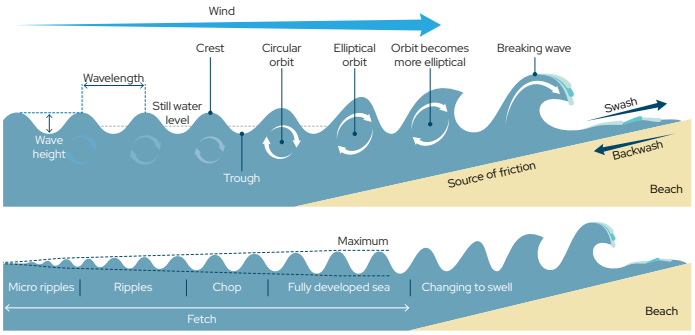
Coastal Management Program
Coastal processes

Waves

Waves are created by the movement of energy through water, causing it to move in a circular motion. The most common waves are caused by wind blowing over a body of water (fetch), and stronger wind and larger fetch will increase the size and wavelength of a swell.

Waves may also be caused by adverse weather or natural events such as severe storms and submarine earthquakes or landslides. Severe storms can result in storm surge, a particular type of wave detailed on page 2.

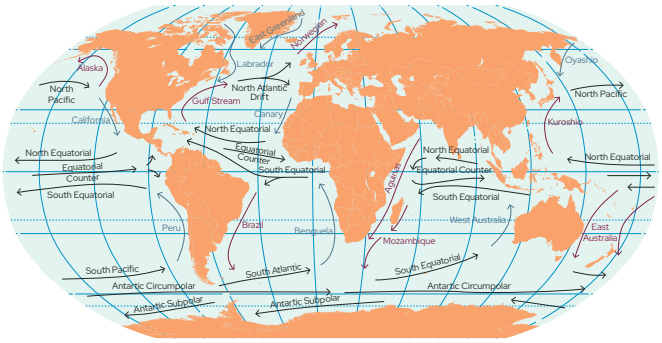


Wave anatomy

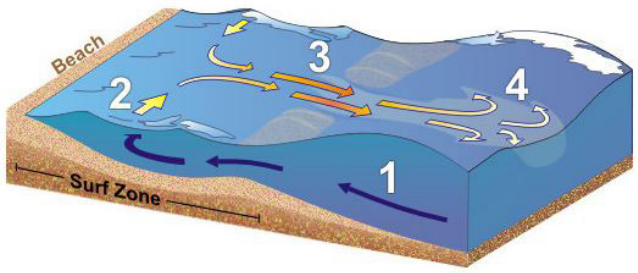
The rate of sediment transfer through a coastline is largely affected by the energy contained within waves, the angle of approach and the nearshore rip-currents they cause.

Currents

Ocean currents are the continuous, naturally occurring movement of seawater around the planet driven by gravity, wind (Coriolis effect) and water density. Currents may be large-scale in response to global drivers (for example, East Australian Current) or local scale in response to local conditions (for example, rip current driven by waves).



Ocean currents

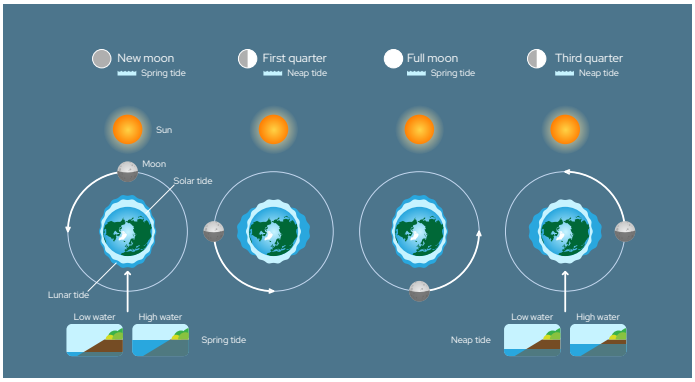


Rip currents

Tides

Tides are a naturally occurring phenomena that are a product of the distribution of the planet's oceans around the surface of the earth. Tides are caused by the gravitational effect of the moon (and to a lesser extent, the sun and other planets) in relation to earth. Tidal ranges vary by location, through each lunar month, and between months.

Tweed experiences semi-diurnal tides, meaning that there are 2 high and 2 low waters daily.

