ALBERTA WaterPortal SOCIETY

Climate and water words worth knowing

A handy glossary of key climate and water terms

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1.0 Introduction

Our changing climate and its effect on our shared water resources is an increasingly popular topic of discussion in government, academia, businesses and households. Conversations about climate can be heavily science based, and may frequently be accompanied by an array of terms that are critical to understanding climate issues and their solutions.

This document provides brief definitions for many key climate and water related words. It is intended to serve as a guide for navigating climate and water-centered discussions. Although research and investigation done to create these definitions was focused in Alberta, this guide covers many generic terms that apply to all Canadian provinces and the global community.

2.0 Glossary

Ablation

Combined processes (such as melting, sublimation, evaporation or calving), which remove snow or ice from a glacier or from a snowfield. Ablation is also used to express the quantity lost by these processes as the water equivalent of snow cover by melting, evaporation, wind and avalanches.

Acidification

Acidification is a process occurring in oceans, freshwaters and soil. The most common reference is to ocean acidification, which refers to a reduction in pH of the ocean over an extended period typically decades or longer. Acidification is caused primarily by uptake of carbon dioxide from the atmosphere, but can also be caused by other chemical additions or subtractions to the water.

Adaptive capacity

The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.

Adaptive management

A dynamic system or process of task organization and execution that recognizes the future cannot be predicted perfectly. Adaptive management applies principles and methods to improve activities incrementally as decision-makers learn from experience, collect new scientific findings, and adapt to changing social expectations and demands.

Adverse effect

Impairment of or damage to the environment, human health or safety, or property.

Alkalinity

The acid-neutralizing capacity of water, typically measured as concentration of calcium carbonate ($CaCO_3$). Mildly alkaline water may have a pH of 8 (neutral water has a pH of 7, while pH below 7 is acidic). Note pH (potential of hydrogen) is a scale of acidity from 0 to 14.

Allocation (of water)

Individuals, municipalities, businesses and others in Alberta can obtain a license from the provincial government to divert water under the Water Act. The diverted water is expressed as an allocation, which refers to a specific quantity of water, maximum pumping rate and timing of pumping associated with the license.

Ambient

Conditions occurring before an activity occurs or upstream of a specific location. Ambient air temperature is the temperature of the surrounding air. Ambient water quality is the water quality in a river, lake, or other water body, as opposed to the quality of the water being discharged.

Anoxic

The absence of oxygen, as in bodies of water, lake sediments, or sewage. Generally, anoxic conditions refer to a body of water sufficiently deprived of oxygen to where Zooplankton and fish would not survive.

Aquifer

A geological formation or structure that stores and/or transmits water, such as to wells and springs. The term is commonly used to describe formations with enough water to supply human use/s.

Baseflow

Sustained flow of a stream in the absence of direct runoff from the surrounding drainage basin. Includes natural and human-induced streamflows. Natural baseflow is sustained largely by groundwater, which is generally sustained by snowmelt.

Baseline data

An initial set of observations or measurements used for comparison; a starting point.

Basin

An area having a common outlet for its surface water runoff. The land area within a basin/watershed drains water to a stream, river, or lake (see also *Watershed*).

Best Management Practices (BMP)

Techniques and procedures proven through research, testing, and use to be the most effective and appropriate for use in each application. Effectiveness and appropriateness are determined by a combination of: (i) the efficiency of resource use, (ii) the availability and evaluation of practical alternatives, (iii) the creation of social, economic, and environmental benefits, and (iv) the reduction of negative social, economic, and environmental impacts.

Biochemical oxygen demand

A measure of the amount of oxygen consumed by aquatic organisms in the decomposition of organic material. The term can be used as an indicator of how much oxygen will be removed from water and the resulting stress on the aquatic ecosystem.

Biodiversity

The variability among living organisms from terrestrial, marine, and other ecosystems. Biodiversity includes variability at the genetic, species, and ecosystem levels.

Biosolids

Treated solid or semi-solid residues generated during the treatment of domestic sewage in a wastewater treatment facility. Primarily an organic product produced by wastewater treatment processes.

