon, deepwater tidal habitat and tidal wetland, they are usually partially enclosed by land but have free access to the ocean and are at least occasionally diluted by fresh water runoff from the land.

Euphotic Zone

The euphotic zone, or photic zone, is the area of the ocean surface in which enough light penetrates the water for the photosynthesis of algae and other photosynthetic plants to occur. The lower limit of this zone is determined by the fraction of residual light present in the environment. Below 1% of the surface incident light, the photic zone ends and the aphotic zone begins. The depth of the euphotic zone therefore depends on the

penetration of sunlight, in other words, the water's turbidity. An area of primary production, this ocean zone is one of the most biologically rich (the other being areas around hydrothermal sources).

Eutrophic

Having a large or excessive supply of plant nutrients, nitrates and phosphates, usually resulting in an increase in biomass and productivity.

Eutrophication

The process of increasing the nutrients, primarily nitrate and phosphate, content of natural waters, usually resulting in an increase in biomass and productivity of algae which may result in the depletion of the oxygen concentration in the water leading to a fish kill, from natural erosion and runoff from the land or from anthropogenic sources.

Evaporation

The process by which water is converted to vapor, e.g. the heat of the sun converts puddles of rainwater into vapor.

Evaporimeter

An instrument which measures the evaporation rate of water into the atmosphere.

Evapotranspiration [mm/d, mm/a]

The amount of water that would be lost from the ground surface by evaporation and transpiration from plants if sufficient water were available in the soil to meet the demand is termed potential evapotranspiration (PE). The proportion of PE that is actually evapotranspired under the prevailing soil moisture conditions is termed actual evapotranspiration.

Exclusive Economic Zone (EEZ)

An Exclusive Economic Zone (EEZ) is a concept adopted at the Third United Nations Conference on the Law of the Sea (1982), whereby a coastal State assumes jurisdiction over the exploration and exploitation of marine resources in its adjacent section of the continental shelf, taken to be a band extending 200 miles from the shore. The Exclusive Economic Zone (EEZ) comprises an area which extends either from the coast or in federal systems from the seaward boundaries of the constituent states (3 to 12 nautical miles, in most cases) to 200 nautical miles (370 kilometres) off the coast. Within this area, nations claim and exercise their sovereign rights and economic resource extraction.

Extreme (weather) Event

Extreme weather includes unusual, severe or unseasonal weather; weather at the extremes of the historical distribution, the range that has been seen in the past. The most commonly used definition of extreme weather is based on an event's climatological distribution: Extreme weather occurs only 5% or less of the time. According to climate scientists and meteorological researchers, extreme weather events have been rare.

External Water Footprint of National Consumption

The part of the water footprint of national consumption that falls outside the nation considered. It refers to the appropriation of water resources in other nations for the production of goods and services that are imported into and consumed within the nation considered.

Extractive Value

A value calculated by adding up the benefits (across time) of removing water from an aquifer.

F

Fall Velocity

The velocity at which a sediment particle falls through a column of still water.

Fauna

Fauna is a term which refers to all of the animal life within a specified region, time period, or both.

Fen

A type of wetland that accumulates peat deposits. Fens are less acidic than bogs, deriving most of their water from groundwater rich in calcium and magnesium.

Field capacity

The amount of water a saturated soil contains after rapid internal drainage has ceased (approximately 2 days).

Filtration

The process of separating liquids from solids bypassing the liquids through a porous barrier (filter).

Filter Feeder

An organism that obtains its food by straining particles from the water; either in a passive way solely driven by the current or in an active mode by moving the body or specific filtering parts.

Fjords and Rias

Fjords and rias are U-shaped valleys formed by glacial action. Fjords are found in areas with long histories of glacier activity, seen along the west coast of the South Island. A Fjord has a sill and a Ria does not.

Flash Flood

A flood which follows within a few hours (usually less than 6 hours) of heavy or excessive rainfall, dam or levee failure, or the sudden release of water impounded by an ice jam.

Flood

A temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters or from the unusual and rapid accumulation of runoff, an overflow or inundation that comes from a river or other body of water.

Flood, 100-Year

A 100-year flood does not refer to a flood that occurs once every 100 years, but to a flood level with a 1 percent or greater chance of being equaled or exceeded in any given year.

Flood Action Plan (FAP)

After the severe floods in 1987 and 1988 the Government of Bangladesh (GoB) and World Bank (WB) jointly prepare long-term objectives and strategies (for mitigating flood) in June 1989 to concentrate on an Action Plan for the next five years as the first step in formulating a long-term program. That program for undertaking 11 main and 15 supporting activities was drafted. This program became known as the Flood Action Plan (FAP).

Flood Control & Drainage

Effective management of floods in densely populated urban areas. Flood control and drainage is used as a means to reduce the depth of flooding or eliminate it through 'controlled flooding', so as to provide greater security for crop production.

Flood Depth

Height of flood waters above the surface of the ground at a given point.

Flood Duration

Amount of time between the initial rise of flood waters and their recession.

Flow Direction

Flow direction calculates the direction water will flow using slope from neighboring cells. This is usually determined by the direction of the steepest descent in each cell.

Flood Elevation

Height of flood waters above an elevation datum plane (also called water surface elevation).

Flood Forecasting

Flood forecasting is the use of real-time precipitation and stream flow data in rainfall-runoff and stream flow routing models to forecast flow rates and water levels for periods ranging from a few hours to days ahead, depending on the size of the watershed or river basin.

Flood-Frequency Curve

A graph indicating the probability that the annual flood discharge will exceed a given magnitude or the recurrence interval corresponding to a given magnitude.

Flood Fringe

The part of a floodplain where, during a flood, the water is shallower.

Flood Hazard

Frequency of occurrence of excess water (large flow rates, high stages, or both) at a location. Commonly, this is represented with flow or stage frequency relationships (how severe and how often floods occur) at specific locations.

Floodplain

The land bordering a stream, built up of sediments from stream overflow and subject to inundation when the stream floods or any normally dry land area that is susceptible to being inundated by water from any natural source. This area is usually low land adjacent to a stream or lake.

Flood Peak

The highest stage or discharge during a given flood event.

Flood Proofing

The process of protecting a building from flood damage on site. Flood proofing can be divided into wet and dry flood proofing. In areas subject to slow-moving, shallow flooding, buildings can be elevated, or barriers can be constructed to block the water's approach to the building. These techniques have the advantage of being less disruptive to the neighborhood. It must be noted that during a flood, a flood proofed building may be isolated and without utilities and therefore unusable, even though it has not been damaged.

Flood Stage

The elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Flood Wall

A long, narrow concrete or masonry embankment usually built to protect land from flooding. If built of earth the structure is usually referred to as a levee. Floodwalls and levees confine stream flow within a specified area to prevent flooding. Ring levees confine stream flow out of an area. The term "dike" is used to describe an embankment that blocks an area on a reservoir or lake rim that is lower than the top of the dam.

Floodway

A part of the flood plain, reserved for emergency diversion of water during floods. A part of the flood plain which, to facilitate the passage of floodwater, is kept clear of encumbrances. The channel of a river or stream and those parts of the flood plains adjoining the channel, which are reasonably required to carry and discharge the floodwater or flood flow of any river or stream.

Flora

The plants of a particular region, habitat, or geological period.

Flow

The quantitative rate of water discharged from a source, or passing by a given point, expressed as volume per unit of time.

Flow Capacity

The maximum amount of water any particular hydrogeologic environment can accept and transmit.

Flow Line

The path a molecule of water takes in its movement through a porous medium.

Flow Net

A map showing both equipotentials and streamlines of an aquifer or geological system.

Flow Path or Flow Pattern

The line or group of lines that indicate the direction of groundwater flow in an aquifer and which reflect the movement of groundwater from a recharge zone to a discharge zone.

Flow Velocity

Speed at which water moves during a flood. Velocities usually vary across the floodplain. They are usually greatest near the channel and lowest near the edges of the floodplain.

Flowing well/spring

A well or spring that taps groundwater under pressure so that water rises without pumping. If the water rises above the surface, it is known as a flowing well.

Flume

A flume is a human-made channel for water in the form of an open declined gravity chute whose walls are raised above the surrounding terrain, in contrast to a trench or ditch.

Fluvial

Pertaining to rivers. In geography and geology, fluvial processes are associated with rivers and streams and the deposits and landforms created

by them. When the stream or rivers are associated with glaciers, ice sheets, or ice caps, the term glacio-fluvial or fluvio-glacial is used.

Fluvial Deposits

All sediments, past and present, deposited by flowing water, including glacio-fluvial deposits.

Foreshore

Foreshore means any part of land lying in-between the low water mark and high water mark during ordinary spring tide of a year, and any part of land thereof which is 50 meters extended from the highest level of water to river bank, and in the case of areas other than river or sea port, any part of land thereof which is 10 meters extended from the highest level of water.

Fossil Water

Fossil water or paleo-water is an ancient body of water that has been contained in some undisturbed space, typically groundwater in an aquifer, for millennia. Other types of fossil water can include subglacial lakes, such as Antarctica's Lake Vostok, and even ancient water on other planets.

Fracture

The term fracture is used on this site to refer to a parting in a rock. The term does not imply any particular orientation or origin, except that of brittle failure. Thus joints and faults are fractures, but a fracture is only referred to as a joint or fault if the relevant mode of formation is known. The term fissure is commonly used by hydro geologists but its meaning is imprecise and is not used in the report. Where fractures are thought to have been enlarged by solution they are described as such.

Fracture Flow

The preferential flow of groundwater through dilated cracks, joints, bedding planes or other features of secondary porosity within an aquifer. It does not include preferential groundwater flow through a thin high-permeability horizon of an aquifer.

Fractured Formation

A fractured porous medium in which flow rates in the matrix can be assumed to be negligible. Compare with a purely fractured medium and a double porosity medium.

Fresh Water

Fresh water (or freshwater) is any naturally occurring water except seawater and brackish water. Fresh water includes water in ice sheets, ice caps, glaciers, icebergs, bogs, ponds, lakes, rivers, streams, and even underground water (groundwater). Fresh water is generally characterized by having low concentration of dissolved salts and other total dissolved solids. Though the term specifically excludes seawater and brackish water, it does include mineral-rich waters. Fresh water is not the same as potable water (or drinking water). Much of the earth's fresh water (on the surface and groundwater) is unsuitable for drinking without some treatment.

Froude Number

The Froude Number is important when analyzing flow in spillways, weirs, channel flows, rivers and in ship design. It is a dimensionless parameter measuring the ratio of the inertia force on an element of fluid to the weight of the fluid element

G

Gaging (gauging) Station

A location on a stream, lake, or canal where data (usually stage height and/ or discharge) are collected.

Gaining Stream

A stream in which groundwater discharges contribute significantly to the stream flow volume. The same stream could be both a gaining stream and a losing stream, which recharges the groundwater system, depending on the conditions.

Gauge Height

The elevation of a water surface measured by a gauge.

GBM system

The Ganges, the Brahmaputra and the Meghna river system with a total area of just over 1.7 million km2, distributed between India (64 percent), China (18 percent), Nepal (9 percent), Bangladesh (7 percent) and Bhutan (3 percent). Nepal is located entirely in the Ganges river basin and Bhutan is located entirely in the Brahmaputra river basin. The GBM river system

G is considered to be one transboundary river basin, even though the three rivers of this system have distinct characteristics and flow through very different regions for most of their lengths. They join only just a few hundred kilometers upstream of the mouth in the Bay of Bengal. The GBM river system is the third largest freshwater outlet to the world's oceans, being exceeded only by the Amazon and the Congo River systems.

Geographic Information System (GIS)

A computer-based software package for storing, displaying, and querying location and attribute data. The following is not an attempt to provide a single generic definition. 1) Computerized decision support systems that integrate spatially referenced data. These systems capture, store, Retrieve, analyze and display spatial data. 2) An organized assemblage of computer hardware, software, spatial data and operating instructions designed for capturing, storing, updating, manipulating, analyzing, and displaying all forms of geographically referenced information. 3) A manual or computer-based system for geographic data input, storage, manipulation, analysis, modeling and output. The system is used to improve geographic question-asking and problem-solving, and to enhance the overall geographic decision-making process.

Geographic Sustainability

The geographic sustainability of the green, blue and grey water footprints in a catchment or river basin can be assessed based on a number of environmental, social and economic sustainability criteria.

Geothermal System

A hydrothermal system capable of generating electricity or heat for commercial purposes. (1) Geopressure geothermal system – a system in which hot fluids flow to the surface from overpressure reservoirs at depth. (2) hot-dry rock hydrothermal system (systems with high thermal potential, but limited formation water). (3) hot-water dominated hydrothermal system - systems in which the dominant water phase in the pores of the reservoir is liquid. (4) vapor-dominated hydrothermal system (systems with 'dry' steam); water in the pores of the reservoir is vapor and liquid.

Geyser

A periodic thermal spring that flows or spurts violently from discharge of super-heated steam or other gas.

Ghyben-Herzberg Principle

In general, the Ghyben-Herzberg theory describes the relationship between saltwater and freshwater bodies; it specifically states that the thickness of the freshwater lens is directly related to the elevation of the water table above sea level. The Ghyben–Herzberg ratio states that, for every meter of fresh water in an unconfined aquifer above sea level, there will be forty meters of fresh water in the aquifer below sea level.

Glacier

A huge mass of ice, formed on land by the compaction and re-crystallization of snow that moves very slowly down slope or outward due to its own weight.

Glacio-fluvial deposit

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. These deposits are stratified and may occur in the form of outwash plains, deltas, or terraces.

Glide

A part of a stream that is characterized by a smooth, easy movement of water, usually just upstream of a riffle.

Global Warming

The phenomenon of increasing average air temperatures near the surface of Earth over the past one to two centuries. Climate scientists have since the mid-20th century gathered detailed observations of various weather phenomena (such as temperatures, precipitation, and storms) and of related influences on climate (such as ocean currents and the atmosphere's chemical composition). These data indicate that Earth's climate has changed over almost every conceivable timescale since the beginning of geologic time and that the influence of human activities since at least the beginning of the Industrial Revolution has been deeply woven into the very fabric of climate change.

GPS

Acronym for Global Positioning System, hardware and software designed to communicate with specialized satellites to determine ground location.

GRACE

The Gravity Recovery and Climate Experiment (GRACE) was a joint mission of NASA and the German Aerospace Center. Twin satellites took detailed measurements of Earth's gravity field anomalies from its launch in March 2002 to the end of its science mission in October 2017. The Gravity Recovery and Climate Experiment Follow-On (GRACE-FO) is a continuation of the mission on near-identical hardware, launched in May 2018. By measuring gravity anomalies, GRACE showed how mass is distributed around the planet and how it varies over time. Data from the GRACE satellites is an important tool for studying Earth's ocean, geology, and climate.

Gravitational Water

Water in the zone of aeration (unsaturated zone) that can flow downwards by gravity or water in the zone of saturation that is not bound to the solid material.

Greenhouse effect

The warming of the earth's atmosphere caused by a build-up of carbon dioxide or other trace gases; it is believed by many scientists that this build-up allows light from the sun's rays to heat the earth but prevents a counterbalancing loss of heat.

Green Water

The precipitation on land that does not run off or recharge the groundwater but is stored in the soil or temporarily stays on top of the soil or vegetation. Eventually, this part of precipitation evaporates or transpires through plants. Green water can be made productive for crop growth (although not all green water can be taken up by crops, because there will always be evaporation from the soil and because not all periods of the year or areas are suitable for crop growth).

Green Water Footprint

Volume of rainwater consumed during the production process. This is particularly relevant for agricultural and forestry products (products based on crops or wood), where it refers to the total rainwater evapotranspiration (from fields and plantations) plus the water incorporated into the harvested crop or wood.

Green Water Footprint Impact Index

An aggregated and weighed measure of the environmental impact of a green water footprint at catchment level. It is based on two inputs: (i) the green water footprint of a product, consumer or producer specified by catchment and by month; and (ii) the green water scarcity by catchment and by month. The index is obtained by multiplying the two matrices and then summing the elements of the resultant matrix. The outcome can be interpreted as a green water footprint weighed according to the green water scarcity in the places and periods where the various green water footprint components occur.

Grey Water

Grey water also spelled gray water in the United States. Untreated wastewater that has not been affected by infectious, contaminated, or unhealthy bodily wastes, and which does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. Gray water includes, but is not limited to, wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers.

Grey Water Footprint

The grey water footprint of a product is an indicator of freshwater pollution that can be associated with the production of a product over its full supply chain. It is defined as the volume of freshwater that is required to assimilate the load of pollutants based on natural background concentrations and existing ambient water quality standards. It is calculated as the volume of water that is required to dilute pollutants to such an extent that the quality of the water remains above agreed water quality standards.

Grey water Footprint Impact Index

An aggregated and weighed measure of the environmental impact of a grey water footprint at catchment level. It is based on two inputs: (i) the grey water footprint of a product, consumer or producer specified by catchment and by month; and (ii) the water pollution level by catchment and by month. The index is obtained by multiplying the two metrices and then summing the elements of the resultant matrix. The outcome can be interpreted as a grey water footprint weighed according to the water pollution level in the places and periods where the various grey water footprint components occur.

Groyne/Groin

A structure built from the bank of a stream in a direction transverse to the current to redirect the flow or reduce flow velocity.

Ground Moraine

Rolling plain that has gently sloping swells, sags, or basins made of till.

Groundwater

Water in the zone of saturation where all open spaces in sediment and rock are completely filled with water. Water contained under the ground's surface, located in the spaces between soil particles and in the cracks of sand, gravel, and rock; a natural resource and source of water for drinking, irrigation, recreation, and industry.

Groundwater Banking

Groundwater banking is a water management mechanism designed to increase water supply reliability. Groundwater can be created by using dewatered aquifer space to store water during the years when there is abundant rainfall. It can then be pumped and used during years that do not have a surplus of water. People can manage the use of groundwater to benefit society through the purchasing and selling of these groundwater rights.