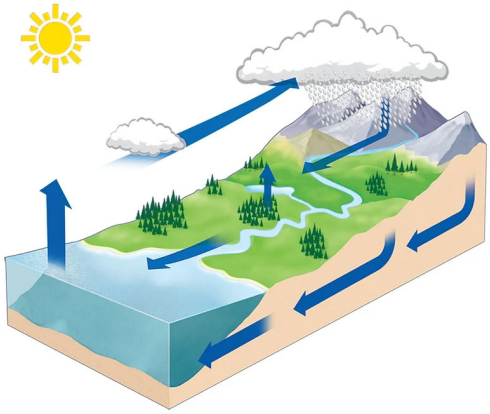


Lunar tides

Rainfall, waterways and intermittently closed and open lakes and lagoons

Rainfall and runoff over land creates rivers, creeks and estuaries as water returns to the ocean. As water returns to the ocean via these waterways, interaction with coastal processes over time can cause the formation of lakes and lagoons that alternate between being open or closed to the ocean.

Intermittently closed and open lakes and lagoons (ICOLLs) often accommodate important aquatic and estuarine habitats including mangrove, saltmarsh and seagrasses which provide valuable ecosystem services such as nutrient and water filtration, oxygenation and sediment stabilisation, breeding habitat for fish and carbon sequestration.



The rainfall cycle.

The (natural vs. artificial) opening and closing of ICOLLs is often debated, as artificial opening can reduce concerns of localised flooding in adjacent residential areas but can lead to unpleasant odour and fish kills within the waterway.

Storms, storm surge and storm tide

Storms

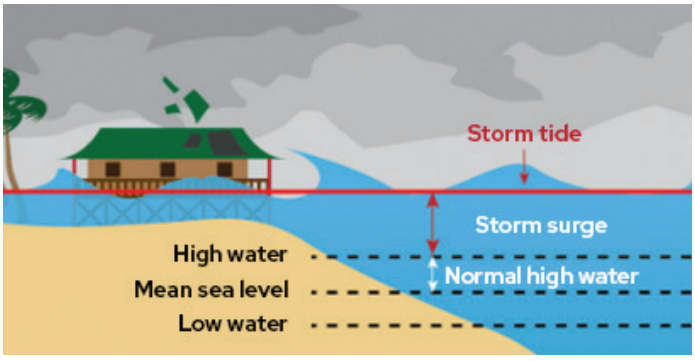
Storms vary in size, severity, and duration (for example, storm, severe thunderstorm, East Coast Low, cyclone etc.) and may be marked by lightning and thunder, heavy rain, strong wind and hail. The conditions associated with storms (strong wind, low atmospheric pressure) can contribute to larger waves and exacerbate the effect of coastal processes.

Storm surge

Storm surge refers to the abnormal elevation in sea level generally caused by severe weather vents including cyclones and east coast lows. Storm surges can cause inundation and erosion of low-lying coastal areas in beachfront, urban and estuarine environments.

Storm tide

Storm tide describes the combined effect of a storm surge and normal astronomical tide levels. The greatest impacts occur when peak storm surge coincides with a high water. The combined effect of storm tide and waves can increase the severity of coastal erosion and damage to built and natural assets.



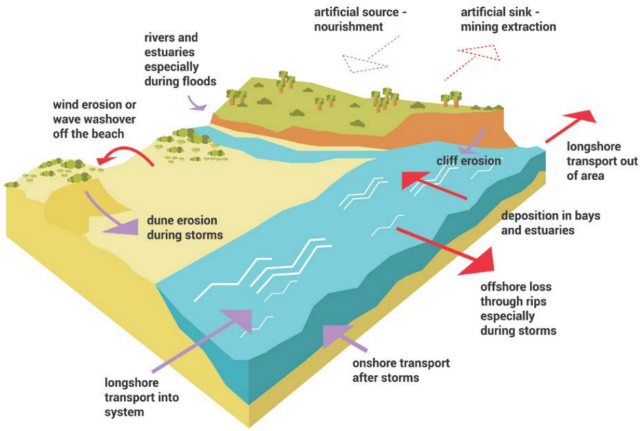
Storm surges and tides.

Sediment compartments, transfer, erosion and accretion

A coastal sediment compartment is an area where coastal processes and their effects on the geology of the coastline are generally consistent. They are used to understand the transfer of sediment (i.e. sand) through a geographic area by observing beach erosion and accretion.

Tweed occurs within the Point Danger – Cape Byron coastal sediment compartment, with sediment transfer following the presiding ocean current and swell direction north along the coastline into Qld.

The Tweed River Entrance Sand Bypass project at the Qld/NSW border maintains the natural flow of sand through the sediment compartment around the Tweed River training walls and into the Gold Coast.



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