



Main Beach Shoreline Project

Glossary of terms

Accretion - The build-up of sediments to form land or shoaling in coastal waters or waterways. It may be either natural or artificial. Natural accretion is the build-up of land on the beach, dunes, or in the water by natural processes, such as waves, current and wind. Artificial accretion is a similar build-up of land resulting from built structures such as groynes or breakwaters, or activities such as filling and beach nourishment, or also aggradation.

Adaptation – Adjustment in natural or human systems in response to actual or expected climate change or its effect, to moderate harm or to take advantage of beneficial opportunities.

Alongshore or Longshore – Parallel to and near the shoreline.

Average Recurrence Interval (ARI) – The average time between which a threshold is reached or exceeded (e.g. large wave height or high water level) of a given value. Also known as the Return Period.

Beach – The *Coastal Management Act 2016* (CM Act) defines beach as an area that is generally composed of sand or pebbles or similar sediment that extends landward from the lowest astronomical tide to the line of vegetation, bedrock or structure.

Beach erosion – Refers to landward movement of the shoreline and/or a reduction in beach volume usually associated with storm events or a series of events that occur within the beach fluctuation zone. Beach erosion occurs due to one or more process drivers; wind, waves, tides, currents, ocean water level, and downslope movement of material due to gravity.

Beach nourishment – Beach restoration or augmentation using clean dredged or fill sand. Dredged sand is usually hydraulically pumped and placed directly onto an eroded beach or placed in the littoral transport system. When the sand is dredged in combination with constructing, improving, or maintaining a navigation project, beach nourishment is a form of beneficial use of dredged material.

Beach system – Defined in the CM Act as, “the processes that produce the beach fluctuation zone and the incipient foredunes and foredunes landward of the relevant beach.” In general, this means coastal lands, comprised of sand, gravel or shell, between a seaward limit of 40 metres depth in the State coastal waters and a landward limit at the lee side of the dunes.

Bedrock – A general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.

Berm – On a beach, a nearly horizontal plateau on the beach face or backshore, formed by the deposition of beach material by wave action or by means of a mechanical plant as part of a beach renourishment scheme. Some natural beaches have no berm, others have several.

Biological diversity – The richness and variety of life (plant and animal) and habitats. It includes genetic diversity, species diversity and the variety of communities or ecosystems.

Bypassing sand – Hydraulic or mechanical movement of sand from the accreting up-drift side to the eroding down-drift side of an inlet or harbour entrance. The hydraulic movement may include natural movement as well as movement caused by humans.



Climate – The characteristic weather of a region, particularly regarding temperature and precipitation, averaged over some significant interval of time (years).

Climate change – Occurs naturally in response to long-term variables, but often used to describe a change of climate that is directly attributable to human activity that alters the global atmosphere, increasing change beyond natural variability and trends.

Closure depth – Do not detect vertical seabed changes, generally considered the seaward limit of littoral transport (collected over several years). The depth can be determined from repeated cross-shore profile surveys or estimated using formulas based on wave statistics. Note that this does not imply the lack of sediment motion beyond this depth.

Coast – A strip of land of variable width that extends from the shoreline inland to the first significant landform that is not influenced by coastal processes (such as waves, tides and associated currents).

Coastal asset – Includes natural features of the coastal zone, including landforms, ecosystems and species, and built assets such as infrastructure, public and private buildings or structures.

Coastal dune – Vegetated and un-vegetated sand ridges built-up at the back of a beach. They comprise dry beach sand that has been blown landward and trapped by plants or other obstructions. Stable sand dunes act as a buffer against wave damage during storms, protecting the land behind from salt water intrusion, sea spray and strong winds. Coastal dunes also act as a reservoir of sand to replenish and maintain the beach at times of erosion.

Coastal engineering – A branch of civil engineering that applies engineering principles specifically to projects within the coastal zone (nearshore, estuary, marine, and shoreline).

Coastal environment area – Land identified in the CM Act as land containing coastal features such as coastal waters of the State, estuaries, coastal lakes, coastal lagoons and land adjoining those features, including headlands and rock platforms. The CM State Environmental Planning P maps the extent of the coastal environment area for planning purposes.

Coastal flooding – Flooding of low lying areas by ocean waters, caused by a higher than normal sea level.

Coastal hazard – Defined in the CM Act to mean the following:

- Beach erosion
- Shoreline recession
- Coastal lake or watercourse entrance instability
- Coastal inundation
- Coastal cliff or slope instability
- Tidal inundation
- Erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.