Groundwater Basin

The underground area from which groundwater drains. The basins could be separated by geologic or hydrologic boundaries.

Groundwater discharge

Outflow of water from a groundwater system.

Groundwater Divide

The boundary between two adjacent groundwater basins, which is represented by a high point in the water table.

Groundwater Flow

The movement of groundwater beneath the earth's surface.

Groundwater Flooding

Groundwater flooding is the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground, through natural processes, under conditions where the 'normal' range of groundwater levels and groundwater flows are exceeded.

Groundwater level

Elevation to which groundwater will or does rise in a piezometer connected to a point in the groundwater domain. It is a time-dependent variable, varies from point to point within the groundwater domain, and indicates the potential energy of groundwater in any point considered (in meters of water column relative to a selected topographic reference level).

Groundwater Mining

The removal of groundwater from an aquifer in excess of the rate of natural or artificial recharge. Continued groundwater mining reduces the groundwater supply until it is no longer an economical source of water.

Groundwater Model

Groundwater models are computer models of groundwater flow systems, and are used by hydro geologists. Groundwater models are used to simulate and predict aquifer conditions. An unambiguous definition of "groundwater model" is difficult to give, but there are many common characteristics. A groundwater model may be a scale model or an electric model of a groundwater situation or aquifer. Groundwater models are used to represent the natural groundwater flow in the environment. Some groundwater models include (chemical) quality aspects of the groundwater. Such groundwater models try to predict the fate and movement of the chemical in natural, urban or hypothetical scenario.

Groundwater models may be used to predict the effects of hydrological changes (like groundwater abstraction or irrigation developments) on the behavior of the aquifer and are often named groundwater simulation models. Also nowadays the groundwater models are used in various water management plans for urban areas. As the computations in mathematical groundwater models are based on groundwater flow equations, which are equations that can often be solved only by approximate methods using a numerical analysis, these models are also called mathematical, numerical, or computational groundwater models. Basic example of groundwater modeling is MODFLOW.

Groundwater Protection Zone (GPZ)

Delineated area in which groundwater is protected by restrictions on human activities. The most severe restrictions are applied in those zones close to groundwater sources in areas of high vulnerability.

Groundwater Rebound

Rising groundwater levels resulting from a reduction in abstraction rates following a period of high abstraction which kept groundwater levels artificially low. The classic scenario is in urban centers overlying major aquifers where groundwater levels were depressed by decades of substantial industrial abstractions. A decline in industrial activities allowed depressed groundwater levels to recover. Groundwater rebound can cause negative effects such as a risk of flooding to subsurface infrastructure, such as tunnels and the basements of buildings, as well as changes in geotechnical and geochemical properties that could result in settlement and corrosion of deeply founded structures.

Ground water Reservoir

An aquifer or aquifer system in which ground water is stored; water may be placed in the aquifer by artificial or natural means.

Groundwater Recharge [mm/d, mm/a]

Inflow of water to a groundwater body from the surface. Infiltration of precipitation and its movement to the water table is one form of natural recharge. Many methods have been devised to increase natural recharge to utilize aquifer storage, termed artificial or managed aquifer recharge.

Groundwater Runoff

Part of stream flow contributed by groundwater (by springs or by diffuse seepage into the stream bed).

Groundwater Table

Surface defined by the phreatic levels in an aquifer (i.e. surface of atmospheric pressure within an unconfined aquifer).

Guide Bank

A dike extending upstream from the approach embankment at either or both sides of the bridge opening to direct the flow through the opening.

Gulf

A gulf is a portion of the ocean that penetrates land. Gulfs vary greatly in size, shape, and depth. They are generally larger and more deeply indented than bays. Like bays, they often make excellent harbors. Many important trading centers are located on gulfs. For example, The Gulf of Mexico, bordered by the United States, Mexico, and the island nation of Cuba, is the world's largest gulf. It has a coastline of about 5,000 kilometers (3,100 miles).

Gully

A channel or miniature valley formed as a result of erosion and caused by concentrated but intermittent flow of water usually during or immediately after heavy rains. The channel is deep enough to interior with tillage operations. Gully may be dendritic or branching or linear (long, narrow and of uniform width). Gully may be U, V or W shaped.

Guyot

A seamount whose top is flat due to weathering is called Guyot.

H

Hadal Zone

The hadal zone (named after the realm of Hades, the underworld in Greek mythology), also known as the hadopelagic zone, is the deepest region of the ocean lying within oceanic trenches. The hadal zone is found from a depth of around 6,000 to 11,000 metres (20,000 to 36,000 ft), and exists in long but narrow topographic V-shaped depressions.

Hail

Precipitation in the form of spheres or lumps of ice.

Half-Life

The time required for half of a homogeneous sample of radioactive material to decay.

Hanging Valley

A tributary in a U-shaped glacial valley that enters the valley at a higher elevation, instead of the same level as that of a main stream, is known as a hanging valley.

Haor

A haor is a wetland ecosystem located mostly in the north-eastern region of the country which physically is a bowl or saucer shaped shallow geologic depression. It receives surface runoff water from rivers and canals.

Hard water

Water containing a high level of calcium, magnesium, and other minerals,

H hard water reduces the cleansing power of soap and produces scale in hot water lines, boilers and appliances.

Hardness

A characteristic of natural water due to the presence of dissolved calcium and magnesium. Hardness is usually expressed in grains per gallon, parts per million, or milligrams per liter, all as calcium carbonate equivalent. Water up to 1 GPG (or 17.1 mg/l) is considered soft, and water from 60 to 120 ppm is considered moderately hard.

Hard Point

A stream bank protection structure whereby 'soft' or erodible materials are removed from a bank and replaced by stone or compacted clay.

Hazardous Waste

A waste that contains any substance (solid, liquid, or gaseous) that is harmful or potentially harmful to life or the environment; this type of waste includes toxic flammable, corrosive and oxidizing substances and is subject to special handling, shipping, storage, and disposal requirements.

Headwaters

The source and upper reaches of a stream, also the upper reaches of a reservoir, the water upstream from a structure or point on a stream, the small streams that come together to form a river, any and all parts of a river basin except the mainstream river and main tributaries.

Headworks

All structures and associated facilities located at the beginning (upstream end) of a water management project.

Hierarchical Linear Model (HLM)

Hierarchical linear modeling (HLM) also known as multi-level analysis is a more advanced form of multiple linear regressions. ANOVA with random effects is a simple example of hierarchical linear model. Multilevel analysis allows variance in outcome variables to be analyzed at multiple hierarchical levels, whereas in multiple linear regressions all effects are modeled as occurring at a single level. Thus, HLM is appropriate for use with lake water quality data which are nested within lake types or eco-regions. Data analysis using regression and multilevel/hierarchical models.

Hierarchical Database

A database that stores related information in a tree-like structure, where records can be traced to parent records, which in turn can be traced to a root record.

Hierarchy

A type of network attribute for a network element in a network dataset. Hierarchy can be used during network analysis to assign priority to a network element. For example, in a transportation network dataset, a "road class" hierarchy can be assigned to edges to favor major roads instead of local streets.

Hill

A natural land elevation, usually less than 1000 feet above its surroundings, with a rounded outline. The distinction between hill and mountain depends on the locality.

Hydrodynamic Force

Force exerted by moving water; including positive frontal pressure against the structure, drag effect along the sides, and negative pressures on the downstream side.

Hydroponics

Hydroponics is a subset of hydroculture, which is a method of growing plants without soil by instead using mineral nutrient solutions in a water solvent.

Hydrostatic Force

Force exerted by water at rest, including lateral pressure on walls and uplift (buoyancy) on floors.

Hydrophytic

In relation to vegetation, plants that grow in water or in saturated soils that are periodically deficient in oxygen as a result of high water content.

Hydrograph

A hydrograph is a graph where streamflow is plotted against time. By choosing suitable scales for time, the short and long term variations of streamflow can be displayed. Short-term patterns include flood

hydrographs in response to storms; long-term patterns include seasonal variations, and responses to long-term variations in rainfall.

Hydrography

The mapping of the characteristics of oceans, lakes, and rivers. On the other hand, hydrography is a term describing the geographic representation of water features such as streams, rivers and lakes in a GIS.

Hydro-morphology

The physical characteristics of the shape, the boundaries and the content of a water body.

Hydraulic Structure

The facilities used to impound, accommodate, convey or control the flow of water such as dams, weirs, intakes, culverts, channels and bridges.

Hydraulic

Related to water and the flows and pressures within a connected water-containing system.

Hydraulic Conductivity, k [m/d]

For an isotropic porous medium and homogenous fluid, the volume of water that moves in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow. Commonly, though imprecisely taken to be synonymous with permeability.

Hydraulic Diffusivity

The ratio of hydraulic conductivity (K) to specific storage (Ss) or the ration of transmissivity (T) to storativity (S).

Hydraulic Fracture

A fracture created by the nature or human-induced fluid pressure.

Hydraulic Gradient

The change in hydraulic head with direction. The slope of the water surface in an aquifer. The hydraulic gradient indicates the direction of groundwater flow. Water always flows from higher elevations to lower elevations. All other factors being equal, flow is greater when the hydraulic gradient is steeper.

Hydraulic Head

The height above a datum plane (such as sea level) of the column of water that can be supported by the hydraulic pressure at a given point in a ground water system. For a well, the hydraulic head is equal to the distance between the water level in the well and the datum plane or the elevation in a well in reference to a specific datum; the mechanical energy per unit weight of water.

Hydraulic Jump

Hydraulic jump in a rectangular channel, also known as classical jump, is a natural phenomenon that occurs whenever flow changes from supercritical to subcritical flow. In this transition, the water surface rises abruptly, surface rollers are formed, intense mixing occurs, air is entrained, and often a large amount of energy is dissipated.

Hydraulic Radius

The cross-sectional area of a stream, conduit, or fracture divided by its wetted perimeter.

Hydro Chemical Facies

How the groundwater chemistry changes over space. Typically, the facies reflect the major ionic constituents.

Hydro Compaction

Volume decrease and density increase caused as moisture-deficient sediments compact as they become wetted.

Hydrodynamic Dispersion

The dispersion or spreading of solutes, colloids, or heat in a groundwater system which is caused by variations in the velocity and direction of flow.

Hydrostratigraphic Unit

A formation, part of a formation, or group of formations of significant lateral extent that compose a unit of reasonably distinct (similar) hydrogeologic parameters and responses.

Hydrothermal Deposits

The ones that are formed by the action of hot water and gases related to magmatic source are known as hydrothermal deposits.

H Hydrothermal System

A groundwater system that has a source (or area) of recharge, a source (or area) of discharge, and a heat source.

Hydrology

The science that deals with water, its properties, distribution and circulation over the Earth's surface.

Hydrological Zoning

Hydrological zoning (or simply zoning) is an approach to divide land into different zones based on their hydrological properties. Typically, each type of zone has different land use and development regulations linked to it. This land and water management method aims to protect local water sources from risks of over-abstraction, land salinization, groundwater pollution and water logging by managing land use activities based on the assigned hydrological zones. For example, zones with a high groundwater table, large amounts of surface water (e.g. rivers) or high erosion susceptibility will usually have more land-use restrictions in place. Such restrictions may limit irrigation to avoid nutrient loading and sediment runoff into watersheds, but can also limit other activities such as industrial discharge and water abstraction from surface or groundwater sources. Zoning also ensures that irrigation, urban development or other land-use activities take place in the ideal land areas in relation to local hydrology, as well as where environmental impacts can be mitigated.

Hydrologic Cycle

The natural pathway water follows as it changes between liquid, solid, and gaseous states; biogeochemical cycle that moves and recycles water in various forms through the environment, evaporation from oceans to the atmosphere, rain and snowfall to the earth's surface, replenishment of ground water, runoff, uptake by plants, and storage in oceans and ice caps, the movement of water from the atmosphere to the earth and its return to the atmosphere through condensation, precipitation, evaporation and transpiration, the cyclic transfer of water from the Earth's surface via evapotranspiration into the atmosphere, from the atmosphere via precipitation back to earth, and through runoff into streams, rivers, and lakes and ultimately into the oceans. On the other hand, the hydrologic cycle begins with the evaporation of water from the surface of oceans, lakes, rivers, marshes etc., as well as from land surface. As moist air is lifted, it cools and water vapor condenses to form clouds. Moisture is transported around the globe until it returns to the surface as precipitation.

Hydrogeology

The branch of geology concerned with water occurring, use, function of underground or on the surface of the earth. On the other hands, the study of groundwater, with particular emphasis on the chemistry and movement of water.

Hydrometer

An instrument that measures the density of water.

Hydro Period

The length of time that a wetland is covered with standing water.

Hyetograph

The time history of rainfall depth on the ground for a specific location or specific area.

Hygroscopic Water

Water in the unsaturated zone that so tightly bound to the solid particles that it cannot be removed by gravity or by plant root suction.

Hypereutrophic

Pertaining to a lake or other body of water characterized by excessive nutrient concentrations such as nitrogen and phosphorous and resulting high productivity. Such waters are often shallow, with algal blooms and periods of oxygen deficiency.

Hypolimnion

The cool, denser bottom layer of water in lake.

Hyporheic Zone

The zone in fluvial sediments in the chemistry of the pore fluids is influenced by both ground water and surface water.

Hypsography

Hypsography is the geographic representation of features on a map related to elevation, altitude and height above sea-level from a reference surface.

Ice Age

It is the name given to the period when the temperature of the Earth was too low, and caused expansion of glaciers and ice sheets in various continents and especially in Polar Regions.

Ice Cap

It is a small dome-shaped sheet of ice that covers a large area of the peak of a mountain.

ICZM

Integrated Coastal Zone Management (ICZM) is a resource management system following an integrative, holistic approach and an interactive planning process in addressing the complex management issues in the coastal area. This concept was born in 1992 during the Earth Summit of Rio de Janeiro. The policy regarding ICZM is set out in the proceedings of the summit within Agenda 21, Chapter 17. The European Commission defines ICZM as "a dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation. ICZM uses the informed participation and cooperation of all stakeholders to assess the societal goals in a given coastal area, and to take actions towards meeting these objectives. ICZM seeks, over the long-term, to balance environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics.

Improved Drinking Water Sources

Piped household water connection located inside the user's dwelling, plot or yard. Also public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs or rainwater collection are few examples of improved drinking water sources

Improved Sanitation

An improved sanitation facility is one that hygienically separates human excreta from human contact and can consist of one of the following facilities: Flush/pour, flush, to piped sewer system, septic tank, pit latrine; Ventilated improved pit latrine; Pit latrine with slab; Composting toilet.

Impact

The environmental effect of the pressure, e.g., fish kills, algal bloom, extinction, ecosystem modification.

Impermeable

A surface or membrane through which water, or other liquids, will not penetrate, a layer of solid material, such as rock or clay, which does not allow water to pass through, any material that does not permit fluids to penetrate.

Impervious

A material through which water, or other liquids, will not penetrate and thus must run off over the surface or accumulate on the top, surfaces with a low capacity for soil infiltration, paving, roofs, roadways or other human structures, impervious cover increases runoff and affects the quantity and composition of non-point source pollution, the quality or state of being impermeable, resisting penetration by water or plant roots.

Impervious Surfaces

Land where water cannot infiltrate back into the ground such as roofs, driveways, streets, and parking lots. Total imperviousness means the actual amount of land surface taken up with impervious surfaces, often stated as a percentage. Interestingly, a site with a total imperviousness of 60% can act like a site with only 10% imperviousness if strategies such as channeling roof runoff into a garden and using swales to capture rainwater are used.

Impermeable Layer

A layer of material (such as clay) in an aquifer through which water does not pass.

Impoundment

A structure built to maintain desired water level; commonly used in waterfowl management.

Index Fossil

They are also called guide fossils, and are remnants of living organisms that were present in a particular geologic period. With the help of these fossils, the age of rock layers in which they are found can be identified.

Indirect Water Footprint

The indirect water footprint of a consumer or producer refers to the freshwater consumption and pollution 'behind' products being consumed or produced. It is equal to the sum of the water footprints of all products consumed by the consumer or of all (non-water) inputs used by the producer.

Indicator

Environmental and ecological indicators are used to communicate information in quantitative terms about ecosystems and the impact human activity has on ecosystems to groups such as the public or government policy makers.

Indicator Organism

Microorganisms, such as coliform bacteria, that are not in themselves harmful but whose presence is indicative of possible pollution or the presence of other more harmful microorganisms which, through its population size or condition, mirrors environmental conditions within an ecosystem.

Indicator Tests

Tests for a specific contaminant, organism, and group of contaminants or constituent, which signals the presence of something else, coliforms, indicate the possible presence of other pathogenic bacteria, tests for a specific contaminant, or constituent which signals the possible presence of something else.

Industrial Symbiosis

The principle behind industrial symbiosis is quite simple; instead of being thrown away or destroyed, surplus resources generated by an industrial process are captured then redirected for use as a 'new' input into another process by one or more other companies, providing a mutual benefit or symbiosis.

Industrial Water Use

Industrial water use comprises of water usage for fabricating, processing, washing, diluting, cooling or transporting a product, incorporating water into a product, or for sanitation needs within the manufacturing facility.

Infauna

Benthic animals that burrow into the substrate.

Infiltration

Flow of water from the land surface into the subsurface; also known as recharge.

Infiltration Capacity

The maximum rate [L3/t/L2] at which a soil at a given condition can absorb rain as it falls. Infiltration is a function of the saturation and permeability of the soil.

Infiltration Rate

The rate of water entry into the soil [L3/t/L2]. The infiltration rate can change with time but cannot exceed the infiltration capacity.

Influent Stream

An influent stream or river is one that loses flow to ground water, i.e., a stream that replenishes ground water reservoirs by percolation through its porous bed. Since influent streams tend to lose substantial amounts of their water, they are usually of an ephemeral nature.