Blackwater

Wastewater containing excreta (urine and faecal sludge).

Carbon footprint

Conceptually, a carbon footprint is a measure of the amount of greenhouse gases emitted by the entity of interest, such as an individual, organization, process or product. There is no single method for calculating and expressing a carbon footprint, and the metric can be tailored based on the audience, available data, and other considerations.

Carbon sequestration

Removing carbon from the atmosphere (present as gaseous CO_2) usually followed by storage to reduce the accumulation of atmospheric CO_2.

Climate

Basically the average weather of the region of interest. More rigorously, it is a statistical description in terms of the mean and variability of relevant weather characteristics over a period ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years (World Meteorological Organization).

Climate change

Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically on the scale of decades, centuries, or longer. Climate change can occur naturally or as a result of human activities (see also *Global warming*).

Climate feedback

An interaction where one climate quantity causes a change in a second quantity, which ultimately leads to another change in the first. Negative feedback is where the initial perturbation (disturbance) is weakened by the changes it causes. Positive feedback is where the initial perturbation is enhanced.

Climate model

A numerical representation of the climate system based on the physical, chemical and biological properties of its components, their interactions and feedback processes. Climate models are applied as a research tool to study and simulate the climate and for operational purposes, including monthly, seasonal and inter-annual climate predictions. They may also be called General/Global Circulation Models (GCM).

Climate variability

Climate variability refers to natural variations in the mean state, and other statistics on climate (such as standard deviations, occurrence of extremes, etc.) of climate, on scales beyond individual weather events but below scales considered for climate change. Climate variability occurs on time scales from months to years and even decades, while weather variability occurs over hours, weeks, and sometimes months.

Conjunctive use

The use of more than one water source, systematically, to reduce overall environmental impacts. For example, someone might use groundwater instead of surface water during a drought period, and then return to using surface water when runoff becomes available.

Conservation tillage

A tillage practice that leaves residues on the soil surface for erosion control and water conservation. It includes specific residue management practices, such as no-till, mulch-till, or ridge-till.

Consumptive use

Water consumed by humans or livestock, evaporated (e.g. via the sun), transpired (e.g. via plant leaves), or incorporated into products or crops. This water is not returned to the original source. Water returned to a different watershed than the point of withdrawal (*Inter-basin transfer*) is not currently considered consumptive use.

Contaminant

A substance that, in a sufficient concentration, will cause adverse effects to water, land, fish, or other things potentially rendering it unusable.

Cryosphere

Made of frozen water in the form of snow, permanently frozen ground (permafrost), floating ice, and glaciers. Fluctuations in the volume of the cryosphere cause changes in ocean sea level, which directly impact the atmosphere and biosphere.

Cumulative effects

The combined effects of individual projects on the environment, economy and society. Cumulative effects could include impacts from past, present, and foreseeable activities in a region.

Desertification

Process by which arid or semi-arid land is transformed progressively into desert due to a continuous lack of precipitation (water) and/or land mismanagement.

Discharge

Volume of water flowing per unit of time, or the rate of flow. The use of this term is not restricted to a watercourse and can be used to describe the flow of water from a pipe, drainage basin or groundwater.

Dissolved oxygen (DO)

A measurement of the amount of oxygen available to aquatic organisms. Temperature, salinity, organic matter, biochemical oxygen demand, and chemical oxygen demand affect dissolved oxygen solubility in water. Dissolved oxygen is generally greater in colder waters with significant mixing at the air water interface (rapids, waterfalls, etc.).

Diversion of water

Impoundment, storage, consumption, taking or removal of water for any purpose. Does not include water removal for the sole purpose of removing an ice jam, drainage, flood control, erosion control or channel realignment.

Drought

A period of abnormally dry weather long enough to cause a serious hydrological imbalance (the rate of water loss from the area significantly exceeds the rate of water return).

Ecological integrity

An ecosystem exhibits integrity if, when subjected to stress, it can maintain a state that allows the ecosystem to thrive.

