



# Tweed River Entrance Sand Bypassing Project (TRESBP)

[www.tweedsandbypass.nsw.gov.au](http://www.tweedsandbypass.nsw.gov.au)

## GEOGRAPHICAL PROCESSES

Case study part 1, of 5

Both physical and human elements influence the Tweed River entrance and southern Gold Coast, the area where the Tweed River Entrance Sand Bypassing Project (TRESBP) operates.

### Physical elements

The shape of the coastline fluctuates. Sand is constantly moving in the surf zone—eroding (washing away) and accreting (building up) with the influence of physical elements. These elements are examined below.

#### Waves

Waves shift sand. On the Gold Coast, average wave energy is high. During cyclonic periods, waves in excess of 11 metres have been recorded at the Waverider buoy off Kirra. During storms in May 2009, a 5.6-metre wave was recorded on the southern Gold Coast and waves were higher than 4 metres for four days. With very high tides at the time, waves cut even further into dunes and foreshore areas.



A 1-metre scarp carved by storm waves at Snapper Rocks, autumn 2009. Photo: Brad Wagner, courtesy 'Gold Coast Bulletin' newspaper

#### Longshore drift

Along Australia's east coast, ocean swells from the south-east push sand (in the ocean) to the north. This is longshore drift; this drifting sand is needed to build up beaches, especially after storms. But the drift can be interrupted by natural or man-made structures.



Longshore drift, on average, is a half a million cubic metres of sand per year along this coast.

#### Tropical cyclones

The Gold Coast averages 1.3 cyclones per year, but this is only an average. Three severe cyclones hit the Gold Coast in quick succession in 1974. In contrast, from the 1980s to the early 2000s there were few cyclones. In February 1954, a very destructive cyclone crossed the coast at Coolangatta. Beaches were scoured by waves, rain and storm

surges. The Bureau of Meteorology has summarised this event, see: [www.bom.gov.au/lam/climate/levelthree/c20thc/cyclone3.htm](http://www.bom.gov.au/lam/climate/levelthree/c20thc/cyclone3.htm)

#### East coast lows



Autumn 2009 on the southern Gold Coast was the stormiest period for 20 years. Photo: Brad Wagner, courtesy 'Gold Coast Bulletin' newspaper

An east coast low (ECL) is a low pressure system that intensifies rapidly, most commonly in autumn or winter. The storm-force winds can be as severe as strong cyclones. The Gold Coast and northern New South Wales suffered a series of storms from February to June 2009, mostly generated by ECLs, causing extensive coastal erosion and flooding. The intervals between storms were not long enough for natural beach recovery. See more on the impact of these 2009 storms: [www.tweedsandbypass.nsw.gov.au/topics\\_of\\_interest/autumn\\_storms\\_2009](http://www.tweedsandbypass.nsw.gov.au/topics_of_interest/autumn_storms_2009) In June 1967, three ECLs brought storms that battered the Gold Coast causing the worst erosion on record. Read more through the Bureau of Meteorology at [www.bom.gov.au/lam/climate/levelthree/c20thc/cyclone5.htm](http://www.bom.gov.au/lam/climate/levelthree/c20thc/cyclone5.htm)

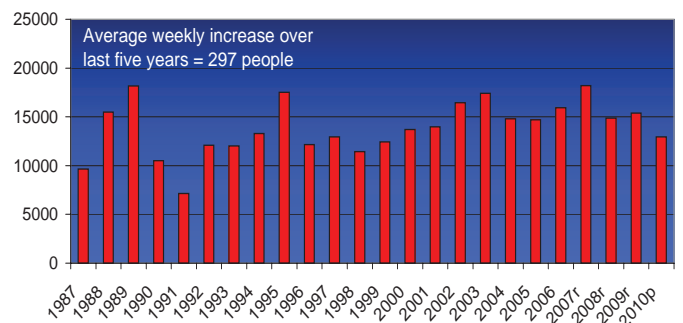
### Human elements

Coastline with sandy beaches, headlands and river access is scenic and highly valued—valued for tourism, residential, recreational and commercial purposes.

#### Population growth and tourism

Australian Bureau of Statistics (ABS) research shows the Gold Coast and Tweed Heads are growing.

Population growth, Gold Coast City, 1987-2010



r – revised estimate p – preliminary estimate (Reprinted with permission) Note: Based on ASGC 2010 – adjustments have been made for boundary changes to Gold Coast in 2007. Source: ABS 3218.0 Regional Population Growth, Australia (various editions); unpublished data.

## Coastal change

### 3218.0 - Regional Population Growth, Australia, 2008-09 New South Wales

...All 21 NSW coastal LGAs [local government areas] outside the Sydney SD [statistical division] experienced population increases, though only Tweed (A) exceeded the state average of 1.7%. Lake Macquarie (C) in the Hunter region had the largest growth, with an increase of 2,900 people. Large population increases were also recorded in Wollongong (C) (2,200) in the Illawarra region and Tweed (A) (1,800) on the far north coast of the state.