Initial Dilution Zone

Areas immediately adjacent to a wastewater discharge in which chronic water quality objectives for water or sediment, but not those for fish, may be exceeded; however, they may not exceed the acute objectives; they are defined on a site-specific basis and may not encroach on water intakes, bathing beaches, shellfish beds, fish spawning and rearing areas, areas of sensitive aquatic vegetation or other specified sensitive areas.

Injection Well

A well-constructed for the purpose of injecting treated water, often wastewater, directly into the ground. Water is generally forced (pumped) into the well for dispersal or storage into a designated aquifer. Injection wells are generally drilled into aquifers that are not used as a drinking water source, unused aquifers, or below freshwater levels.

Inset Map

An inset map is a more detailed (larger scale) representation of a specific area on a map usually placed in an uncluttered portion of the same sheet as the smaller scale main map.

In stream Use

Use of water that does not require withdrawal or diversion from its natural watercourse, the use of water for navigation, recreation and habitat for fish and wildlife.

In stream Flow (in stream use)

Water for uses within the defined stream channel, principally for fish and wildlife habitat and/or recreational uses.

Intake

The place at which a fluid is taken into a channel or pipe, the location where water is withdrawn from a stream.

Intensity (of rainfall)

The time rate of precipitation [L/t in/hr or cm/hr] interception - the process in which precipitation is retained by vegetation and does not reach the ground surface.

Inter Alia

Latin term for 'among other things'. Legal drafters often use this term to precede a list of examples or samples covered by a more general descriptive statement.

Interface

The zone or surface separating waters of different salinities or separating different fluids (e.g., oil and water or water and air). Interfacial tension: the force per unit length along the interface between two liquids arising from the free surface energy. The interfacial tension for water is O (~10 dynes/cm).

Interflow

Water that infiltrates the land surface and flows into a stream but never recharges the local water table.

Intergenerational equity

The concept that one generation should consume in a manner that allows an equal opportunity for future generations.

Intermittent Stream

A stream that flows only periodically.

International Tribunal for the Law of the Sea (ITLOS)

The International Tribunal for the Law of the Sea (ITLOS) is an intergovernmental organization created by the mandate of the Third United Nations Conference on the Law of the Sea. It was established by the United Nations Convention on the Law of the Sea, signed at Montego Bay, Jamaica, on December 10, 1982. The Convention entered into force on November 16, 1994, and established an international framework for law over "all ocean space, its uses and resources". The ITLOS is one of four dispute resolution mechanisms listed at Article 287 of the UNCLOS. The tribunal is based in Hamburg, Germany. The Convention also established the International Seabed Authority, with responsibility for the regulation of seabed mining beyond the limits of national jurisdiction that is beyond the limits of the territorial sea, the contiguous zone and the continental shelf.

Intrinsic Permeability, k

Permeability of a porous medium dependent solely upon the porosity and pore structure of the medium.

IPCC

The Intergovernmental Panel on Climate Change (IPCC) is an intergovernmental body of the United Nations, dedicated to providing the world with an objective, scientific view of climate change, its natural, political and economic impacts and risks, and possible response options. It was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), and later endorsed by the United Nations General Assembly. Membership is open to all members of the WMO and UN. The IPCC produces reports that contribute to the work of the United Nations Framework Convention on Climate Change (UNFCCC), the main international treaty on climate change.

Irrigation

The controlled application of water to crops and turf areas to supplement that supplied by nature.

Irrigation Return Flow

Irrigation water that is not used consumptively and then either recharges the underlying aquifer or flows into nearby surface water bodies.

Irrigation Water

Water application on lands to assist in the growing of crops and pastures or to maintain vegetative growth in recreational lands, such as parks and golf courses, water which is applied to assist crops in areas or during times where rainfall is inadequate, the controlled application of water for agricultural purposes through man-made systems to supply water requirements not satisfied by rainfall.

IRWR

Internal Renewable Water Resources. Natural renewable water resources are the total amount of a country's water resources (internal and external resources), both surface water and groundwater, which is generated through the hydrological cycle. The amount is computed on a yearly basis.

Isohyet

A line demarcating equal amounts of rainfall/precipitation.

IUCN

International Union for Conservation of Nature. Created in 1948, IUCN has evolved into the world's largest and most diverse environmental network. The International Union for Conservation of Nature (IUCN) is a membership union uniquely composed of both government and civil society organizations. It provides public, private and non-governmental organizations with the knowledge and tools that enable human progress, economic development and nature conservation to take place together.

IWRM (Integrated Water Resources Management)

Integrated Water Resources Management (IWRM) is a process which promotes the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and the environment. Dublin Principles for IWRM implementation: (1) Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment. (2) Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels. (3) Women play a central part in the provision, management and safeguarding of water. (4) Water has an economic value in all its competing uses and should be recognized as an economic good.

J

Jet

A concentrated, high velocity flow of water capable of causing erosion, used in mining operation.

JRC

Joint Rivers Commission. The Joint River Commission is a bilateral working group established by India and Bangladesh in the Indo-Bangla Treaty of Friendship, Cooperation and Peace that was signed on March 19, 1972 and came into being in November, 1972.

K

Karst

Limestone terrains produced by dissolution of and attrition by groundwater. Karstic limestone is characterized by the absence of surface drainage and by sinks and rising streams connected underground by flow along major fissures or in cave systems.

Kalundborg Symbiosis

Kalundborg Symbiosis in the Kalundborg City of Denmark is the world's first large scale industrial symbiosis and has evolved over a period of fifty years. . The cooperation between the companies in the symbiosis provides mutual benefits, economical as well as environmental. The main principle is that a residue from one company becomes a resource in another. Such industrial symbiosis is critical for optimizing industrial water use and for reducing water pollution from industrial effluents.

Karst Topography

A landscape typical of gypsum and limestone areas, where sinkholes have formed as a result of the dissolution of rocks by rainwater; narrow, crumbling ridges separate the sinkholes.

Khal

Khal means any passage of inflow and outflow of water.

Lacustrine

Relating to a lake environment or of or relating to a lake or living or growing in lakes, as various organisms or formed at the bottom or along the shore of lakes, as geological strata.

Lacustrine Deposits

Material deposited by or settled out of lake waters and exposed by the lowering of water levels or the elevation of land. These sediments range in texture from sand to clay and are usually varied (layered annual deposits).

Lagoon

A shallow pond where sunlight, bacterial action and oxygen work to purify wastewater, typically used for the storage of wastewaters, sludge's, liquid wastes or spent nuclear fuel, a shallow sound, channel or pond, near and generally connected to, a larger body of water.

Lake

A generally permanent inland body of fresh water of considerable size occupying a basin or hollow in the earth's surface.

Laminar Flow

The flow of a viscous fluid in which particles of the fluid move in parallel layers, each of which has a constant velocity but is in motion relative to its neighboring layers.

Latitude

Latitudes are spherical coordinates of Earth locations that vary in North-South directions. Lines of latitude are angles on the Earth's surface which ranges from 0° at the Equator to 90° (North or South) at the poles.

Launching Apron

Integrated and articulated toe protection, i.e. mattress systems, such as sand-filled geo-textile bags, concrete-filled geo-textile bags or concrete blocks linked to a strong geo-textile fabric, placed on prepared slopes and a filter layer above and below water or in a horizontal excavation above DLW(Design Low Water).

La Nina

La Niña means The Little Girl in Spanish. La Niña events are the reverse of El Nino, with a sustained cooling of these same areas. La Niña is a phenomenon that describes cooler than normal ocean surface temperatures in the Eastern and Central Pacific Ocean; regions close to the equator off the west coast of South America. In some parts of the world, La Niña causes increased rainfall while in other regions it causes extreme dry conditions. The conditions that cause La Niña recur every few years and can persist for as long as two years.

Lentic

Related to slow-moving water, such as in lakes and bogs.

Leachate

Liquids that have percolated through a soil and that carry substances in solution or suspension.

Leaching

Occurs when a liquid (e.g. water) passes through a substance, picking up some of the material and carrying it to other places; this can happen underground in solid rock, or above ground through piles of material.

Levee

An artificial bank raised above the immediately surrounding land to redirect or prevent flooding by a river, lake or sea.

Licensed Quantity

The volume of water, usually expressed as m^3/d, which a user is allowed to withdraw from a groundwater source under the terms of an abstraction license issued by an appropriate authority.

Light Detection and Ranging (LiDAR)

LiDAR uses laser pulse measurements to identify heights, depths and other properties of features on the Earth's surface. Example outputs for LiDAR are digital elevation models, light intensity and digital surface models.

Lithification

The processes that convert sediment into a sedimentary rock.

Lithology

The systematic description of rocks, in terms of mineral composition and texture.

Lithostratigraphy

Stratigraphy based only on the physical and petrographic features of rocks; the delineation and classification of strata as three-dimensional, lithologically unified bodies.

Lithosphere

That part of the earth which is composed predominantly of rocks (either coherent or incoherent, and including the disintegrated rock materials known as soils and subsoils), together with everything in this rocky crust.

Limnetic

Related to the environment of lakes and ponds.

Limnology

The scientific study of physical, chemical and biological conditions and interactions in lentic systems, lakes, ponds and reservoirs.

Littoral

The zone between the extreme high-tide and extreme low-tide levels in the sea; also the zone from the shore to the light-compensation level of the sea and lakes.

Littoral zone

Area on or near the shore of a body of water in relatively shallow water.

Liquid

Water's state in the hydrologic cycle in which molecules move freely among themselves but do not separate like those in a vapor/gaseous state.

Local Scour

Removal of material from around piers, abutments, spurs and embankments caused by acceleration of flow and resulting vortices induced by obstructions to the flow or scour downstream from a structure or obstruction.

Longitude

Longitudes are coordinate on Earth that varies in east-west directions. They are usually expressed in degrees ranging from 0° to +180° east and –180° west. The prime meridian marks the 0° longitude and passes through the Royal Observatory in Greenwich, England.

Lotic

Related to fast-moving water, such as in most streams and rivers.

Losing Stream

A stream that is losing water to (or recharging) the groundwater system. The same stream could be both a gaining stream (in which groundwater discharge contributes to stream flow) and a losing stream, depending on the conditions.

Low Flows

Low flows are the stream flows that occur during a prolonged absence of rain. Probabilities of low flows can be assessed in a manner similar to the way that flood frequencies are expressed.

Low Lift Pump& High Lift Pump

In water supply system: Pumps, nearby treatment plant are called low-lift pumps. These move large volumes of water at relatively low discharge pressures. Pumps that discharge treated water into arterial mains are called high-lift pumps. Pumps that increase the pressure within the distribution system or raise water into an elevated storage tank are called booster pumps.

Macro Invertebrates

Macro invertebrates are organisms that lack a spine and are large enough to be seen with the naked eye. Examples of macro invertebrates include flatworms, crayfish, snails, clams and insects, such as dragonflies. Many aquatic insects live as juveniles, called nymphs or larvae, in the water, and become flying insects as adults.

Macrophyte

All aquatic higher plants, mosses andalgae, but excluding single celled phytoplankton or diatoms.

MacroZoobenthos (MZB)

Macro zoobenthos is defined as invertebrate bottom fauna living on, or in the bottom of the ocean, which is retained on a sieve with a mesh size of 1 mm x 1 mm. smaller animals that pass through such a sieve are called meiozoobenthos.

Magmatic Water

Water which is part of magma or which is released from the magma during crystallization.

Marginal Value

The value of another (hypothetical or last) increment of water when used in the most efficient manner.

Mariculture

Mariculture refers to aquaculture practiced in marine environments and in underwater habitats. It is a specialized branch of aquaculture involving the cultivation of marine organisms for food and other products in the open ocean, an enclosed section of the ocean, or in tanks, pond or raceways which are filled with seawater.

Marine Biology

Marine biology is the study of marine organisms, their behaviors and interactions with the environment. Marine biologists study biological oceanography and the associated fields of chemical, physical, and geological oceanography to understand marine organisms. As growing global population stresses the ability of our society to produce food, water,

and shelter, we will continue to look to the oceans to help sustain our basic needs. Advances in technology, combined with demand, will improve our ability to derive food, drinking water, energy sources, waste disposal, and transportation from the ocean. It will be up to this and future generations to build upon our existing knowledge of the ocean and its potential to help meet the needs of the world and its inhabitants.

Marine Bio-Technology

Marine Biotechnology is the study of how the various organisms and actions of the ocean can be used to provide services and products to us. Marine biotechnology provides growth potentials for Pharmaceuticals, Cosmetics, Nutritional supplements, Agrichemicals, Fine chemicals, Bio fuels, Enzymes and Molecular probes.

Marine Geology

Marine geology or geological oceanography is the study of the history and structure of the ocean floor. It involves geophysical, geochemical, sedimentological and paleontological investigations of the ocean floor and coastal zone. Marine geology has strong ties to geophysics and to physical oceanography.

Marine Renewable Energy

All movement is energy. The world's tides, ocean waves and river currents all contain kinetic and potential energy that can be used to drive turbines and produce electricity, reducing our dependence on fossil fuels is called marine renewable energy.

Marine Spatial Planning (MSP)

According to Intergovernmental Oceanographic Commission (IOC) of UNESCO, Marine spatial planning is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process. Characteristics of marine spatial planning include ecosystem-based, area-based, integrated, adaptive, strategic and participatory. Marine spatial planning is not an end in itself, but a practical way to create and establish a more rational use of marine space and the interactions among its uses, to balance demands for development with the need to protect the environment, and to deliver social and economic outcomes in an open and planned way. The main elements of marine spatial planning include an interlinked system of plans, policies and regulations; the components of environmental management

systems (e.g. setting objectives, initial assessment, implementation, monitoring, audit and review); and some of the many tools that are already used for land use planning.

Marsh

A water body covered by water for at least part of the year and characterized by aquatic and grass-like vegetation, especially without peat-like accumulation.

Mathematical Model

Mathematical Model is a simplified representation of complex physical processes using mathematical equations and operators.

Maximum Contaminant Level (MCL)

Designation given by the U.S. Environmental Protection Agency (EPA) to drinking water standards promulgated under the Safe Drinking Water Act. A MCL is the greatest amount of a contaminant allowed in drinking water without causing a risk to human health.

Mean Sea Level (MSL)

Mean Sea Level (MSL) is the datum for measurement of elevation and altitude. The average level of the ocean's surface, calculated as the arithmetical mean of hourly tide levels taken over an extended period of time and used as the standard for determining terrestrial and atmospheric elevations and ocean depths.

Meander

A loop-like bend in a stream or river that develops when a watercourse flows through level land and erodes its floodplain. One curved portion of a sinuous or a winding stream channel, consisting of two consecutive loops flowing clockwise and the other counter-clockwise.

Meandering River

Rivers flowing over gently sloping ground begin to curve back and forth across the landscape. These are called meandering rivers. Meandering rivers erode sediment from the outer curve of each meander bend and deposit it on an inner curve further downstream. This causes individual meanders to grow larger and larger over time.

Mesohabitat

Basic structural element, such as a riffle, run or pool in rivers or littoral and profundal in lakes, river margin, mussel bank, riprap, or fallen tree.

Meteoric water

Water that is or has recently been a part of the atmospheric portion of the hydrologic cycle.

Meteorology

Science of the atmosphere.

Metadata

Description of the characteristics of a set of data. Metadata is data about data. Metadata describes the characteristics of a dataset which includes abstract, coordinate system; attribute information, origin and accuracy.

Microhabitat

Zones of similar physical characteristics within a meso-habitat unit, differentiated by environmental characteristics (e.g., substrata type, water velocity, light, temperature or depth).

Mid-Oceanic Ridges

Elongated rises on the ocean floor where basalt periodically erupts, forming new oceanic crust; similar to continental rift zones.

Mineral

A naturally occurring, homogeneous inorganic solid substance having a definite chemical composition and characteristic crystalline structure.

Mixed Tide

Tide characterized by two markedly unequal high waters or two markedly unequal low waters or both on each lunar day during most of the month.

Moraine

A moraine is material left behind by a moving glacier. This material is usually soil and rock. Just as rivers carry along all sorts of debris and silt that eventually builds up to form deltas, glaciers transport all sorts of dirt and boulders that build up to form moraines.

M

Monitoring Well

A non-pumping well, generally of small diameter, that is used to measure the elevation of a water table or water quality. A piezometer, which is open only at the top and bottom of its casing, is one type of monitoring well.

Morphodynamics

Study of the time-dependent changes in the form of alluvial beds and their underlying processes.

Mud

Loose slushy fine sediment consisting of clay, silt, fine sand, and organic material. Often water-formed and deposited on the bottom of lakes and rivers.

Multiple Stressors

Refers to the multiple sources of ecosystem deterioration, which affect ecological and chemical status, water quantity and ecosystem functions and services. Multiple stressors occur in concert and may interact synergistically (i.e. self-energizing), antagonistically (i.e. attenuate each other) or just neutral with no direct relationships. For example, intensive land use activities may include water pollution and abstraction, with stronger pollution effects (i.e. less dilution) under reduced discharge.

Municipal Water System

A network of pipes, pumps, and storage and treatment facilities designed to deliver potable water to homes, schools, businesses, and other users in a city or town and to remove and treat waste materials.

Municipal Water Use

Purposes usually served by water within a city, town, or village such as household and sanitary purposes, watering of lawns and gardens, and fire protection.

N

N

Nanofiltration

A membrane filtration process designed to desalinate (or soften) water at relatively low pressure.

National Water Footprint

National water footprint is the same as what is more accurately called the 'water footprint of national consumption', which is defined as the total amount of fresh water that is used to produce the goods and services consumed by the inhabitants of the nation. Part of this water footprint lies outside the territory of the nation. The term should not be confused with the 'water footprint within a nation', which refers to the total freshwater volume consumed or polluted within the territory of the nation.

Natural and Actual Renewable Water Resources

Natural renewable water resources are the total amount of a country's water resources (internal and external resources), both surface water and groundwater, which is generated through the hydrological cycle. The amount is computed on a yearly basis.

Natural Concentration

The natural or background concentration in a receiving water body is the concentration in the water body that would occur if there was no human disturbance in the catchment. (It corresponds to the 'high status' conditions as defined in the EU Water Framework Directive.)