Coastal inundation – Coastal inundation occurs when a combination of marine and atmospheric processes raises the water level at the coast above normal elevations, causing land that is usually 'dry' to become inundated by sea water. Alternatively, the elevated water level may result in wave run-up and overtopping of natural or built shoreline structures (e.g. dunes, seawalls).

Coastal management program – A long-term strategy for the coordinated management of land within the coastal zone, prepared and adopted under Part 3 of the CM Act.



Coastal processes – Marine, physical, meteorological and biological activities that interact with the geology and sediments to produce a particular coastal system.

Coastal protection works – The CM Act defines coastal protection works as: a) beach nourishment b) activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters, including (but not limited to) seawalls, revetments and groynes.

Coastal sediment compartment – An area of the coast defined by its sediment flows and landforms. Coastal sediment compartments may be mapped at primary, secondary or tertiary (local) scales. Boundaries are generally defined by structural features related to the geologic frameworks that define the planform of the coast.

Conceptual model – An simplified representation of the physical hydro-geologic setting. This includes the identification and description of the geologic and hydrologic framework, media type, hydraulic properties, and sources and sinks of flow.

Cross-shore transport – Refers to the sediment moved in a cross-shore direction to the coastline induced by water motions due to waves and currents.

Current, coastal – One of the offshore currents flowing generally parallel to the shoreline in the deeper water beyond and near the surf zone; these are not related genetically to waves and resulting surf, but may be related to tides, winds, or distribution of mass.

Current, littoral – Any current in the littoral zone caused primarily by wave action; e.g. longshore current, rip current.

Current, longshore – The littoral current in the breaker zone moving essentially parallel to the shore, usually generated by waves breaking at an angle to the shoreline.

Design storm – A hypothetical extreme storm with waves that coastal protection structures will often be designed to withstand. The severity of the storm (i.e. return period) is chosen in view of the acceptable level of risk of damage or failure. A design storm consists of a design wave condition, a design water level and a duration.

Design wave – In the design of harbour works, coastal protection works etc., the type or types of waves selected as having the characteristics against which protection is desired.

Diffraction of water waves – The phenomenon by which energy is transmitted laterally along a wave crest. When a part of a train of waves is interrupted by a barrier, such as a breakwater, the effect of diffraction is manifested by propagation of waves into the sheltered region within the barrier's geometric shadow.

Economic evaluation – An assessment that helps decision-makers to understand the socioeconomic implications of adopting alternative management options and to make choices that will provide net benefits to the community. Cost-benefit analysis is a type of economic evaluation that considers and evaluates a wide range of costs and benefits associated with a proposal, in qualitative or quantitative (monetary) terms (with future costs and benefits reduced to today's prices), compared with a base case. It may be used in conjunction with other criteria (such as technical feasibility, community acceptance or environmental impact) to select optimal management responses. A multi-criteria assessment is not an economic evaluation but may assist decision-making in other ways.

Erosion – The wearing away of land by the action of natural forces. On a beach, the carrying away of beach material by wave action, tidal currents, littoral currents, or by deflation.

Escarpment (storm bite) – The landward limit of erosion in the dune system caused by storm waves. At the end of a storm the escarpment may be nearly vertical; as it dries out the sand slumps to a typical slope of one vertical to 1.5 horizontal.



Extreme storm event – A storm for which characteristics (wave height, period, water level etc.) were derived by statistical ‘extreme value’ analysis. Typically, these are storms with average recurrence intervals (ARI) ranging from one to 100 years.

Foredune – The larger and more mature dune lying between the incipient dune and the hind-dune area. Foredune vegetation is characterised by grasses and shrubs. Foredunes provide an essential reserve of sand to meet the erosion demand during storm conditions. During storm events, the foredune can be eroded back to produce a pronounced dune scarp.

Foreshore – The part of the shore, lying between the crest of the seaward berm (or upper limit of wave wash at high tide) and the ordinary low water mark, that is ordinarily traversed by the uprush and backrush of the waves as the tides rise and fall; or the beach face, the portion of the shore extending from the low water line up to the limit of wave uprush at high tide. The CM Act defines the foreshore as ‘the area of land between highest astronomical tide and the lowest astronomical tide’.