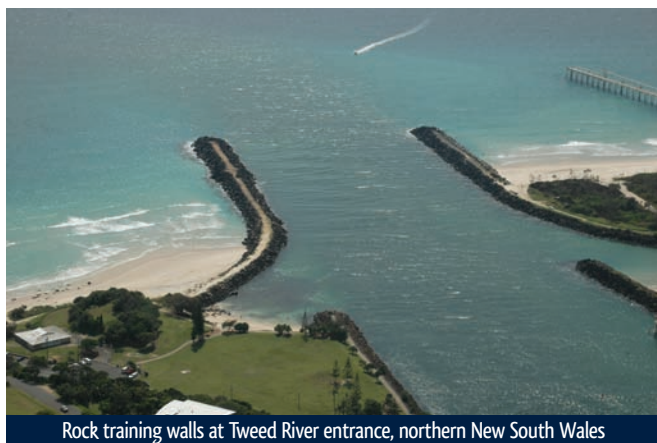
The fastest population growth occurred in Tweed (A) with an increase of 2.0%, followed by Clarence Valley (A) on the mid-north coast, and Shoalhaven (C) and Shellharbour (C) in the Illawarra (all 1.6%). Port Stephens (A) and Lake Macquarie (C) in the Hunter region and Byron (A) on the far north coast all grew by 1.5%

Source: Australian Bureau of Statistics [www.abs.gov.au/ausstats/abs@.nsf/Products/3218.0~2008-09~Main+Features~New+South+Wales?OpenDocument#PARALINK3](http://www.abs.gov.au/ausstats/abs@.nsf/Products/3218.0~2008-09~Main+Features~New+South+Wales?OpenDocument#PARALINK3)

Gold Coast City Council local government area had a resident population of 472,279 in 2006; a population of 730,000 is forecast for 2026. Tweed Shire's resident population was 81,386 in 2006, with Council's research projecting 120,000 by 2031. Tourism is a major industry for the Gold and Tweed Coasts. Gold Coast beaches are known worldwide; visits to the foreshore have been calculated at 40 million per year by residents and 7 million per year by tourists (Lewis et al. 2010).

#### River entrance training works

The Tweed River entrance training walls were extended by 380 metres in the 1960s to improve navigation safety. Training walls stabilise a river entrance and establish a channel. But improvements after the extensions were only temporary as sand again accumulated in the channel and around the south wall. Shorter training walls had been built in the 1890s to assist navigation.



Rock training walls at Tweed River entrance, northern New South Wales

#### Coastal protection and management measures

From the 1960s to the 1990s a series of measures was undertaken to address erosion at the southern Gold Coast and the heavily silted Tweed River entrance.

#### Beach nourishment and dredging

Beach nourishment means placing additional sand on beaches to build them up following erosion. There were major nourishment programs on eroded southern Gold Coast beaches from 1996 to 2001, and earlier in the 1970s and 1980s. Sand for beach nourishment usually comes from dredging.

During the 1996 to 2001 nourishment campaign, more than 3.5 million cubic metres of sand were dredged from the heavily silted Tweed River entrance. The sand had built up across decades; northwards longshore drift had been blocked by the southern training wall and accumulated at the wall and then around the wall into the river entrance. This large volume was used to partially restore eroded southern Gold Coast beaches. Dredging of the Tweed River entrance still occurs periodically.

#### Groynes

Extending from the shore, groynes are structures built to interrupt water flow and sand movement. Three groynes were built at Kirra and North Kirra in the 1970s and 1980s to build up beaches by trapping sand in the surf zone. Two of these have since been modified to allow more sand to drift north.



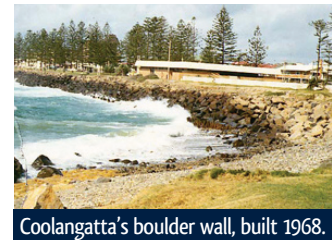
Kirra Point groyne was built in 1972 to help build up Coolangatta Beach to the south.

#### Revetments

At the southern end of the Gold Coast, boulder walls were built at Colangatta in 1968. In 1973 rock walls were built at Kirra to prevent the highway slipping into the sea, and at Kirra Beach, North Kirra and Bilinga over the following three years. Decades earlier, timber walls had been constructed at the back of Coolangatta Beach and at Kirra following a 1936 cyclone.

Since the 1970s, Gold Coast City Council has developed new standards and sees foreshore

seawalls as one of many approaches, not a complete answer to foreshore stability. Revetments, built to absorb wave energy and give protection from currents and waves, often suffer significant damage.



Coolangatta's boulder wall, built 1968.

#### Tweed sand bypassing

Tweed River Entrance Sand Bypassing Project (TRESBP) began in 2001. Drifting ocean sand is drawn in at the jetty and delivered by underground pipe back to the ocean, north of the river. From here, waves and currents transport the sand, replenishing southern Gold Coast beaches. The TRESBP jetty, on Letitia Spit, extends seawards just beyond the river entrance training walls. In essence, this system redirects sand preventing it from building up around the training walls and river entrance. Tweed River entrance is also dredged periodically, to clear sand missed by the jetty.



Tweed River entrance with the 450-metre long TRESBP jetty to the south.

#### Reference:

Lewis, J, Mortensen, S, Drønen, N, Tomlinson, R & Hunt, S 2010, 'Detailed assessment of extreme coastal erosion and storm surge vulnerability of central Gold Coast beaches', paper presented at 19th NSW Coastal Conference, Batemans Bay, NSW, 10-12 November.