Natural Discharge

Ground water that reaches the surface (streams, lakes, wetlands, etc.) in the absence of pumping, excavation, or other human action.

Navigable Water

A body of water that is deep and wide enough for a boat or other floating object to be transported from one place to another. Navigable water includes any body of water capable, in its natural state, of being navigated by floating vessels of any description for the purposes of transportation, recreation, or commerce; as well as any waterway where the public right to navigation exists by dedication of the waterway for public purposes, or by the public having acquired the right to navigate through long use.

Neap Tide

Seven days after a spring tide, the sun and moon are at right angles to each other. When this happens, the bulge of the ocean caused by the sun partially cancels out the bulge of the ocean caused by the moon. This produces moderate tides known as neap tides, meaning that high tides are a little lower and low tides are a little higher than average. Neap tides occur during the first and third quarter moon, when the moon appears 'half full'.

Non-Point Source

A pollution source that cannot be defined as originating from discrete points such as pipe discharge. Areas of fertilizer and pesticide applications, atmospheric deposition, manure, and natural inputs from plants and trees are types of non-point source pollution.

Nonpoint source pollution

Pollution which cannot usually be traced back to its source. Pollution coming from many varied indeterminable sources. An example of point source pollution is a chemical spill from a factory. Nonpoint source pollution usually comes from storm water run-off from urban, suburban or agricultural areas. Human activities that add to nonpoint source pollution in storm water run-off include improper disposal of pet and yard waste, use of pesticides and construction.

Normal Depth

The depth of uniform channel flow.

Numerical Models

A numerical model is a combination of a large number of mathematical equations that depend upon computers to find an approximate solution to the underlying physical problem. The study field of water comprises a large variety of activities and interests, and therefore, areas of work. These areas face real engineering problems and, as a consequence, the contributions by some techniques from applied mathematics are really important. On the one hand, it is necessary to have analysis tools that allow us to carry out reliable simulations of the different models by analyzing different configurations, operation modes, load conditions, etc., in order to study existing installations from their basic characteristic data. They are determinist processes whose mathematical expressions consist of coupled systems of different types of equations, algebraic, ordinary differential, and partial differential equations, typically nonlinear, for which specific numerical techniques are necessary. For example, recharge can be estimated using numerical methods, using such codes as Hydrologic Evaluation of Landfill Performance, UNSAT-H, SHAW, WEAP and MIKE SHE.

NWMP

National Water Management Plan. In order to guide the management of the country's water resources Water Resources Planning Organization (WARPO) has prepared the National Water Management Plan (NWMP)

in December 2001. NWMP is a rolling plan to be periodically updated to include new priorities and challenges in the water sector.

NWPo (National Water Policy) 1999

The National Water Policy, promulgated in 1999 provides overall policy direction for water sector in Bangladesh. The National Water Policy, formulated by the Ministry of Water Resources (MoWR), aims to provide direction to all agencies and institutions relevant to the water sector in Bangladesh, to achieve integrated water resources management.

NWRD (National Water Resources Database)

NWRD is a geo-spatial database which holds spatial, temporal and attribute information on water resources. The data contained in NWRD have been collected from a wide range of sources and agencies; data are also captured from satellite images, aerial photographs and hardcopy maps. Water Resources Planning Organization (WARPO) collated data from different primary data collecting agencies, performs needful conversion, processing and quality checks of the data layers. Data is being scrutinized through proper temporal and spatial quality guidelines.

O

Ocean

An ocean is a body of salt water that composes much of a planet's hydrosphere. The average depth of the ocean is estimated to be about 13,000 feet (3,960 meters). The ocean bottom is a generally level or gently undulating plain, covered with a fine red or gray clay, or, in certain regions, with ooze of organic origin. The water, whose composition is fairly constant, contains on the average 3½ percent of dissolved salts; of this solid portion, common salt forms about 78 percent, magnesium salts 15–16 percent, calcium salts 4 percent, with smaller amounts of various other substances. The density of ocean water is about 1.026 (relative to distilled water, or pure H_2O). The oceans are divided into the Atlantic, Pacific, Indian, Arctic, and Antarctic Oceans.

Ocean Floor Sediment

Unconsolidated materials that settle and accumulate on the floor of the deep ocean. These materials can be fine mud and clays, quartz grains, dust, glacial debris comprised of microscopic shells of plants or animals, and

substances precipitated directly from seawater.

Oceanography

The science relating to the study of the ocean.

Offshore

Situated off the shore but within waters under a country's control.

Off take

A channel for taking away water; also, the point of beginning of such a channel; a take-off.

Oligotrophic lake

Deep, clear lakes with low nutrient supplies. They contain little organic matter and have a high dissolved oxygen level.

Onshore

Coming or moving from the water toward or onto the shore, as a breeze or prevailing wind.

Open Channel System

A system of conveyance channels where the top flow boundary is a free surface (e.g., canal systems).

Operational Water Footprint of a Business

The operational (or direct) water footprint of a business is the volume of freshwater consumed or polluted due to its own operations.

Organic Pollution

Any organic or partly organic load polluting streams and rivers with dissolved and particulate organic matter, e.g., sewage, manure, industrial effluents. Due to aerobic bacterial decomposition of the organic material organic pollution causes severe oxygen decrease in rivers and lakes and, hence kills fish and aquatic macro invertebrates.

Organizational Water Footprint

The Water Footprint Network is a platform for collaboration between companies, organizations and individuals to solve the world's water crises by advancing fair and smart water use. We are a dynamic, global network

that drives innovation and inspires the changes we must all make to share fresh water fairly amongst all people to sustain thriving communities and nature's diversity.

Osmosis

The selective passage of liquids through a semi permeable membrane in a direction which tends to make concentrations of all substances on one side of the membrane equal to those on the other side. The semi permeable membrane allows the passage of water but prevents the passage of substances dissolved in the water. The water movement is from the more dilute solution toward the more concentrated solution, and will continue until the two solutions are equal in concentration. If pressure is applied to the more concentrated side, the flow of water will reverse, from the concentrated side to the more dilute side, a condition termed Reverse Osmosis.

Outlet

Point where water exits from a stream, river, lake, reservoir, tidewater, or artificial drain. The mouth of a river where it flows into a larger body of water.

Outlet Channel

A waterway constructed or altered primarily to carry water from man-made structures, such as terraces, tile lines, and diversions.

Outlet Discharge Structure

A structure built to protect the downstream end of a dam's outlet pipe from erosion and is often designed to slow the velocity of released water to prevent erosion of the stream channel.

Outwash

The deposition of sediments due to the melting of glacial ice is known as an outwash. These deposits mainly consist of sand and gravel.

Over Bank Flow

Water movement that overtops the bank either due to stream stage or due to overland surface water runoff.

Over Drafting

Ground water supply that is being used in excess of its natural recharge rate.

Overexploitation

Intensive exploitation considered to be excessive. Among groundwater specialists there is no generally shared interpretation of groundwater overexploitation, and in particular it is often not explicitly specified with respect to what criterion the exploitation is considered excessive. Here, overexploitation is interpreted as intensive exploitation characterized by a less favorable balance between benefits and negative side effects than would have been the case at a lower rate of exploitation.

Overhead Water Footprint

The water footprint of a product consists of two elements: the use of freshwater that can immediately be related to the product and the use of freshwater in overhead activities. The latter element is called the 'overhead water footprint'. The overhead water footprint refers to freshwater use that in the first instance cannot be fully associated with the production of the specific product considered, but refers to freshwater use that associates with supporting activities and materials used in the business, which produces not just this specific product but other products as well.

Over Withdrawal

Withdrawal (removal) of groundwater over a period of time that exceeds the recharge rate of the supply aquifer.

Oxbow

An abandoned meander in a river or stream, caused by neck cutoff. Used to describe the U-shaped bend in the river or the land within such a bend of a river.

Oxbow Lake

It is a crescent-shaped or U-shaped lake that is formed when a meander separates out from the main body of a river. This type of lake is formed due to erosion and deposition in the river channel. The term "oxbow" is used to refer to a part of the river that is U-shaped.

P

Packer Testing

A field method of hydraulic conductivity testing involving the use of mechanically, pneumatically or hydraulically expanded packers in a borehole to isolate a section of the drilled length. The resultant separated section is then tested in a manner similar to standard pumping tests by injecting or withdrawing water over a period of time.

Palatable Water

Water, at a desirable temperature, that is free from objectionable tastes, odors, colors, and turbidity.

Pavement

Stream bank surface covering usually impermeable, designed to serve as protection against erosion.

Pebble

It is often synonymously used for gravel, grain size 2.0 - 7.5 cm diameter.

Pelagic

The word "pelagic" is derived from Ancient Greek πέλαγος (pélagos), meaning 'open sea'. Living and feeding in the water column, as opposed to living associated with a sea or lake bottom. The pelagic zone consists of the water column of the open ocean, and can be further divided into regions by depth.

Peninsula

A piece of land that projects into a body of water and is connected with the mainland by an isthmus (a narrow strip of land with sea on either side, forming a link between two larger areas of land).

Penman Method

A method of estimating evapotranspiration.

Penstock

A gate or sluice used in controlling the flow of water. On the other hand, a tube or trough for carrying water to a water wheel, or pipe carrying water to an electric turbine.

Percolation

The movement of water downward through the subsurface to the zone of saturation.

Percolating Waters

Waters passing through the ground beneath the Earth's surface without a definite channel.

Perched Aquifer

A perched water table or perched aquifer is an aquifer that occurs above the regional water table in the vadose zone. This occurs when there is an impermeable layer of rock or sediment (aquiclude) or relatively impermeable layer (aquitard) above the main water table or aquifer but below the land surface.

Perched Groundwater

Groundwater in a saturated zone of material has underlain by a relatively impervious stratum which acts as a barrier to downward flow and which is separated from the main ground water body by a zone of unsaturated material above the main groundwater body.

Perched Streams

Perched streams are either losing streams or insulated streams that are separated from the underlying groundwater by a zone of aeration.

Perched Water Table

The top of a zone of saturation that bottoms on an impermeable horizon above the level of the general water table in the area. It is generally near the surface, and frequently supplies a hillside spring.

Percolation

The movement of water through the openings in rock or soil or the entrance of a portion of the stream flow into the channel materials to contribute to groundwater replenishment.

Percolation Rate

The rate, usually expressed as a velocity, at which water moves through saturated granular material, and applies to quantity per unit of time of such movement and has been used erroneously to designate infiltration rate or infiltration capacity also.

Perennial Stream

A stream that flows from source to mouth throughout the year.

Perennial Yield (Groundwater)

The amount of usable water of a groundwater reservoir that can be withdrawn and consumed economically each year for an indefinite period of time. It cannot exceed the sum of the natural recharge, the artificial (or induced) recharge, and the incidental recharge without causing depletion of the groundwater reservoir.

Permafrost

Soil or rock which remains below freezing pointthroughout the year, as in polar and alpine regions.

Permeable

Capable of transmitting water within porous rock, sediment or soil. On the other hand, the rate at which water moves throughout the rocks or soil.

Permeable Layer

A layer of porous material (rock, soil, unconsolidated sediment); in an aquifer, the layer through which water freely passes as it moves through the ground.

Permeability, K (Specific or Intrinsic Permeability) [mD (milliDarcy)]

The term permeability, used in a general sense, refers to the capacity of a rock to transmit water. Such water may move through the rock matrix (intergranular permeability) or through joints, faults, cleavage or other partings (fracture or secondary permeability). A more strict definition of permeability is that it is a measure of the relative ease with which a porous medium can transmit a fluid under a potential gradient. It is the property of the medium only and is independent of the fluid.

Permeameter

A device for measuring permeability.

pH

The intensity of acidity and alkalinity, expressed as the negative logarithm of the hydrogen ion concentration or a numerical measure of acidity or

alkalinity. The pH scale ranges from 1 (acidic) to 14 (alkaline). A pH of 7 is neutral; lower values indicate acidity and higher values alkalinity.

Phenology

Phenology is a branch of science dealing with the relations between climate and periodic biological phenomena such as bird migration or plant flowering.

Photolysis (of Water)

It is the process of breakdown of water (H_2O) molecule into hydrogen and oxygen under the influence of light during the light reaction of photosynthesis. This process is the source of the free oxygen formed in photosynthesis.

Phreatic Aquifer

Aquifer in which the upper boundary of the groundwater mass forms a surface (water table) that is in direct contact with the atmosphere. This condition favors the aquifer being actively involved in the water cycle.

Phreatic Surface

The free surface of groundwater at atmospheric pressure.

Phreatic Water

Water within the earth that supplies wells and springs. On the other hand, water in the zone of saturation where all openings in rocks and soil are filled, the upper surfaces of which forms the water table.

Phreatic Zone

The locus of points below the water table where soil pores are filled with water. It is also called the zone of saturation.

Phreatophyte

A plant that habitually obtains its water supply from the zone of saturation, either directly or through the capillary fringe.

Physiography

Description and interpretation of landforms.

Phytoplankton

Microscopic plants that float or drift almost passively in oceans, lakes, or rivers.

Piedmont

An area lying at the foot of a mountain or mountain range and formed by its erosion products.

Piezometer

An instrument for measuring pressure head in a conduit, tank, soil, etc. It usually consists of a small pipe or tube tapped into the side of the container, the inside end being flush with, and normal to, the water face of the container, connected with a manometer pressure gage, mercury of water column, or other device for indicating pressure head.

Piezometric Level (or Surface)

Confined groundwater is usually under pressure because of the weight of the overburden and the hydrostatic head. If a well penetrates the confining layer, water will rise to this level, the artesian equivalent of the water table. If the piezometric level is above ground level, the well discharges as a flowing well, artesian well, or a spring.

Pirate Stream

The type of stream that captures the origin or headwaters of another stream is known as pirate stream. This mainly happens due to the tectonic activities that are taking place in the particular regions.

Placer Deposit

The type of mineral deposits that results due to the flow of transporting medium like streams and rivers is known as placers.

Planform

Shape on map of bank lines or waterlines. The shape or form of an object, such as an airfoil, as seen from above as in a plan view. In geography, a body of water's outline or morphology as defined by the still water line.

Planimetric Map

Horizontal depiction of map features on a two-dimensional plane without any reference to contours or topographic relief. Typical features defined

within a planimetric map include such natural and cultural features as streams, roads, shorelines, waterways, building footprints, reservoirs, bridges, roadways, overpasses, sidewalks and parking lots.

Plate Tectonic

A theory in geology. The lithosphere of the earth is divided into a small number of plates which float on and travel independently over the mantle and much of the earth's seismic activity occurs at the boundaries of these plates. The outer shell of the earth is the lithosphere, is broken up into several tectonic plates. The seven major plates are: The African plate, Antarctic plate, Eurasian plate, Indo-Australian plate, North American plate, Pacific plate and South American plate.

Plateau

Extensive relatively flat and horizontal upland area, usually higher than the surrounding area and bounded at least at one side by steep slopes.

Playa

A dry (ephemeral) lakebed. Common in semi-arid areas.

Plume

An underground pattern of contaminant concentrations in groundwater created by the movement of groundwater beneath a contaminant source. Contaminants spread mostly laterally in the direction of groundwater movement. The source site has the highest concentration, and the concentration decreases away from the source.

Pluvial

In hydrology, anything that is brought about directly by precipitation.

PPM (part per million)

A measure of concentration of a dissolved material in terms of a mass ratio (milligrams per kilogram or mg/kg). For water analysis, part per million often is presented as a mass per unit volume (milligrams per liter or mg/l), 1 ppm = 1 mg/l.

Point-In-Polygon

A spatial query that determines which polygon boundary encompasses a specified point. A typical operation is to select multiple points within a boundary and assign to them an attribute equal to a characteristic

assigned to all areas within the boundary (i.e. soil type) to the attributes describing the point. As a variation, one or more polygons are selected and all points within them are likewise assigned new attributes. A process can be extended to apply to linear features (line-in-polygon) and closed polygons (polygon-in-polygon) located within or partially within polygons as well.

Point Source

A source at a discrete location such as a discharge pipe, drainage ditches, well, or concentrated livestock operation. Point source pollution arises from a discrete source, e.g., the discharge from a sewage treatment works.

Polder

Polder is a low-lying tract of land enclosed by embankments known as dykes that forms an independent hydrological entity which has no physical connection with outside water other than through manually operated devices.

Polygon

A closed plane figure bounded by three or more line segments with a non-zero area. Alternatively, a polygon is a multisided feature that represents an area on a map. Many different natural and man-made features are typically represented by polygons in a spatial database including zoning districts, soil types, water bodies, building footprints, lot boundaries, etc. A type spatial queries wherein the spatial selection area is a polygon shape rather than a square, rectangle, or circle.

Polygon Overlay

A group of polygons on one or more layers, representing various areas that make up a particular geographic theme (e.g., soil types, zoning designations, parcels, land use, etc.).

Potamology

The scientific study of rivers. Originated early 19thcentury from Greek potamos river + logy.

Point Source Pollution

Pollution discharged from any identifiable point, including pipes, ditches, channels, sewers, tunnels, and containers of various types.

Pollution

An alteration in the character or quality of the environment, or any of its components, that renders it less suited for certain uses. On the other hand, the alteration of the physical, chemical, or biological properties of water by the introduction of any substance that renders the water harmful to use.

Pond

A small natural body of standing fresh water filling a surface depression, usually smaller than a lake.

Pore Space

Pore space is defined by porosity of a material possessing free space between the mineral grains, expressed as percentage and depends on size and sorting of the particles as a cubic or hexagonic package.

P**orosity**

The ratio of the volume of void or air spaces in the rock or sediment to the total volume of the rock or sediment or the capacity of rock or soil to hold water varies with the material.

Potable Water

Water of a quality suitable for drinking or water that is drinkable. Potable water is considered safe for human consumption and is often referred to as drinking water.

Pollutant

A contaminant that negatively impacts the physical, chemical, or biological properties of the environment.