Geodiversity – The natural range (diversity) of geological (bedrock), geomorphological (landform) and soil features, assemblages, systems and processes. Geodiversity includes evidence of the past life, ecosystems and environments in the history of the earth as well as a range of atmospheric, hydrological and biological processes currently acting on rocks, landforms and soils.

Geomorphology – That branch of physical geography which deals with the form of the earth, the general configuration of its surface, the distribution of the land, water, etc.; or the investigation of the history of geologic changes through the interpretation of topographic forms.

Groyne – A shore protection structure built (usually perpendicular to the shoreline) to trap littoral drift or retard erosion of the shore; or a narrow, roughly shore normal structure built to reduce longshore currents, and/or to trap and retain littoral material. Most groynes are of timber or rock and extend from a seawall, or the backshore, well onto the foreshore and rarely even further offshore.

Hard defences (protection) – General term applied to impermeable coastal defence (protection) structures of concrete, timber, steel, masonry, etc., which reflect a high proportion of incident wave energy.

Highest astronomical tide (HAT) – The highest level which can be predicted to occur under average meteorological conditions and any combination of astronomical conditions. In Australia HAT is calculated as the highest level from tide predictions over the tidal datum epoch (TDE), this is currently set to 1992 to 2011. The HAT and the Lowest Astronomical Tide (LAT) levels will not be reached every year. LAT and HAT are not the extreme water levels which can be reached, as storm surges may cause considerably higher and lower levels to occur.

Holocene – An epoch of the Quaternary period, from the end of the Pleistocene, about 8000 years ago, to the present time.

Hydrodynamic – Relates to the specific scientific principles that deal with the motion of fluids and the forces acting on solid bodies immersed in fluids, and in motion relative to them.

Impacts – Include damage, harm or losses to exposed communities, property, services, livelihoods, access, use and amenity, heritage, ecosystems and the environment because of exposure and sensitivity. Impacts may also be positive.

Inshore zone – In beach terminology, the zone of variable width extending from the low water line through the breaker zone.

Littoral – Of or pertaining to a shore, especially of the sea. Often used as a general term for the coastal zone influenced by wave action, or, more specifically, the shore zone between the high and low water marks.



Littoral transport rate – Rate of transport of sedimentary material parallel or perpendicular to the shore in the littoral zone. Usually expressed in cubic metres per year. Commonly synonymous with longshore transport rate.

Longshore transport (littoral drift) – Refers to the sediment moved along a coastline under the action of wave-induced longshore currents (Dean and Dalrymple, 2002). The net drift is the sum of the positive (conventionally northwards direction in NSW) and negative (southwards in NSW) direction. The gross drift is the sum of the drift magnitudes (absolute values). The differential drift is the difference between the net drift into and out of a coastal compartment. Both gross and net drift are typically averaged over a year and expressed in **m³/yr**.

Mean high water mark – The line of the medium high tide between the highest tide each lunar month (the springs) and the lowest tide each lunar month (the neap) averaged over out over the year. In NSW, the methods for determining the position of the MHW are outlined in the Crown Directions to Surveyors - No. 6 Water as a Boundary.

Mean sea level – The arithmetic mean of hourly heights of the sea at a tidal station, observed over a long period of time.

Multi-criteria analysis – A logical and structured decision-making tool for complex problems involving multiple factors or criteria, where a consensus is difficult to achieve. It may involve processes such as ranking, rating (with relative or ordinal scales) or pairwise comparisons. The process allows participants to consider, discuss and test complex trade-offs among alternatives.

Near shore – The area of ocean close to the coast that is affected by waves, tides and longshore currents.

Outflanking or end effects – Erosion behind or around the land-based end of a groyne, jetty or breakwater or the terminus of a revetment or seawall, usually causing failure of the structure or its function.

Overwash or overtopping – The part of the wave uprush that runs over the crest of a berm or structure and does not flow directly back to the ocean or lake. When waves overtop a coastal protection structure they often carry sediment landwards which is then lost to the beach system. Also defines a process in which waves penetrate inland of the beach, which is common on low barriers.

Progradation – The building forward or outward toward the sea of a shoreline or coastline (as with a beach, delta, or fan) by nearshore deposition of river-borne sediments or by continuous accumulation of beach material thrown up by waves or moved by longshore drifting.

Recession – A continuing landward movement of the shoreline; or a net landward movement of the shoreline over a specified time.

Reflection – The process by which the energy of the wave is returned seaward.