Ecosystem services

Ecological processes or functions having monetary or non-monetary value to individuals or society at large. These are frequently classified as (i) supporting services such as productivity or biodiversity maintenance, (ii) provisioning services such as food, fiber, or fish, (iii) regulating services such as climate regulation or carbon sequestration, and (iv) cultural services such as spiritual and aesthetic appreciation.

Environmental flows

Environmental flows describe the quantity, timing, and quality of water flows required to sustain freshwater and estuarine (river-ocean transition zone) ecosystems, as well as the human livelihoods and wellbeing depending on these ecosystems.

Evaporation

The process of liquid water becoming water vapour, including vaporization from water surfaces, land surfaces, and snowfields, but not from leaf surfaces.

Evapotranspiration

Water withdrawn from the soil by evaporation during plant transpiration.

Feedback (feedback mechanisms)

Factors that increase or amplify (positive feedback) or decrease (negative feedback) the rate of a process or a system change (see also *Climate feedback*).

Flood

The overflowing of normal confines of a stream or other body of water, or the accumulation of water over areas not normally submerged. Floods include river (fluvial) floods, flash floods, urban floods, pluvial (rain dominated) floods, sewer floods, coastal floods, and glacial lake outburst floods.

Freshwater

Water containing less than 4,000 milligrams per liter (mg/L) of dissolved solids. Also referred to as ‘High Quality Non-Saline Water’ in Alberta Environment and Parks policy documents.

Geoengineering

A broad set of methods and technologies aiming to deliberately alter climate to alleviate the impacts of climate change. Most, but not all, methods seek to (i) reduce the amount of absorbed solar energy in the climate system (solar radiation forcing) or (ii) increase net carbon sinks from the atmosphere at a scale sufficiently large to alter climate (carbon dioxide removal). Geoengineering is different from weather modification and ecological engineering but the boundaries are not clear.

Global warming

Global warming refers to the gradual increase—observed or projected—in global surface temperature as one of the consequences due to natural internal processes or due to changes in energy in the atmosphere (radiative forcing) caused by anthropogenic (human) emissions.

Greywater

Wastewater from clothes washing machines, showers, bathtubs, hand washing, and sinks. Greywater is wastewater that does not contain faecal matter.

Groundwater

Subsurface water. It originates from rainfall or snowmelt that penetrates the layer of soil just below the surface. For groundwater to be a recoverable resource, it must exist in an aquifer (see also *Aquifer*).

Headwaters

Upper tributaries of a stream or river, considered the source of that stream/river.

Hydrological cycle (the water cycle)

Water from the ocean and other water bodies evaporates and travels through the atmosphere as clouds, which release the water as precipitation. Precipitation over land makes its way to streams and rivers, which carry it to the ocean or other surface water bodies, where the cycle begins again.

Inter-basin transfer

A transfer of water from one river basin to another. Inter-basin transfers may be tracked or regulated for different levels of watersheds such as a hydrologic unit level or a set of basin delineations made by a regulatory authority.

Irrigation

The controlled application of water for agricultural purposes through human-made systems to supply water requirements not typically satisfied by rainfall.

IWRM (Integrated Water Resource Management)

A process promoting the coordinated development and management of water, land, and related resources through decisions, legislation, policies, programs and activities across sectors, to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

Mitigation (of climate change)

A human intervention to reduce the sources or enhance the removal (sinks) of greenhouse gases.

Potable water

Water treated to provincial standards and fit for human consumption. Potable water may also be called drinking water.

Precipitation

Total measurable supply of water of all forms of falling moisture, including dew, rain, mist, snow, hail, and sleet; usually expressed as a depth of liquid water on a horizontal surface in a day, month, or year, and designated as daily, monthly, or annual precipitation.

Recharge (of groundwater/aquifer recharge)

Natural or artificial introduction of water into the saturated zone of an aquifer. Recharge results from surface water infiltrating through the soil to the water table.

Reservoir

A pond, lake, tank, basin, or other space, either natural in its origin or created in whole or in part by the building of engineering structures. A reservoir stores water. The engineering structures regulate and control water levels and flows out of the reservoir.