Potentiometric Surface

An imaginary surface representing the elevation and pressure head of groundwater and defined by the level to which water rises in a well or piezometer. The water table is a particular potentiometric surface.

Pool

A relatively deep, still section in a stream.

Pore Pressure

The interstitial pressure of water within a mass of soil, rock, or concrete.

Precipitation

Precipitation is the discharge of water, in a liquid or solid state, out of the atmosphere, generally onto a land or water surface. It is the common process by which atmospheric water becomes surface, or subsurface water. The term "precipitation" is also commonly used to designate the quantity of water that is precipitated. Precipitation includes rainfall, snow, hail, and sleet.

Pressure

The direct environmental effect of a driver (e.g., altered flow conditions, changing water chemistry, organic pollution, water abstraction).

Pressure (stressor) Gradient

A gradient describing the different levels of impact caused by a pressure (stressor).

Pressure Head

Hydrostatic pressure expressed as the height of a column of water that the pressure can support, expressed with reference to a specific level such as land surface. The hydraulic head is the height of the free surface of a body of water above a given surface or subsurface point.

Primary Impacts

The term 'primary impacts' is used in the context of assessing the sustainability of a water footprint in a geographic area. Primary impacts refer to the effect of the water footprint in a catchment on water flows and water quality.

Process Water

Water that is used in an industrial process and is not intended for human consumption.

Protection

Protection means imposition of ban and restrictions or conditions for the conservation of any water resources.

Pumping Test

A field testing procedure to quantify aquifer properties at a site involving pumping water out of (or less commonly injecting water into) an aquifer

P and measuring the effect on water levels in that aquifer and sometimes in adjacent strata. There are several different procedures employed depending on the physical properties to be quantified. A constant-rate pumping test is conducted at a steady rate of discharge or injection; a step-test increases the discharge in stages to a maximum value; a bailing test is conducted during the drilling process, using the bailer drilling tool as a water withdrawal method.

Pumping Head

Energy given to a fluid by a pump, usually expressed in feet of fluid (foot-pounds per pound).

Pumping Station

Mechanical devices installed in sewer or water systems or other liquid-carrying pipelines to move the liquids to a higher level.

Q

Q

QGIS (software)

QGIS (formerly Quantum GIS) is a free and open source software package that allows to create, edit, visualize, analyze and publish geospatial information.

Quantitative Precipitation Forecast

A spatial and temporal precipitation forecast that will predict the potential amount of future precipitation for a specified region, or area.

R

R

Rainfall

Rainfall is the amount of rain that falls in a place during a particular period.

Rainfall-Runoff Model

A rainfall-runoff model is a mathematical representation of the movement of water through a river basin. These models are used to link rainfall, soil moisture, evaporation, groundwater and stream flow.

Raw Water

Water in its natural state, prior to any treatment for drinking.

Reach

A group of river segments with similar biophysical characteristics. Most river reaches represent simple streams and rivers, while some reaches represent the shorelines of wide rivers, lakes and coastlines.

Recharge

Water added to a groundwater aquifer. For example, when rainwater seeps into the ground. Recharge may occur naturally through precipitation or surface water or artificially through injection wells or by spreading water over groundwater reservoirs. Recharge derived from rainfall can occur via direct or indirect means. Direct recharge is rainwater that percolates where it falls straight into the soil zone, whereas indirect recharge takes place from rainwater that is transported overland. In semi-arid and arid regions, indirect recharge is an important mechanism.

Recharge Model

Recharge is a fundamental component of groundwater systems, and in groundwater-modeling exercises recharge is either measured and specified or estimated during model calibration. The most appropriate way to represent recharge in a groundwater model depends upon both physical factors and study objectives. Where the water table is close to the land surface, as in humid climates or regions with low topographic relief, a constant-head boundary condition is used. Conversely, where the water table is relatively deep, as in drier climates or regions with high relief, a specified-flux boundary condition is used. In most modeling applications, mixed-type conditions are more effective, or a combination of the different types can be used. The relative distribution of recharge can be estimated from water-level data only, but flux observations must be incorporated in order to estimate rates of recharge.

Recharge Rate

The quantity of water per unit of time that replenishes or refills an aquifer.

Recharge Zone/ Area

An area where permeable soil or rock allows water to seep into the ground to replenish an aquifer.

Reclaimed Wastewater

Treated wastewater that can be used for beneficial purposes, such as irrigating certain plants.

Reclaimed Water

Water that is utilized after it has fulfilled its primary purpose as identified in a water act license and before it becomes return flow (leaves the wastewater treatment plant back to a watercourse).

Recovery

The recovery of the biota of an ecosystem or water body from the adverse impacts of environmental pressures. Recovery is expected in consequence of appropriate response measures and activities (e.g., restoration, waste water treatment, other pressure reduction).One of the use values provided by water. It is rooted indirectly to the value of ground water, which plays a role in providing surface water.

Recycled Water

Water that is used more than one time before it passes back into the natural hydrologic system.

Reference (condition)

Natural or near-natural status, characterized by least impairment due to human activities, such as agriculture, settlement, organic pollution, eutrophication, water abstraction, etc. For any water body type or river type reference conditions or 'high ecological status' is a state in the present or in the past where there are no, or only very minor, changes to the values of the hydro morphological, physico-chemical, and biological quality elements which would be found in the absence of anthropogenic disturbance.

Reference Criteria

Selected environmental and biotic criteria to define reference conditions, such as hydrologic and morphologic status, physical-chemical parameters, land use characteristics, channel and bed form.

Regime

The condition of a stream or its channel with regard to stability.

Relief

Elevations and depressions of the earth's surface, including those of the ocean floor. Relief can be represented on maps by contours, shading, hypsometric tints, digital terrain modeling, or spot elevations.

Remediation

Containment, treatment or removal of contaminated groundwater.

Remote Sensing

Remote sensing is the acquisition of information about an object or phenomenon without making physical contact with the object and thus in contrast to on-site observation, especially the Earth. Remote sensing is used in numerous fields, including geography, land surveying and most Earth Science disciplines (for example, hydrology, ecology, meteorology, oceanography, glaciology, geology).

Renewable and Non-Renewable Water Resources

In computing water resources on a country basis, a distinction is to be made between renewable and non-renewable water resources. Renewable water resources are computed on the basis of the water cycle, which usually represents the long-term average annual flow of rivers (surface water) and groundwater. Non-renewable water resources are groundwater bodies (deep aquifers) that have a negligible rate of recharge on the human time-scale and thus can be considered non-renewable.

Renewable groundwater

Body of groundwater that is replenished under current climate and geological conditions.

Reynolds Number

The Reynolds number is the ratio of inertial forces to viscous forces and is a convenient parameter for predicting if a flow condition will be laminar or turbulent. It can be interpreted that when the viscous forces are dominant (slow flow, low Re) they are sufficient enough to keep all the fluid particles in line, then the flow is laminar. Even very low Re indicates viscous creeping motion, where inertia effects are negligible. When the inertial forces

dominate over the viscous forces (when the fluid is flowing faster and Re is larger) then the flow is turbulent. It is a dimensionless number comprised of the physical characteristics of the flow. An increasing Reynolds number indicates an increasing turbulence of flow.

Where, V is the flow velocity, D is a characteristic linear dimension, (travelled length of the fluid; hydraulic diameter etc.), ρ fluid density (kg/m3), μ dynamic viscosity (Pa.s), ν kinematic viscosity (m2/s); ν = μ / ρ.

Renovated Ground Water

Ground water from which certain contaminants have been removed, synonymous with remediated ground water.

Return Flow

The part of the water withdrawn for an agricultural, industrial or domestic purpose that returns to the groundwater or surface water in the same catchment as where it was abstracted. This water can potentially be withdrawn and used again.

Reservoir Area

The total surface of a reservoir measured in a horizontal plane at an elevation corresponding to the full supply level of the reservoir. The area that would be flooded due to backwater elevations or surcharge is not included.

Reservoir Capacity

The total volume of water a reservoir is capable of holding when filled up to the full supply or normal water level. Storage derived from temporary flashboards, surcharge, or backwater curve is not included. Reservoir capacity usually is reported as of the date of construction of the dam.

Residence Time

Period of time that groundwater remains in an aquifer.

Resilience

An ecosystem's ability to recover and retain its structure and function following a transient and exogenous impairment. If a stressor or disturbance does alter the ecosystem, then it should be able to bounce back quickly to resume its former ability to yield a service or utility rather than transform into a qualitatively different state that is controlled by a different set of

ecosystem processes. In order for ecosystem resilience to be defined, the ecosystem must have a degree of stability prior to the perturbation.

Reservoir

A pond, lake, tank, or basin (natural or human made) where water is collected and stored. Large bodies of groundwater are called groundwater reservoirs; water behind a dam is also called a reservoir.

Restoration

The renewing or repairing of a natural system so that its functions and qualities are comparable to those of its original, unaltered state.

Return Flow

That part of a diverted flow that is not consumptively used and returned to its original source or another body of water. Irrigation water that is applied to an area and which is not consumed in evaporation or transpiration and returns to a surface stream or aquifer.

Reverse Osmosis

Reverse Osmosis is a highly efficient removal process for inorganic ions, salts, some organic compounds, and in some designs, microbiological contaminants. Reverse osmosis resembles the membrane filtration process in that it involves the application of a high feed water pressure to force water through semi permeable membrane. In osmotic processes, water spontaneously passes through semi permeable membrane from a dilute solution to a concentrated solution in order to equilibrate concentrations. Reverse osmosis is produced by exerting enough pressure on a concentrated solution to reverse this flow and push the water from the concentrated solution to the more dilute one. The result is clear permeate water and a brackish reject concentrate.

Reynolds Number

It is an important dimensionless quantity in fluid mechanics used to help predict flow patterns in different fluid flow situations. It can be defined as the ratio of inertia force (ρ u L) to viscous or friction force (μ).

Riffle

A shallow section in a river or stream where the water flows swiftly; may be less turbulent than rapids.

Riffle-Pool Section

Regular alternation of shallow (riffle) areas with higher current velocities and gravel-cobble substrates followed by deeper slow-flowing pool areas with finer substrates. Mountain streams often have a fixed riffle-pool sequence.

Ring of Fire

The Ring of Fire is a major area in the basin of the Pacific Ocean where many earthquakes and volcanic eruptions occur. In a large 40,000 km (25,000 mi) horseshoe shape, it is associated with a nearly continuous series of oceanic trenches, volcanic arcs, and volcanic belts and plate movements. It has 452 volcanoes (more than 75% of the world's active and dormant volcanoes).

Riparian (area)

The area adjacent to a stream or river with a high density, diversity, and productivity of plant and animal species relative to nearby uplands. Pertaining to the banks of a river, stream, or other typically, flows body of water. This term is also commonly used for other bodies of water, e.g., ponds, lakes.

Riparian Habitat

The aquatic and terrestrial habitat adjacent to streams, lakes, estuaries, or other waterways.

Riparian Water Rights

The rights of an owner whose land abuts water. T The doctrine of riparian rights is an old one, having its origins in English Common Law. Specifically, persons who own land adjacent to a stream have the right to make reasonable use of the stream. Riparian users of a stream share the stream flow among themselves, and the concept of priority of use (Prior Appropriation Doctrine) is not applicable. Usually, riparian rights cannot be sold or transferred for use on non-riparian land.

River

A river is a natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river. In some cases a river flows into the ground and becomes dry at the end of its course without reaching another body of water. Small rivers can be referred to using names such as stream, creek, brook, rivulet, and rill. There are no official definitions for the generic term river as applied to geographic features. Rivers are part of

the hydrological cycle; water generally collects in a river from precipitation through a drainage basin from surface runoff and other sources such as groundwater recharge, springs, and the release of stored water in natural ice and snow-packs (e.g., from glaciers).

River Bank Stabilization

Holding a river in place by protecting its bank against erosion with a continuous covering of loose stones or riprap.

River Basin

The whole river system including all tributaries and springs from the source to the mouth (sea).

River Flooding

The rise of a river to an elevation such that the river overflows its natural banks causing or threatening damage.

River Type

A river type is a constructed ecological entity with limited internal variation in its biotic and abiotic components, which shows a minimal and constant biotic and abiotic discontinuity in comparison with other entities. Such river types might serve as 'units', for which an assessment system can be applied. A river type should always be defined on the basis of natural or near-natural reference sites.

Riverine Habitat

The aquatic habitat within streams and rivers.

River Bank

River Bank is the margin of a stream or river. Banks are called right or left as viewed facing downstream, in the direction of the flow.

River Delta

A river delta is a landform created by deposition of sediment that is carried by a river as the flow leaves its mouth and enters slower-moving or stagnant water. This occurs where a river enters an ocean, sea, estuary, lake, reservoir, or (more rarely) another river that cannot carry away the supplied sediment. The size and shape of a delta is controlled by the balance between watershed processes that supply sediment, and receiving basin processes that redistribute, sequester, and export that sediment. The size,

R geometry, and location of the receiving basin also play an important role in delta evolution.

River Gage

A device for measuring the river stage.

River Gage Datum

The arbitrary zero datum elevation which all stage measurements are made from.

River Basin

The area drained by a river and its tributaries or catchment area of a river.

River Dependent Area (RDA)

RDA is an area directly influenced by a river in terms of historic hydrologic linkages and currently having potential for direct impact from the river.

River Training

Engineering works with or without the construction of embankment built along a stream or reach of stream to direct or to lead the flow into a prescribed channel.

Runoff

Runoff is nothing more than water "running off" the land surface. That part of the precipitation, snow melt, or irrigation water that appears in uncontrolled (not regulated by a dam upstream) surface streams, rivers, drains or sewers. Runoff may be classified according to speed of appearance after rainfall or melting snow as direct runoff or base runoff, and according to source as surface runoff, storm interflow, or groundwater runoff.

Runoff coefficient

Ratio of runoff volume and the volume of rainfall during the event that caused runoff.

S

Safe Yield

The definition of safe yield has evolved for nearly a century; initially, it was defined by Lee as "the limit and quantity of water which can be withdrawn regularly and permanently without dangerous depletion of the storage reserve." The definition was modified and expanded by Meinzer, Conkling,

and Todd. Due to ambiguity and lack of agreement on the definition, many authors have suggested abandoning the term for an alternate term such as "sustainable yield."

Salt Water

Water that contains a relatively high percentage (over 0.5 parts per thousand) of salt minerals.

Saltwater Intrusion

Process by which an aquifer is over drafted creating a flow imbalance within an area that results in salt water encroaching into fresh water supply.

Saline Water

More commonly known as salt water is water that contains a high concentration of dissolved salts (mainly sodium chloride). The salt concentration is usually expressed in parts per thousand (permille, ‰) or parts per million (ppm).

Salinity

Salinity in rivers, lakes, and the ocean is conceptually simple, but technically challenging to define and measure precisely. Conceptually the salinity means the quantity of dissolved salt content of a body of water.

Saline Intrusion

The entry of sea water into a coastal aquifer. It may be caused by over pumping fresh water from the aquifer or insufficient natural head on the fresh water aquifer. Sea water is denser than fresh water and it may form a wedge beneath the fresh water adjacent to the coast.

Sanitation

Sanitation is access to, and use of, excreta and wastewater facilities and services that ensure privacy and dignity, ensuring a clean and healthy living environment for all. 'Facilities and Services' should include the 'collection, transport, treatment and disposal of human excreta, domestic wastewater and solid waste and associated hygiene promotion' to the extent demanded by the particular environment conditions.

Sand

A mineral soil particle between 0.05 and 2.0 mm in diameter or a soil textural class containing more than 85 % sand and less than 10 % clay.

Sandstone

A sedimentary rock composed predominantly of sand-sized quartz grains.

Saturated Thickness

Total water-bearing thickness of an aquifer.

Saturation Zone

The portion below the earth's surface that is saturated with water. The upper surface of this zone, open to atmospheric pressure, is known as the water table.

Scenario

Coherent descriptions of alternative hypothetical futures that reflect different perspectives on past, present and future developments, which can serve as a basis for action. Scenario is also used for 'external context' scenario that describes developments that cannot be influenced. The Intergovernmental Panel on Climate Change (IPCC) uses scenario planning for a wide range of numerical projections including economic growth, energy use, global warming, and greenhouse gas emissions.

Scour

An erosion of a river , stream, tidal inlet or other water bed area by a current, wash or other water in motion producing a deepening of the overlying water or a widening of the lateral dimension of the flow area.

Sea Level Rise

As humans continue to pour greenhouse gases into the atmosphere, oceans have tempered the effect. The world's seas have absorbed more than 90 percent of the heat from these gases, but it's taking a toll on our oceans: 2018 set a new record for ocean heating. Many people think of global warming and climate change as synonyms, but scientists prefer to use "climate change" when describing the complex shifts now affecting our planet's weather and climate systems. Rising seas is one of those climate change effects. Average sea levels have swelled over 8 inches (about 23 cm) since 1880, with about three of those inches gained in the last 25 years. Every year, the sea rises another 0.13 inches (3.2 mm). Rising average sea water surface caused primarily by two factors related to global warming: the added water from melting land ice and the thermal expansion of seawater as it warms.

Sea Wall

A seawall (or sea wall) is a form of coastal defense constructed where the sea, and associated coastal processes, impact directly upon the landforms of the coast

Seaweed

Seaweed or sea vegetables are forms of algae that grow in the sea. They're a food source for ocean life and range in color from red to green to brown to black. Seaweed grows along rocky shorelines around the world, but it's most commonly eaten in Asian countries such as Japan, Korea and China.

Second-Day Feet

The volume of water represented by a flow of one cubic foot per second for 24 hours; equal to 84,000 cubic feet. This is used extensively as a unit of runoff volume.

Secondary Impacts

The term 'secondary impacts' is used, next to the term 'primary impacts', in the context of assessing the sustainability of a water footprint in a geographic area. Secondary impacts refer to the impacts of a water footprint on ultimate ecological, social and economic values such as biodiversity, human health, welfare and security.