Refraction – The process by which the direction of a wave moving in shallow water at an angle to the contours is changed. The part of the wave advancing in shallower water moves more slowly than that part still advancing in deeper water, causing the wave crest to bend toward alignment with the underwater contours; or the bending of wave crests by currents.

Resilience – The ability of a system (human or natural) to adapt to changing conditions (including hazards or threats, variability and extremes), and rapidly recover from disruption due to emergencies. Resilient systems or communities have the capacity to 'bounce back' after a disrupting event such as a major storm or an extended heat wave, to moderate potential damages, take advantage of opportunities, maintain or restore function or to cope with the consequences.



Revetment or seawall – A type of coastal protection work which protects assets from coastal erosion by armouring the shore with erosion-resistant material. Large rocks/boulders, concrete or other hard materials are used, depending on the specific design requirements.

Rip – A narrow, strong shore normal current in the nearshore area of most wave-dominated beaches (i.e. most beaches along the open coast of NSW). They are fed by along shore feeder currents initiated by the deflection of waves at the shoreline. There are diverse types of rip on NSW beaches and they affect beach safety.

Risk – The effect of uncertainty on planning and management objectives, usually characterised by reference to potential hazards, their consequence and their likelihood. Consequence combines the concepts of magnitude, sensitivity and duration.

Sand drift – The movement of sand by wind. On the coast, this generally describes sand movement resulting from natural or human-induced degradation of dune vegetation, resulting in either nuisance or major sand drift (dune transgression).

Sea level rise – An increase in the mean level of the oceans. Relative sea level occurs where there is a local increase in the level of the ocean relative to the land, which might be caused by ocean rising, the land subsiding, or both. In areas with rapid land level uplift (e.g. seismically active areas), relative sea level can fall.

Sediment cells (tertiary) – Small and relatively contained sediment compartments. A tertiary sediment cell may apply to a single beach/embayment.

Sediment transport – The process whereby sediment is moved offshore, onshore or along shore by wave, current or wind action.

Shoreline recession – The continuing landward movement of the shoreline, that is, a net landward movement of the shoreline, generally assessed over a period of several years. As shoreline recession occurs the beach fluctuation zone is translated landward.

Storm surge – The increase in coastal water level caused by the effects of storms. Storm surge consists of two components – the increase in water level caused by the reduction in barometric pressure and the increase in water level caused by the action of wind blowing over the sea surface (wind set-up).

Storm tide – An abnormally high water level that occurs when a storm surge combines with a high astronomical tide. The storm tide must be accurately predicted to determine the extent of coastal inundation.

Surf zone – Defined in CM Act as the area from the line of the outer most breaking waves to the limit of wave run-up on the beach.

Swash zone – The zone of wave action on the beach, which moves as water levels vary, extending from the limit of run down to the limit of run-up.

Swell waves – Ocean waves that travel beyond the area where they are generated.

Tidal inundation – The inundation of land by tidal action under average meteorological conditions and the incursion of sea water onto low lying land that is not normally inundated, during a high sea level event such as a king tide or due to longer-term sea level rise.

Vulnerability – A function of exposure and sensitivity of assets to a hazard, which determines the potential impacts of the hazard. For instance, the vulnerability of coastal assets may be influenced by the extent and impact of environmental, social



and economic factors such as saline contamination of soils from flooding, erosion of built-up and natural areas, loss of vegetation, disruption to use, or access, or continuity of service, or loss of amenity, corrosion of built structures, undermining of foundations or damage to contents. Vulnerability also considers the adaptive capacity which is the capacity to adapt or the resilience in the system to manage the impacts and changes.

Wave-dominated coast – The coast of south eastern Australia is a wave-dominated system. This affects the beach type and the types of estuaries that occur in the landscape.

Wave energy – The capacity of waves to do work. The energy of a wave system is theoretically proportional to the square of the wave height; a high-energy coast is characterised by breaker heights greater than 50 centimetres and a low-energy coast is characterised by breaker heights less than 10 centimetres. Most of the wave energy along equilibrium beaches is used in shoaling and in sand movement. The NSW coast is a high wave energy coast.

Wave run-up – The vertical distance above mean water level reached by the uprush of water from waves across a beach or up a structure.

Wave set-up – The rise in the water level above the still water level when a wave reaches the coast. It can be very important during storm events as it results in further increases in water level above the tide and surge levels.

Wind waves – Ocean waves resulting from the action of the wind on the surface of the water.