Resilience

The capacity of a system to cope with a hazardous event or disturbance, responding or reorganizing in ways that maintain its essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation.

River

A natural stream of water of considerable volume, larger than a brook or creek.

Runoff

The part of precipitation that does not evaporate and is not transpired, but flows through the ground or over the ground surface and returns to bodies of water.

Source water

Raw/untreated water received at a treatment facility which delivers treated water to municipal, industrial and/or private users. Sources include groundwater, groundwater under the influence of surface water, seawater, and surface water from lakes, streams, rivers or other watercourses.

Sub-basin

Part of a river basin drained by a tributary to the basin's final outlet or with significantly different characteristics than the other areas of the basin.

Surface water

Flowing water present on the Earth's surface, such as in a stream, river, lake, or reservoir. Surface water is renewed by run-off from rain and snow each year.

Sustainability

A dynamic process that guarantees the persistence of natural and human systems in an equitable manner.

Sustainable development

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Stream

A general term for a body of flowing water; natural watercourse containing water at least part of the year. In hydrology, it is generally applied to the water flowing in a natural channel as distinct from a canal.

Streamflow

General term for water flowing in a river or watercourse that is often quantified using discharge, or flow rate (see also *Discharge*).

System

A set of connected parts or things working together as part of a complex whole.

Thermal expansion

When used in the context of sea level, this refers to the increase in volume (and decrease in density) that results from warming water (thermal increase). Warming of the ocean leads to an expansion of the ocean volume and hence an increase in sea level.

Tipping point

A level of change in system properties beyond which a system reorganizes, often abruptly, and does not return to the initial state even if the original drivers of the change are removed or reduced. For the climate system, it refers to a critical threshold when global or regional climate changes from one stable state to another stable state.

Virtual water content

The volume of water consumed in producing a product, measured over its full production chain. If a nation exports/imports such a product, it exports/imports water in virtual form. Note the water footprint of a product is a multidimensional indicator (volume, sort of water, when and where it is used), whereas virtual water content refers to volume alone (see also *Water footprint*).

Vulnerability

The propensity or predisposition to be adversely affected. Vulnerability includes a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Wastewater

Any combination of the following: domestic effluent consisting of blackwater (excreta, urine and faecal sludge) and greywater (kitchen and bathing wastewater); water from commercial establishments and institutions, including hospitals; industrial effluent, stormwater and other urban run-off; agricultural, horticultural and aquaculture effluent, either dissolved or as suspended matter.

Water footprint

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. Water use is measured in terms of water volumes consumed (evaporated or incorporated into a product) and/or polluted per unit of time. A water footprint can be calculated for a single product, for any well-defined group of consumers (for example, individual, family, city, province, state or nation) or producers.

Water quality

A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a specific purpose.

Water reuse

When water is used again after its original intended (licensed) purpose. The reuse can be for the same or a new purpose, and includes the use of return flow, wastewater, treated wastewater or effluent, reclaimed water, or any type of water recycling.

Water security

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.

Watershed

An area having a common outlet for its surface water runoff. The land area within a basin/watershed drains water to a single body of water, such as a stream, river, or lake (see also *Basin*).

Water table

Upper limit of the zone of saturation of groundwater in the subsurface, or the top surface of groundwater.

Weather

State of the atmosphere over a small temporal scale, such as hours, days or weeks, as defined by the various meteorological elements (temperature, pressure, humidity, wind speed and direction, etc.).

Well (water well; groundwater well)

An artificial excavation by any method for the purpose of withdrawing water from aquifers. 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.

Wicked problem

Issues highly complex and resistant to resolution. Wicked problems go beyond the capacity of a single mind or organization to understand them, often requiring collaborative reassessment of traditional problem solving and/or behaviour to successfully solve them.

Withdrawal

Water removed from the ground or diverted from a surface-water source for use. Withdrawn water can be returned to the source after use, see *Consumptive use* for water that is not returned.

3.0 More information

For more information or feedback please contact:

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