Sediment

Sediment is a naturally occurring material that is broken down by processes of weathering and erosion, and is subsequently transported by the action of wind, water, or ice or by the force of gravity acting on the particles and usually settles to the bottom of a liquid.

Sediment Concentration

Weight or volume of sediment relative to the quantity of transporting fluid.

Sediment Discharge

The amount of sediment moved by a stream in a given time, measured by dry weight or by volume. Also known as sediment-transport rate.

Sediment Storage Capacity

The volume of a reservoir planned for the deposition of sediment.

Sediment Load

Amount of sediment being moved by a stream. The majority of a stream's sediment load is carried in solution (dissolved load) or in suspension. The remainder is called the bed load. Dissolved load (Earth material that has been dissolved into ions and carried in solution is the dissolved load).

Seepage

The slow movement of water into or out of a body of surface or subsurface water. The loss of water by infiltration into the soil from a canal, ditch, lateral, watercourse, reservoir, storage facility, or other body of water, or from a field.

Semi-arid Region

A region of low precipitation during a significant part of the year, characterized at least seasonally by a lack of available water, to the extent of hindering the growth and development of plant life, at least during the dry season. In agriculture this term is used to describe dry areas where land cultivation is impracticable or much less profitable without irrigation.

Semi-confined aquifer

Confined aquifer, where either the confining bed on top of the aquifer or the poorly permeable basal formation underneath the aquifer have sufficient permeability (aquitards) to allow the exchange of water between the aquifer and the domains above or below it.

Semi Permeable Bed

Earth layer with limited capacity to transmit groundwater.

Settling Pond

A natural or artificial water body used to contain wastewater in order to enable solids to be removed from it before it is released to the natural environment.

Sewage

Sewage is a type of wastewater that is produced by a community of people. It is characterized by volume or rate of flow, physical condition, chemical and toxic constituents, and its bacteriologic status. It consists mostly of greywater, black water; soaps and detergents; and toilet paper.

Sewage treatment plant

A facility designed to receive the wastewater from domestic sources and to remove materials that damage water quality and threaten public health and safety when discharged into receiving streams or bodies of water.

Shadow Price of Water

A shadow price is commonly referred to as a monetary value assigned to currently unknowable or difficult-to-calculate costs. It is based on the willingness to pay principle - in the absence of market prices, the most accurate measure of the value of a good or service is what people are willing to give up in order getting it. Shadow pricing is often calculated on certain assumptions and premises. Water shadow price is an important reference in setting water price.

Shared Sanitation Facilities

Sanitation facilities of an otherwise acceptable type shared between two or more households.

Sheet Flow

Flow that occurs overland in places where there are no defined channels; the flood water spreads out over a large area at a uniform depth. This also referred to as overland flow.

Shallow Well

A shallow well is a hole which has been dug; bored, driven or drilled into the ground for the purpose of extracting water is a well. A well is considered to be shallow if it is less than 50 feet deep. The source of a well is an aquifer. Shallow tube wells (STWs) are installed in shallow aquifers and have a discharge capacity of about 12-15 l sec-1. STWs are driven by surface mounted centrifugal pumps and can lift water from a depth of ~50 m. They are relatively inexpensive, easy to install and maintain and are shared by small groups of farmers. The average area irrigated by a STW in Bangladesh is about 2-4 ha.

Shore Ice

An ice sheet in the form of a long border attached to the bank or shore; border ice.

Sinuosity

The ratio between the thalweg length and the valley length of a stream.

Siphon

Siphon is a cross drainage structure carrying the water/discharge from a natural stream across a canal intercepting the stream. Canal may come across obstructions like rivers, natural drains and other canals.

Silt

A mineral soil particle between 0.002 and 0.05 mm in diameter or a soil texture class containing more than 80 % silt and less than 12 % clay.

Sinkhole

A depression in the Earth's surface caused by dissolution of underlying limestone, salt, or gypsum. Drainage is provided through underground channels that may be enlarged by the collapse of a cavern roof.

Sludge

A soft water-formed fine sedimentary deposit which normally can be removed by blowing down.

Slug Test

A slug test is a particular type of aquifer test where water is quickly added or removed from a groundwater well, and the change in hydraulic head is monitored through time, to determine the near-well aquifer characteristics.

Sluice

It is an artificial passage for water to flow through with a gate for controlling the flow such as drainage sluice, flushing sluice.

Small Stream Flooding

Flooding of small creeks, streams, or runs.

Snow Density

The mass of snow per unit volume which is equal to the water content of the snow divided by its depth.

Snow Pillow

An instrument used to measure snow water equivalents. Snow pillows typically have flat stainless steel surface areas. The pillow below this flat surface is filled with antifreeze solution and the pressure in the pillow is related to the water-equivalent depth of the snow on the platform. One great advantage of snow pillows over a snow survey is the frequency of observations, which can be as high as twice per day.

Snow Stick

A portable rod used to measure snow depth.

Snow Water Equivalent (SWE)

Snow Water Equivalent (SWE) describes the equivalent amount of liquid water stored in the snow pack. It indicates the water column that would theoretically result should the whole snow pack melt instantaneously and is defined as product between the snow layer's depth and density.

Snowmelt Flooding

Flooding caused primarily by the melting of snow.

Snowpack

The total snow and ice on the ground, including the new snow, the previous snow and ice which have not melted.

Soft Water

Any water whose hardness minerals are 1.0 GPG (17.1 mg/L) or less.

Sole Source Aquifer

An aquifer that supplies 50% or more of the drinking water of an area.

Soil Moisture

Water contained in the aeration or unsaturated zone. Soil moisture is water held in soil layers above the level at which groundwater occur. Soil moisture is replenished by rain and by capillary rise from groundwater, and depleted by evaporation from the soil surface and by plants transpiring water extracted from the soil by their roots. A soil mass that is fully wetted, but freely drained, is said to be at field capacity. When soil moisture is reduced to a level at which plants can no longer transpire freely, the soil moisture level is said to be at wilting point.

Source Water Protection

Voluntary action taken to prevent the pollution of drinking water sources, including groundwater, lakes, rivers, and streams. Source water protection is developing and implementing a plan to manage land uses and potential contaminants. To be effective, source water protection should be directed to major threats to the drinking water source identified in the source water assessment. As part of the source water protection plan, a contingency plan for use in the event of an emergency is developed. Source water protection for groundwater is also called wellhead protection.

Solubility

The quantity of material that dissolves in a given volume of water.

Soil Moisture

Water contained in the upper regions near the earth's surface.

Specific Discharge

The rate of discharge of ground water per unit area of a porous medium measured at right angle to the direction of flow.

Specific Energy

The energy at any cross section of an open channel, measured above the channel bottom as datum; numerically the specific energy is the sum of the water depth plus the velocity head.

Speleology

Science dealing with caves.

Spur

A permeable or impermeable linear structure that projects into a channel from the bank to alter flow direction induce deposition or reduce flow velocity along the bank.

Spatial Analysis

Methods used to explore the spatial relationships between features both real and theoretical. Process of extracting or creating new information about a set of geographic features; techniques to determine the distribution of a spatial feature(s); and the relationships between two or more features, the location of, proximity to, and orientation of these features in space. Study of the locations and shapes of geographic features and the relationships between them.

Spring tide

A spring tide popularly known as a 'King Tide' refers to the 'springing forth' of the tide during new and full moon.

Spatial Data

One of the three kinds of data (spatial, textural and image). Spatial data is categorized according to the following feature types: Zero dimensional features: primitive points; topological node. One dimensional features

include primitive lines, Strings (multiple no branching lines), arcs (mathematically defined curve; topological Links, chains, and rings); two dimensional features include polygons defining enclosed areas, pixels, and grid cells.

Specific Capacity Q/s [l/s/m, m^2/d, m^3/d/m]

The rate of discharge of water from the well divided by the resulting drawdown on the water level within the well.

Specific Storage Ss [m^{-1}]

Specific storage of a saturated aquifer is defined as the volume of water that a unit volume of aquifer releases from storage under a unit decline in hydraulic head.

Specific Yield [dimensionless]

The amount of water in storage released from a column of aquifer of unit cross sectional area under unit decline of head. Expressed as a dimensionless proportion of the saturated mass of that aquifer unit.

Spillway

A structure over or through which excess or flood flows are discharged. If the flow is controlled by gates, it is a controlled spillway, if the elevation of the spillway crest is the only control, it is an uncontrolled spillway. Some various types of spillways include: Auxiliary or Emergency Spillway, Fuse Plug Spillway. Moreover, there is also some spillway like: (1) Primary (or principal) Spillway, (2) Shaft or Morning Glory Spillway (3) Side Channel Spillway (4) Siphon Spillway.

Spillway Crest

The elevation of the highest point of a spillway.

Spring

An issue of water from the earth; a natural fountain; a source of a reservoir of water.

SST (Sea Surface Temperature)

Sea surface temperature is the water temperature close to the ocean's surface. The exact meaning of surface varies according to the measurement method used, but it is between 1 millimeter and 20 meters below the sea surface. Air masses in the Earth's atmosphere are highly modified by sea surface temperatures within a short distance of the shore.

Staff Gage

A vertical staff graduated in appropriate units which are placed so that a portion of the gage is in the water at all times. Observers read the river stage off the staff gage.

Stage

The level of the water surface above a given datum at a given location.

Static Water Level

Elevation or level of the water table in a well when the pump is not operating or the level or elevation to which water would rise in a tube connected to an artesian aquifer or basin in a conduit under pressure.

Step Drawdown Test

A step drawdown test is a pumping test in which the drawdown in a well is observed while the discharge rate from the well is increased in steps. Step drawdown tests can be used to determine the aquifer transmissivity and the well loss component of the drawdown in the pumped well. The aquifer storage coefficient can also be estimated.

Stream

A general term for a body of flowing water; natural water course containing water at least part of the year.

Streamflow

The water discharge that occurs in a natural channel. A more general term than runoff, streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Streamline

An imaginary line within the flow which is everywhere tangent to the velocity vector.

Stream Bank Erosion

Removal of soil particles or a mass of particles from a bank surface primarily due to water action.

Stream Bed

The stream bottom. A stream bed or streambed is the channel bottom of a stream or river, the physical confine of the normal water flow. The lateral confines or channel margins are known as the stream banks or river banks,

during all but flood stage. Under certain conditions a river can branch from one stream bed to multiple stream beds. A flood occurs when a stream overflows its banks and flows onto its flood plain.

Stream Order (Strahler)

A first-order stream is the unbranched section of a river or stream. The tributary initiated by the confluence of two first-order streams is the second-order stream and so on (Strahler system).

Stilling Basin

A basin constructed to dissipate the energy of fast-flowing water (e.g., from a spillway or bottom outlet), and to protect the streambed from erosion.

Storm Drain

Constructed opening in a road system through which runoff from the road surface flows into an underground system.

Storm Surge

Coastal flooding phenomenon resulting from wind and barometric changes.

Storm Water

Runoff generated when precipitation from rain and snowmelt flows over land or impervious surfaces and does not percolate into the ground. As the water flows over the land or impervious surfaces such as streets, parking lots, and rooftops, it accumulates debris, chemicals, sediment, or other potential pollutants that could adversely affect water quality if the runoff is discharged into water bodies untreated.

Stop Logs

Large logs, timbers or steel beams placed on top of each other with their ends held in guides on each side of a channel or conduit providing a temporary closure versus a permanent bulkhead gate.

Storage

Water artificially impounded in surface or underground reservoirs for future use. (2) Water naturally detained in a drainage basin, such as ground water, channel storage, and depression storage.

Storage Co-efficient

The volume of water given out by a unit prism of aquifer when the pizometric surface or the water table drop by a unit depth is called storage coefficient.

Storage Equation

The equation for the conservation of mass. Hydrological equations generally refer to water balance at the basin scale expressing the equality between an inflow and an outflow at the hydrological year time step. The general equation for the water balance performed in each Irrigation District (ID) is:

I + P + OIn – (Q + ETc +OOut) = ΔW

Where I is the volume of water diverted for irrigation from outside the ID; P is the precipitation; and OIn stands for other inputs, specific to each basin. The outputs considered are the surface outflow from the district, the evapotranspiration of the crops (ETc); and other outputs, also specific to each basin. The difference between inputs and outputs along a given period (like a hydrologic year) must be equal to the change in soil and aquifer water storage in the ID (ΔW) and thus the closing error of the balance is given by Inputs – Outputs - ΔW.

Storm Hydrograph

A hydrograph representing the total flow or discharge past a point.

Storm Water Discharge

Precipitation that does not infiltrate into the ground or evaporate due to impervious land surfaces but instead flows onto adjacent land or water areas and is routed into drain/sewer systems.

Stratification

Division of the water column into layers of different temperature or salinity.

Stratigraphy

Stratigraphy is a branch of geology concerned with the study of rock layers and layering. It is primarily used in the study of sedimentary and layered volcanic rocks. Stratigraphy has two related subfields: lithostratigraphy and biostratigraphy.

Stream Gage

A site along a stream where the stage (water level) is read either by eye or measured with recording equipment.

Stream Segment

Refers to the surface waters of an approved planning area exhibiting common hydrological, natural, physical, biological, or chemical processes. Segments will normally exhibit common reactions to external stresses such as discharge or pollutants.

Stream Flow

Water flowing in the stream channel. It is often used interchangeably with discharge.

Sub-critical Flow

Subcritical flow has a low flow velocity and depth that is deeper than critical depth.

Submarine Canyon

A submarine canyon is a steep-sided valley cut into the seabed of the continental slope, sometimes extending well onto the continental shelf, having nearly vertical walls, and occasionally having canyon wall heights of up to 5 km, from canyon floor to canyon rim, as with the Great Bahama Canyon.

Submarine Fan

Accumulation of land-derived sediment on the deep sea floor. As sediment builds up on the continental slope, it can become unstable, and 'fall off the edge' as a turbidity current, and finally lands on the Abyssal Plain as a turbidities deposit.

Subsidence

Sinking down of part of the earth's crust due to underground excavation, such as the removal of groundwater.

Subsurface Storm Flow

The lateral motion of water through the upper layers until it enters a stream channel. This usually takes longer to reach stream channels than runoff. This also called interflow.

Super Critical Flow

Supercritical flow is open channel flow with high flow velocity and depth less than critical depth.

Super Passage

The hydraulic structure in which the drainage is passing over the irrigation canal is known as super passage.

Supply-Chain Water Footprint of a Business

The supply-chain (or indirect) water footprint of a business is the volume of freshwater consumed or polluted to produce all the goods and services that form the input of production of a business.

Surcharge Capacity

The volume of a reservoir between the maximum water surface elevation for which the dam is designed and the crest of an uncontrolled spillway, or the normal full-pool elevation of the reservoir with the crest gates in the normal closed position.

Surface Runoff

The runoff that travels overland to the stream channel. Rain that falls on the stream channel is often lumped with this quantity.

Surface Water Intake

An installation for drawing water from a surface water body. A basic intake may be just a pipe and pump placed in the water with little consideration of water quality (for example, for a small farmer abstracting water for irrigation).

Surface Water

Water above the surface of the land, including lakes, rivers, streams, ponds, floodwater, and runoff. All moving and standing water naturally open to the atmosphere.

Suspended Sediment

Very fine soil particles that remain in suspension in water for a considerable period of time without contact with the bottom. Such material remains in suspension due to the upward components of turbulence and currents and/or by suspension.

Suspended-sediment Concentration

The ratio of the mass of dry sediment in a water-sediment mixture to the mass of the water-sediment mixture. Typically expressed in milligrams of dry sediment per liter of water-sediment mixture.

Suspended-sediment Discharge

The quantity of suspended sediment passing a point in a stream over a specified period of time. When expressed in tons per day, it is computed by multiplying water discharge (in cubic feet per second) by the suspended-sediment concentration (in milligrams per liter) and by the factor 0.0027.

Suspended Solids

Organic and inorganic particles, such as solids from wastewater, sand, and clay that are suspended and carried in water.

Suspended Load

Sediment that is supported by the upward components of the turbulent current in a stream and that stays for an appreciable length of time.

Sustained Overdraft

Long-term withdrawal from the aquifer of more water than is being recharged.

Sustainable Water Use

Deliberate use of water that ensures the long-term maintenance of a sufficient quality and quantity water.

Sustainable Yield

Flux of groundwater that can be withdrawn from an aquifer without causing undesirable side effects, in particular without causing a permanent state of non-equilibrium of the hydrological budget of an aquifer.

Swallow Hole

The point where a sinking stream goes underground.

Swamp Forests

Freshwater swamp forests, or flooded forests, are forests which are inundated with freshwater, either permanently or seasonally. They normally occur along the lower reaches of rivers and around freshwater

S lakes. Freshwater swamp forests are found in a range of climate zones, from boreal through temperate and subtropical to tropical.

Symbiosis

Symbiosis is an evolved interaction or close living relationship between organisms from different species, usually with benefits to one or both of the individuals involved. Symbioses may be 'obligate', in which case the relationship between the two species is so interdependent, that each of the organisms is unable to survive without the other, or 'facultative', in which the two species engage in a symbiotic partnership through choice, and can survive individually. Obligate symbioses are often evolved over a long period of time, while facultative symbioses may be more modern, behavioral adaptations; given time, facultative symbiosis may evolve into obligate symbiosis.

T

T

Tail Water

Water ponded below the outlet of a culvert, pile or bridge waterway.

Tail water Height

Height of water immediately downstream of a dam.

Terrace

A nearly level surface or bench bordering a steep slope, such as a stream terrace or wave-cut terrace.

Territorial Sea

Territorial sea is defined under the UNCLOS as the 12-nautical mile zone from the baseline or low-water line along the coast.

Thalweg

The line of maximum depth in a stream. The thalweg is the part that has the maximum velocity and causes cut-banks and channel migration.

Tidal Currents

The horizontal forward and backward movement of water in estuaries and bays along the coast as a result of tidal action.

Tidal Period

Duration of one complete tidal cycle.

Tidal River Management (TRM)

Tidal river management involves taking full advantage of the natural tide movement in rivers. During flood tide, tide is allowed to enter an embanked low-lying area (tidal basin) where the sediment carried in by flood tide is deposited. During ebb tide, water flows out of the tidal basin with greatly reduced sediment load and eventually erodes the downstream river bed. The natural movement of flood and ebb tide along the tidal basin and along the downstream river stretches maintains a stable and proper drainage capacity.

Tide

Tide is the periodic rise and fall of sea levels caused by the combined effects of gravitational forces exerted by the Moon, Sun, and rotation of the Earth.

Tidal Energy

Tidal energy is energy produced by the tides of the ocean. Tides are produced by the pull of gravity from the Moon as well as the spin of the Earth. There is a lot of energy in the movement of that much water. There are also three main ways that tidal energy is harnessed: Tidal Barrages, Tidal Fences, and Tidal Turbines.

Tidal Flooding

The rise in water level in the seas and tidal rivers due to storm-surge, tides, and waves can cause flooding in coastal areas which is commonly known as tidal flooding.

Time of concentration

Time of concentration is a concept used in hydrology to measure the response of a watershed to a rain event. It is defined as the time needed for water to flow from the most remote point in a watershed to the watershed outlet. It is a function of the topography, geology, and land use within the watershed

Tipping Bucket Rain Gage

A precipitation gage where collected water is funneled into a two compartment bucket; 0.01, 0.1 mm, or some other designed quantity of rain will fill one compartment and overbalance the bucket so that it tips,

emptying into a reservoir and moving the second compartment into place beneath the funnel. Tipping buckets provide a measurement of both intensity and amount of precipitation.

Toe Drain (or Outfall)

A drain which carries seepage away from the dam and can allow seepage quantities to be measured.

Total Dissolved Solids (TDS)

A quantitative measure of the residual minerals dissolved in water that remain after evaporation of a solution. Usually expressed in milligrams per liter (mg/l) or in parts per million (ppm).

Total Sediment Load

The sum of suspended load and bed load or the sum of bed material load and wash load of stream.

Topography

Description of the geographical surface features of a region. Topography is the study and mapping of Earth's features including land surfaces, relief (relative positions and elevations) and the position of natural (water features, physiographic features, etc.) and constructed features (boundaries, cities, parks, landmarks, transportation, buildings, etc.).

Total Gross Reservoir Capacity

The total amount of storage capacity available in a reservoir for all purposes from the streambed to the normal water or normal water or normal pool surface level. It does not include surcharge, but does include dead storage.

Trace

A hydrograph or similar plot for an extended-range time horizon showing one of many scenarios generated through an ensemble forecast process.

Trace (of Precipitation)

A rainfall amount less than 0.01 of an inch.

Transmissivity T [m^2/d]

The integral of the hydraulic conductivity of an aquifer over its saturated thickness. It relates to the ability of an aquifer to transmit water through its entire thickness.

Transpiration

The process by which water absorbed by plants (usually through the roots) is evaporated into the atmosphere from the plant surface (principally from the leaves).

Trans-boundary Aquifer

An aquifer that spans two or more political entities, separated by political boundaries.

Trans-boundary River

A river that crosses at least one political border, either a border within a nation or an international boundary. Bangladesh has the greatest numbers of such these rivers.

Travel Time (Flood)

The time required for a flood wave to travel from one location to a subsequent location downstream.

Tributary

A stream that feeds into a larger stream.

Tsunami

Tsunamis are large and powerful ocean waves that grow in size as they reach the shore. Great sea wave produced by an undersea earth movement or volcanic eruption.

Tube Well

A tube well is a type of water well in which a long, 100–200 millimeters (3.9–7.9 in)-wide, stainless steel tube or pipe is bored into an underground aquifer. The lower end is fitted with a strainer, and a pump lifts water for irrigation. The required depth of the well depends on the depth of the water table.

Turbidity

Turbidity is the measure of the relative clarity of water. Turbid water is caused by suspended and colloidal matter such as clay, silt, organic and inorganic matter, and microscopic organisms. Water high in turbidity appears murky and contains sediments in suspension. Turbidity should not be confused with color, since darkly colored water can still be clear and not turbid. Turbid water may be the result of soil erosion, urban runoff, algal blooms, and bottom sediment disturbances which can be caused by

T boat traffic and abundant bottom feeders. Turbid water may also result in higher concentrations of contaminants and pathogens, that bond to the particles in the water.

Turbulent Flow

In fluid dynamics, turbulent flow is characterized by the irregular movement of particles (one can say chaotic) of the fluid. Turbulent flow tends to occur at higher velocities, low viscosity and at higher characteristic linear dimensions.

Typology

The study and interpretation of types. A typology provides the framework to group bodies into appropriate types (streams, rivers, lakes, etc.). A stream typology covers all stream types encountered in a pre-defined region (usually an entire country or river basin) and provides supplementary data to describe the abiotic and biotic characteristics of the stream types.

U U

UNCLOS

The United Nations Convention on the Law of the Sea (UNCLOS), also called the Law of the Sea Convention or the Law of the Sea treaty, is the international agreement that resulted from the third United Nations Conference on the Law of the Sea (UNCLOS III), which took place between 1973 and 1982. The Law of the Sea Convention defines the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. The Convention, concluded in 1982, replaced the quad-treaty 1958 Convention on the High Seas. UNCLOS came into force in 1994; a year after Guyana became the 60th nation to ratify the treaty.

Unconfined Aquifer

A partially saturated aquifer which contains a water table which is free to fluctuate vertically under atmospheric pressure in response to discharge or recharge or an aquifer in which the water table is at or near atmosphere pressure and is the upper boundary of the aquifer. Because the aquifer is not under pressure the water level in a well is the same as the water table outside the well.

Underground Water

Means any underground water which flows in aquifers and could be extracted in the surface through artificial or natural process.

Undercurrent

A current below the upper currents or surface of a fluid body.

Underflow

The lateral motion of water through the upper layers until it enters a stream channel. This usually takes longer to reach stream channels than runoff. This also called subsurface storm flow.

Uniformity Coefficient (d_{40}/d_{90})

A ratio used to characterize sediment using a plotted grain-size distribution curve. It is the 40% retained size divided by the 90% retained size.

Unit Hydrograph (or Unit graph)

The discharge hydrograph from one inch of surface runoff distributed uniformly over the entire basin for a given time period.

Unit Hydrograph Duration

The time over which one inch of surface runoff is distributed for unit hydrograph theory.

Unsaturated Zone or Vadose Zone

The zone between the land surface and the water table. It includes the capillary fringe and may contain water under pressure less than that of the atmosphere.

Uplift pressure

An uplift pressure is any upward pressure applied to a structure that has the potential to raise it relative to its surroundings

Upstream Slope

The part of the dam which is in contact with the reservoir water. On earthen dams, this slope must be protected from the erosive action of waves by rock riprap or concrete.

Urban Flooding

Flooding of streets, underpasses, low lying areas, or storm drains. This type of flooding is mainly an inconvenience and is generally not life threatening.

V

Vadose Zone

The locus of points just above the water table where soil pores may either contain air or water. This is also called the zone of aeration.

Vapor

The state of water in the hydrologic cycle in which individual molecules are highly energized and move about freely; also known as gas/gaseous.

Velocity Zones

Areas within the floodplain subject to potential high damage from waves. These sometimes appear on flood insurance rate maps.

Vernal Pools

Vernal pools are a type of temporary wetlands. They are depressions in areas where low-permeability soils (e.g., clay or hardpan) prevent rainwater from draining downward into the subsoils. When rain fills the pools in the winter and spring, the water collects and remains in the depressions. In the springtime, the water gradually evaporates away, until the pools become completely dry in the summer and fall.

Virtual Water

The term virtual water was first defined in 1998. It is the volume of water required for making a product and the water used in the production chain. Virtual water is comprised of three different components: Green water, Blue water and Grey water.

Virtual Water Balance

The virtual-water balance of a geographically delineated area (for example, a catchment area) over a certain time period is defined as the net import of virtual water over this period, which is equal to the gross import of virtual water minus the gross export.

Virtual Water Content

The virtual-water content of a product is the freshwater 'embodied' in the product, not in real sense, but in virtual sense. It refers to the volume of water consumed or polluted for producing the product, measured over its full production chain. The 'virtual-water content of a product' is the same as 'the water footprint of a product', but the former refers to the water

volume embodied in the product alone, while the latter term refers to that volume, but also to which sort of water is being used and to when and where that water is being used. The water footprint of a product is thus a multidimensional indicator, whereas virtual-water content refers to a volume alone.

Virtual Water Export

The virtual-water export from a geographically delineated area (for example, a country or catchment area) is the volume of virtual water associated with the export of goods or services from the area. It is the total volume of freshwater consumed or polluted to produce the products for export.

Virtual Water Flow

The virtual-water flow between two geographically delineated areas is the volume of virtual water that is being transferred from the one to the other area as a result of product trade.

Virtual Water Import

The virtual-water import into a geographically delineated area (for example, a nation or catchment area) is the volume of virtual water associated with the import of goods or services into the area. It is the total volume of freshwater used (in the export areas) to produce the products. Viewed from the perspective of the importing area, this water can be seen as an additional source of water that comes on top of the available water resources within the area itself.

Volatile Organic Compounds (VOCs)

VOCs are organic compounds which have a low boiling point, causing them to partition readily into the vapor phase. These compounds can migrate through the unsaturated zone of the subsurface in the vapor (gaseous) phase, as well as in the dissolved (aqueous) phase.

Vulnerability

The sensitivity of a groundwater system to contamination. Intrinsic vulnerability takes into account the hydrogeological characteristics of an area, but is independent of the nature of the contaminants and the contaminant scenario. Specific vulnerability takes these latter factors into account.

Water Accounting

Water accounting is the systematic quantitative assessment of the status and trends in water supply, demand, distribution, accessibility and use in specified domains, producing information that informs water science, management and governance to support sustainable development outcomes for society and the environment.

Water Abstraction

The deliberate removal of water from a water body, either surface or groundwater.

Water Appropriation

This is a term used in the context of water footprint assessment to refer to both the 'consumption' of freshwater for human activities (green and blue water footprint) and the 'pollution' of freshwater by human activities (grey water footprint).

Water Auditing

Water auditing builds on water accounting to advise water governance. It sits between water accounting and water governance. By examining trends in water supply, demand and productivity, water auditing examines features of water governance such as institutions, public and private expenditure, laws and the wider political economy of water in specified domains.

Water Balance

Water balance is based on the law of conservation of mass: any change in the water content of a given soil volume during a specified period must equal the difference between the amount of water added to the soil volume and the amount of water withdrawn from it. In other words, the water content of the soil volume will increase when additional water from outside is added by infiltration or capillary rise, and decrease when water is withdrawn by evapotranspiration or deep drainage. The control soil volume for which the water balance is computed is often determined arbitrarily. In principle, a water balance can be computed for any soil volume, ranging from a small sample of soil to an entire catchment. For the purpose of recharge estimation, it is generally appropriate to consider the root zone as the control volume and express the water balance per unit area.

Water Balance Model

The Water Balance Model is a decision support tool developed to help local governments achieve desired urban stream health and environmental protection outcomes. Available in the public domain and accessible online (www.waterbalance.ca), the Water Balance Model puts the power to run detailed hydrology simulations and comparisons into the hands of anyone with an internet connection. The value of the tool lies in its ability to graph and report the differences between pre-development, post-development and mitigation scenarios for the modeled area. In addition to the ability to model small (site), medium (development) and large (watershed) land masses, the simulation is performed with historically accurate climate data that spans a multi-decade period, recorded in hourly time steps. The input to the water balance is infiltrate which equals the daily precipitation minus interception or runoff. The water balance is often written as:

$R = P - D - ET - \Delta W$

Where R is Recharge, P is precipitation, D is net runoff, ET is actual evapotranspiration, and ΔW is the change in soil moisture storage.

Water Banking

Water banking is the practice of forgoing water deliveries during certain periods, and "banking" either the right to use the forgone water in the future, or saving it for someone else to use in exchange for a fee or delivery in kind. It is usually used where there is significant storage capacity to facilitate such transfers of water.

Water Bearing Rocks

Types of rocks that can hold water, including sedimentary deposits (sand and gravel), channels in carbonate rocks (limestone), lava tubes or cooling fractures in igneous rocks, and fractures in hard rocks.

Water Body

Distinct and significant volume of water. For example, for surface water: a lake, a reservoir, a river or part of a river, a stream or part of a stream. For groundwater: a distinct volume of water within one or more aquifers.

Water Consumption

The volume of freshwater used and then evaporated or incorporated into a product. It also includes water abstracted from surface or groundwater in a catchment and returned to another catchment or the sea. It is

important to distinguish the term ‘water consumption’ from the term ‘water withdrawal’ or ‘water abstraction’.

Water Conservation

The wise use of water with methods ranging from more efficient practices in farm, home and industry to capturing water for use through water storage or conservation projects.

Water Control Structure

It is a structure in a water management system that conveys water, controls the direction or rate of flow, and maintains a desired water level.

Water Course

Any surface flow such as a river, stream, or tributary or flow of water from any water source.

Water Cycle

The water cycle, also known as the hydrologic cycle or the hydrological cycle, describes the continuous movement of water on, above and below the surface of the Earth. The mass of water on Earth remains fairly constant over time but the partitioning of the water into the major reservoirs of ice, fresh water, saline water and atmospheric water is variable depending on a wide range of climatic variables. The water moves from one reservoir to another, such as from river to ocean, or from the ocean to the atmosphere, by the physical processes of evaporation, condensation, precipitation, infiltration, surface runoff, and subsurface flow. In doing so, the water goes through different forms: liquid, solid (ice) and vapor. The water cycle involves the exchange of energy, which leads to temperature changes. When water evaporates, it takes up energy from its surroundings and cools the environment. When it condenses, it releases energy and warms the environment.

Water Diplomacy

Water diplomacy can be defined as the use of diplomatic instruments to existing or emerging disagreements and conflicts over shared water resources with the aim to solve or mitigate those for the sake of cooperation, regional stability, and peace. Water diplomacy’s diplomatic instruments may include negotiations, dispute resolution mechanisms, the establishment of consultation platforms, and the organization of joint fact-finding missions. Technical instruments, such as establishing basin-wide management plans or joint monitoring networks are not part of more

stringent definition of water diplomacy, although diplomatic and technical instruments often build on each other and can be directly linked.

Water Economics

In a market system, economic values of water, defined by its price, serve as a guide to allocate water among alternative uses, potentially directing water and its complementary resources into uses in which they yield the greatest total economic return.

Water Equivalent

The amount of water, in inches, obtained by melting a snow sample.

Water Framework Directive (WFD)

The WFD provides the legal framework by the European Commission to obtain a 'good ecological quality' in all surface and ground waters of the European Union by the end of 2015.

Water Flow

Means the flow of water from any water source.

Water Footprint

The water footprint measures the amount of water used to produce each of the goods and services we use. It can be measured for a single process, such as growing rice, for a product, such as a pair of jeans, for the fuel we put in our car, or for an entire multi-national company. The water footprint can also tell us how much water is being consumed by a particular country – or globally – in a specific river basin or from an aquifer. On the other hand, the water footprint is an indicator of freshwater use that looks at both direct and indirect water use of a consumer or producer. The water footprint of an individual, community or business is defined as the total volume of freshwater used to produce the goods and services consumed by the individual or community or produced by the business. A water footprint can be calculated for a particular product, for any well-defined group of consumers (for example, an individual, family, village, city, province, state or nation) or producers (for example, a public organization, private enterprise or economic sector). The water footprint is a geographically explicit indicator, showing not only volumes of water use and pollution, but also the locations.

Water Footprint Accounting

The step in Water Footprint Assessment that refers to collecting factual, empirical data on water footprints with a scope and depth as defined earlier.

Water Footprint Assessment

Water Footprint Assessment refers to the full range of activities to: (i) quantify and locate the water footprint of a process, product, producer or consumer or to quantify in space and time the water footprint in a specified geographic area; (ii) assess the environmental, social and economic sustainability of this water footprint; and (iii) formulate a response strategy.

Water Footprint Benchmark

A measure of water productivity or its inverse: water footprint (m3/product units) of a process or a product. It is the highest water footprint of process or product produced most efficiently using the best available practices and technologies for a fixed percentile of production in the region or the globe. For example, if the 20 percentile global water footprint benchmark of cotton is 1900 m3/t, it indicates that 20% of the total cotton production in the world is currently done with a water footprint less than or equal to 1900 m3/t. The remaining 80% of cotton production exceeds this figure and, thus, are less efficient compared to the benchmark chosen. Water footprint benchmarks provide an incentive for producers to reduce the water footprint of their products or processes.

Water Footprint of a Business

The water footprint of a business which can also be called alternatively corporate or organizational water footprint – is defined as the total volume of freshwater that is used directly and indirectly to run and support a business. The water footprint of a business consists of two components: the direct water use by the producer (for producing/manufacturing or for supporting activities) and the indirect water use (the water use in the producer's supply chain).

Water Footprint of a Consumer

Water footprint of a consumer is defined as the total volume of freshwater consumed and polluted for the production of the goods and services consumed by the consumer. It is calculated by adding the direct water use by people and their indirect water use. The latter can be found by

multiplying all goods and services consumed by their respective water footprint.

Water Footprint of National Consumption

Water footprint of national consumption is defined as the total amount of fresh water that is used to produce the goods and services consumed by the inhabitants of the nation. The water footprint of national consumption can be assessed in two ways. The bottom-up approach is to consider the sum of all products consumed multiplied with their respective product water footprint. In the top-down approach, the water footprint of national consumption is calculated as the total use of domestic water resources plus the gross virtual water import minus the gross virtual-water export.

Water Footprint of National Production

The water footprint of production is the amount of local water resources that are used to produce goods and services within the country. In this case, the water footprint is calculated for all the goods and services that are consumed by the people living in a country.

Water Footprint of a Product

The water footprint of a product (a commodity, good or service) is the total volume of freshwater used to produce the product, summed over the various steps of the production chain. The water footprint of a product refers not only to the total volume of water used; it also refers to where and when the water is used.

Water Footprint Offsetting

Offsetting the negative impacts of a water footprint is part of water neutrality. Offsetting is a last step, after a prior effort of reducing a water footprint insofar reasonably possible. Compensation can be done by contributing to (for example, by investing in) a more sustainable and equitable use of water in the hydrological units in which the impacts of the remaining water footprint are located.

Water Footprint Sustainability Assessment

The phase in water footprint assessment that aims to evaluate whether a certain water footprint is sustainable from an environmental, social, as well as an economic point of view.

Water Footprint within a Geographically Delineated Area

This is defined as the total freshwater consumption and pollution within the boundaries of the area. The area can be for example a hydrological unit such as a catchment area or a river basin or an administrative unit like a municipality, province, state or nation.

Water Footprint within a Nation

This is defined as the total freshwater volume consumed or polluted within the territory of a nation.

Water Governance

Water governance encompasses all aspects of how water is managed by governments, regulators, suppliers and users. It includes water resources management, protection, allocation, monitoring, quality control, treatment, regulation, policy and distribution. Good water governance ensures responsible sharing of water resources in the interests of users and the natural environment in line with the principles of water stewardship.

Water Justice

Water justice is a combination of social and environmental justice that applies to water allocation and management (water governance). It not only examines the distribution of outcomes but also the processes that underpin them. Water justice challenges us to be explicit about the rationales we adopt to justify our water allocation and management decisions.

Water Logging

Water-logging is the natural flooding and over-irrigation that brings water at underground levels to the surface. As a consequence, displacement of the air occurs in the soil with corresponding changes in soil processes and an accumulation of toxic substances that impede plant growth.

Water Management

Planned development, distribution, and use of water resources.

Water Neutral

A process, product, consumer, community or business is water neutral when: (i) its water footprint has been reduced where possible, particularly in places with a high degree of water scarcity or pollution; and (ii) when the negative environmental, social and economic externalities of the remaining

water footprint have been offset (compensated). In some particular cases, when interference with the water cycle can be completely avoided, for example by full water recycling and zero waste. 'Water neutral' means that the water footprint is nullified; in other cases, such as in the case of crop growth, the water footprint cannot be nullified. Therefore, 'water neutral' does not necessarily mean that the water footprint is brought down to zero, but that it is reduced as much as possible and that the negative economic, social and environmental externalities of the remaining water footprint are fully compensated.

Water Point

This is a generic term used to describe any point of access to water for domestic uses. This includes a household connection, stand-pipe, well, borehole, spring, rainwater harvesting unit, water kiosk or other point of transaction with a water vendor. The term is used to avoid any bias or confusion regarding certain types of access to water.

Water Pollution

The alteration of the constituents of a body of water to such a degree that the water loses its value as a natural resource.

Water Pollution Level

Degree of pollution of the run-off flow, measured as the fraction of the waste assimilation capacity of runoff actually consumed. A water pollution level of 100 per cent means the waste assimilation capacity of the runoff flow has been fully consumed.

Water Portfolio

An accounting of water uses and supplies for a given year statewide or by hydrologic region, subject to availability of data, including flow diagrams, flow diagram tables, water balances, summary tables, and information.

Water Productivity

Product units produced per unit of water consumption or pollution. Water productivity (product units/m3) is the inverse of the water footprint (m3/product unit). The term 'water productivity' is a similar term as the terms labour productivity or land productivity, but now production is divided over the water input. When water productivity is measured in monetary output instead of physical output per unit of water, one can speak about 'economic water productivity'.

Water Potential

Water potential is the potential energy of water per unit volume relative to pure water in reference conditions. Water potential quantifies the tendency of water to move from one area to another due to osmosis, gravity, mechanical pressure, or matrix effects such as capillary action.

Water Quality

The chemical, physical, and biological characteristics of water with respect to its suitability for a particular use. The quality of a natural water body in terms of physical, chemical and biological parameters. The relevant quality standards are defined by national or local regulation and guidelines. Where these are absent, then international standards and guidelines should be applied. Good water quality status is where it meets the requirements of native flora and fauna, and for human needs where applicable. The status is not required to be pristine (i.e. Contaminant free) or of drinking water quality (which would be classed as high water quality status).

Water Quality Standards

Fixed limits of certain chemical, physical, and biological parameters in a water body; water quality standards are established for various uses of water (e.g. drinking).

Water Quality Map

Map with streams, rivers, lakes, or other water bodies colored according to their ecological status. Within the European Union (EU) water quality maps display the ecological status with five colours: blue (high status = reference), green (good), yellow (moderate), orange (poor), and red (bad).

Water Quality Criteria

Specific levels of water quality which, if reached, are expected to render a body of water unsuitable for its designated use. Water-quality criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, fish production, or industrial processes.

Water Quality Index

A Water Quality Index (WQI) is a means by which water quality data is summarized for reporting to the public in a consistent manner. It is similar to the UV index or an air quality index, and it tells us, in simple terms, what the quality of drinking water is from a drinking water supply.

Water Reliability

This is reported as the percentage of years in which water supply meets most of the water demand (e.g., 95 percent). Different reliability thresholds were defined for the urban and agricultural sectors to reflect different historical levels of delivery. For in-stream flows and other environmental objectives, water supply reliability is reported as the percentage of months in which water supply meets most of the water requirement (e.g., 95 percent).

Water Resources

Water Resources means any surface water, groundwater and rain water, i.e., water in the atmosphere, and shall also include water of estuary, aquifer, flood-plain, wetland, water source, foreshore, coast, and any other similar reservoirs or places.

Water Resources Development Project

Water Resources Development Project means any activity, program or initiatives taken for the development of any water resources, such as, any hydraulic infrastructure for irrigation, flood control management and drainage, protection of river bank, dredging or any other similar activity, program or initiatives.

Water Right

A right to use, in accordance with its priority, a certain amount of water.

Water Scarcity

Water scarcity is the lack of sufficient available water resources to meet the demands of water usage within a region. It already affects every continent and around 2.8 billion people around the world at least one month out of every year. More than 1.2 billion people lack access to clean drinking water.

Water Security

Water security is defined as the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability.

Water Source

Water Source means any land natural or manmade river, canal, beel, haor, baor, pond, lake, water-fall or any other similar water source.

Water Self-Sufficiency vs. Water Dependency of a Nation

The 'water self-sufficiency' of a nation is defined as the ratio of the internal to the total water footprint of national consumption. It denotes the degree to which the nation supplies the water needed for the production of the domestic demand for goods and services. Self-sufficiency is 100 per cent if all the water needed is available and indeed taken from within the nation's own territory. Water self-sufficiency approaches zero if the demand for goods and services in a nation is largely met with virtual-water imports. Nations with import of virtual water depend, de facto, on the water resources available in other parts of the world. The 'virtual water import dependency' of a nation is defined as the ratio of the external to the total water footprint of national consumption.

Watershed

The area of land from which rainfall (and/or snow melt) drains to a single point. Ridges of higher ground generally form the boundaries between watersheds, and at these boundaries, rain falling on one side flows toward the low point of one watershed, while rain falling on the other side flows toward the low point of a different watershed.

Watershed Management

The process of evaluating, planning, managing, restoring, and organizing land and other resource use within an area that has a single common drainage point.

Water Shortage

A shortage of water supply of an acceptable quality; low levels of water supply, at a given place and a given time, relative to design supply levels. The shortage may arise from climatic factors, or other causes of insufficient water resources, a lack of, or poorly maintained, infrastructure; or a range of other hydrological or hydro-geological factors.

Water Stewardship

The use of water that is socially equitable, environmentally sustainable and economically beneficial, achieved through a stakeholder-inclusive process that involves site- and catchment-based actions. Water stewardship is the

use of water in a way that maximizes water use efficiency, while emphasizing sustainable on-farm water management practices from an ecological, social, and economic perspective. Stewardship is taking responsibility to protect something that we do not own, a relatively new concept that essentially focuses on the management of public goods. Water stewardship is based on the premise that all water users play a role in the sustainable management of water resources, and that a single actor working alone cannot effectively address complex water issues that are often caused by poor water management. Water stewardship approaches are, therefore, based on collective responses. Businesses increasingly realize the need to take responsibility for their role in promoting sustainable water use and management through collective action initiatives to address water related risks in their operations and/or supply chains.

Water Stress: SDG indicator 6.4.2

Sustainable Development Goal (SDG) Indicator 6.4.2 is about water stress, which is to be measured as proportion of freshwater withdrawal from available freshwater resources. Earlier water stress indices (WSI) quantified available freshwater resources in terms of river discharge or river runoff equating renewable freshwater resources to mean annual river runoff (MARR). But use of MARR assumes changes in soil moisture storage and groundwater storage are negligible, that does not represent reality; and MARR does not truly reflect intra and inter-annual variability in freshwater resources. The recent wave of water resource assessment focuses on 'withdrawal to availability' (WTA) ratio. WTA ratio defines water scarcity in terms of the ratio or percentage of total annual withdrawals across domestic, industrial and agricultural sectors to annual (renewable) resources estimated by MARR. Conducted at national scales, a country is considered 'water stressed' if annual withdrawals are between 20% (0.2) and 40% (0.4) of annual freshwater supply, and severely stressed if this figure exceeds 0.4.

Water Table

The upper level of a saturated formation where the water is at atmospheric pressure. The water table is the upper surface of an unconfined aquifer or the top of an unconfined aquifer; indicates the level below which soil and rock are saturated with water. The top of the saturation zone. On the other hand, the level below the earth's surface at which the ground becomes saturated with water. The water table is set where hydrostatic pressure equals atmospheric pressure.

W Water Treatment Plant

A facility that treats water to remove contaminants so that it can be safely used.

Water Use

Whenever water is used by an activity or organism, either in the place it is found or by withdrawing it. Water used by the site for any purpose. It is important to distinguish the different concepts of total and net water use. Total water use (or total water withdrawal) is the total amount of incoming water supply. However, a proportion of this water is usually returned to the local or regional water cycle. Water may be returned as irrigation losses or where wastewater is treated to a high quality and returned to a nearby water body. This can offset some of the impact of the original water abstractions. Net water use is the amount that is not returned locally. Losses may be from evapotranspiration (in agriculture), evaporative losses from cooling systems or reservoirs, or water that leaves a manufacturing site in finished product. Net water use is the most important for considering impacts within the catchment, and often significantly less than total use.

Water Use Efficiency (WUE): SDG indicator 6.4.1

Sustainable Development Goal (SDG) Indicator 6.4.1 is about using less water to carry out society's economic activities and measures the financial value (value added or VA) produced by an economy (i.e., gross domestic product, GDP) relative to the volume of water used (USD/m_3). SDG 6.4.1 indicator is conceptually different from those aspects of water efficiency. This indicator provides an estimation of the reliance of economic growth of a country on the exploitation of its water resources; in other words, it measures how water-intensive is the development process. The indicator has both economic and hydrologic components; hence two sets of data are needed to compute this indicator. Computation of water use efficiency (WUE) is as follows:

WUE = Awe × PA + Mwe × PM + Swe ×PS

Where: WUE = Water-use efficiency; Awe = Irrigated agriculture water-use efficiency [USD/m_3]; Mwe = Mining, industry, manufacturing, electricity and constructions (MIMEC) water-use efficiency [USD/m_3]; Swe = Services water-use efficiency [USD/m_3]; PA = Proportion of water used by the agricultural sector over the total use; PM = Proportion of water used by the MIMEC sector over the total use; PS = Proportion of water used by the service sector over the total use.

Water Well

A manmade excavation to access groundwater. Traditionally hand dug, they are usually lined with brick or other material to prevent their Collapse. They are typically one to two meters in diameter, and one to a few meters deep (enough to reach below the water table). Water is lifted by bucket or a pump (hand operated or mechanical). 'Water well' is often used generically to include boreholes.

Water Withdrawal

The volume of freshwater abstraction from surface or groundwater. Part of the freshwater withdrawal will evaporate, another part will return to the catchment where it was withdrawn and yet another part may return to another catchment or the sea.

Water Year

A continuous 12-month period selected to present data relative to hydrologic or meteorological phenomena during which a complete annual hydrologic cycle normally occurs. The water year used by the U.S. Geological Survey runs from October 1 through September 30, and is designated by the year in which it ends.

Wandering Channel

A channel exhibiting a more or less non-systematic process of channel shifting, erosion and deposition, with no definite meanders or braided pattern.

Wastewater

Water that contains unwanted materials from homes, businesses, and industries; a mixture of water and dissolved or suspended substances.

Wastewater Treatment

Mechanical or chemical processes used to modify the quality of wastewater in order to make it more compatible or acceptable to humans and the environment.

Wave celerity

The velocity of propagation of a wave through a liquid, relative to the rate of movement of the liquid through which the disturbance is propagated.

W Wave

A wave is a physical phenomenon characterized by its frequency, wavelength, and amplitude. Electromagnetic waves, such as light, do not require a medium and can travel through a vacuum. Transverse waves, such as light, oscillate perpendicular to the direction.

Wave Breaking

In fluid dynamics, a breaking wave is a wave whose amplitude reaches a critical level at which some process can suddenly start to occur that causes large amounts of wave energy to be transformed into turbulent kinetic energy.

Wave Energy

Wave energy is energy harnessed from the waves of the ocean. Waves are formed by wind moving across the surface of the ocean. A large amount of energy is stored in waves. There are three main ways that scientists think we can capture the power of waves: surface devices, underwater devices, reservoir.

Wavelength

An electromagnetic wave produces sinusoidal patterns with distinguishable shape and length. A wavelength is the distance between the peak of a wave and its successive wave.

Weather

Weather is changes in the atmosphere that occur on a daily basis. The weather we experience today could be completely different than the weather we have tomorrow. The science of weather is called meteorology. Meteorologists study the weather and try to predict it.

Weathering

The process by which particles, rocks and minerals are altered upon exposure to surface temperatures and pressure, air, water, wind and biological activity.

Wetland

Wetland is an area where water covers the soil, or is present either at or near the surface of the soil round the year or for varying periods of time during the year. Wetlands typically occur in topographic settings where surface water collects and (or) groundwater discharges, making the area wet for extended periods of time.

Well

A bored, drilled or driven shaft or a dug hole whose depth is greater than the largest surface dimension and whose purpose is to reach underground water supplies to inject, extract or monitor water.

Well Closure

The process of sealing a well that is no longer being used to prevent groundwater contamination and harm to people and animals.

Well Efficiency

Well efficiency, which expresses the ratio of aquifer loss (theoretical drawdown) to total (measured) drawdown in the pumped well, is computed from a step-drawdown test as follows:

$$Ew=(B_1 (rw,t)Q)/\Delta hw(t) \times 100\%$$

When the linear and nonlinear well loss terms are zero, EW=100%.

Well Field

An area in which productive wells are drilled.

Well Loss

When water is pumped out of a well, the total drawdown caused includes not only that of the logarithmic drawdown curve at the well face, but also drawdown caused by flow through well screen and axial movement within the well. The latter drawdown is called well loss. Since turbulent flow generally occurs near the well face, this loss may be taken to be proportional to Qn (an nth power of discharge, as Qn, where n is a constant greater than one).

Well Sitting

Location of a well placed to best protect water quality, access adequate water quantity, and allow for inspection and maintenance of the well.

Weir

A low dam built across a stream to raise the upstream water level (fixed-crest weir when uncontrolled) or a structure built across a stream or channel for the purpose of measuring flow (measuring or gauging weir). On the other hand, a structure built into a levee or river bank that allows water to flow from the main river channel into a bypass channel during time of high flows.

Wet Flood Proofing

An approach to flood-proofing which usually is a last resort. Flood waters are intentionally allowed into the building to minimize water pressure on the structure. Wet flood-proofing can include moving a few valuable items to a higher place or completely rebuilding the floodable area. Wet flood proofing has an advantage over other approaches: no matter how little is done, flood damage will be reduced.

WHO Guidelines for Drinking-Water Quality

These guidelines provide guidance on good practices for ensuring that drinking water is adequate and safe for human health.

Willingness to Accept (WTA) and willingness to pay (WTP)

Willingness to accept is the minimum amount an individual must be paid to accept a certain risk or a change (decrement) in environmental quality. Willingness to pay is the maximum amount an individual would pay to obtain a change (increment) in environmental quality.

Wire Weight Gage

A river gage comprised of a weight which is lowered to the water level. The weight is attached to a cable; and as the weight is lowered, a counter indicates the length of cable released. The stage is determined from the length of cable required to reach the water level.

X

X

Xeriscape

The use of plant materials and practices that minimizes landscaping water use; usually native plants; environmentally friendly form of landscaping.

Y

Y

Yield Q [l/s, m³/d]

The volume of water pumped or discharged from a borehole, well or spring.

Z

Zero Datum

A reference 'zero' elevation for a stream or river gage. This 'zero' can be referenced (usually within ten feet of the bottom of the channel) to mean sea level, or to any other recognized datum.

Zoned Embankment Dam

An embankment dam which is comprised of zones of selected materials having different degrees of porosity, permeability and density.

Zone of Aeration

The locus of points just above the water table where soil pores may either contain air or water. This is also called the vadose zone.

Zone of Saturation

The locus of points below the water table where soil pores are filled with water. This is also called the phreatic zone.

Zonation

The occurrence of species or communities in specific zones, each with a characteristic dominant species; commonly used to define aquatic environments, e.g., longitudinal zonation of streams and rivers: crenal, rhithral, and potamal.

Zoning

Zoning is the process of dividing land in a municipality into zones (e.g. residential, industrial) in which certain land uses are permitted or prohibited. On the other hand, zoning is the legislative process that divides urban areas into different zones (such as residential, commercial, industrial) according to the specified land use. Each zone is regulated as to the density, location, size, and type of buildings permitted therein.

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