Source: https://www.tweedsandbypass.nsw.gov.au/school-students/school-information-package.html

RESOURCE: TWEED SAND BYPASSING SCHOOLS PACKAGE

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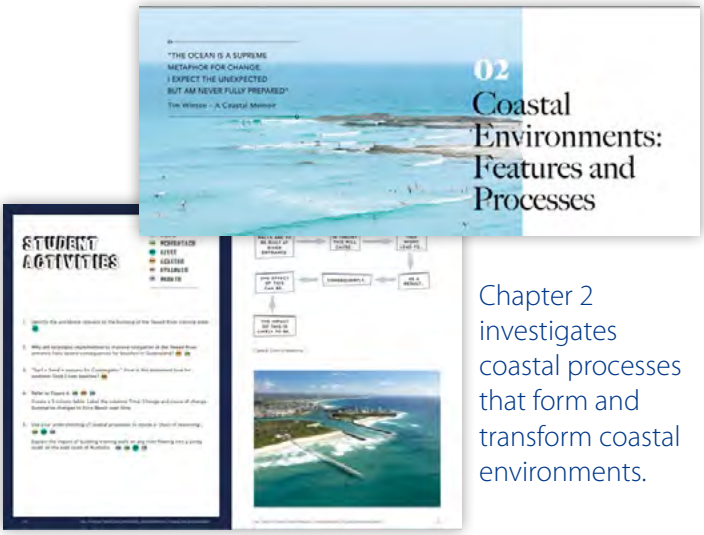
Tweed Sand Bypassing (TSB) is a coastal management case study used in many NSW schools studying coastal environments.

The TSB Schools Information Package was developed during 2019 and 2020 by Tweed Sand Bypassing in collaboration with the Geography Teachers Association of NSW & ACT to provide a complete study for the Stage 5 topic **Environmental Change and Management.** Geographical inquiry and the development of 21st-century skills such as collaboration and creativity are the focus of student activities integrated throughout the package.

Features of the package include:

- **Downloadable chapters** for content areas including coastal environmental processes, environmental change and management, Tweed Sand Bypassing case study, a comparative study from Waikiki Beach in Hawaii as well as other illustrative examples. Key learning is identified for each chapter.
- **Hyperlinks** to videos and other websites such as BOM.
- High quality **stimulus material** such as the change over time images on page 110.
- **Student activities** integrated throughout (coded to levels of thinking)
- **A stimulus booklet** with student activities
- A suggested, transferable **fieldwork activity**, adaptable to other locations
- A suggested **outcomes-based assessment task with marking guidelines**.



Chapter 2 investigates coastal processes that form and transform coastal environments.

Source: https://www.tweedsandbypass.nsw.gov.au/operations/sand-delivery.html

WEB RESOURCE: TWEED SAND BYPASSING

The following tables from the package illustrate coastal management strategies (page 60) used in Australia and globally by coastal managers and coastal monitoring tools (page 128) used by Tweed Sand Bypassing.

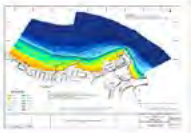
Table 1. *Coastal protection management strategies in NSW and Queensland.*

STRATEGY	DESCRIPTION	ADVANTAGES	DISADVANTAGES
1. TRAINING WALLS  Tweed River Entrance training walls. Source: Tweed Sand Bypassing	Walls located at river mouths/estuaries to prevent natural movement of the entrance. Training walls are often accompanied by periodic dredging (e.g. coastal rivers along the NSW and south-east Queensland coast).	The coastal inlet or river maintains one position along the coastline. A trained river entrance can improve navigation and safety for boats, which enhances the social and economic values of the coast.	Can contribute to beach erosion (downdrift) by interrupting longshore drift. Sand can accumulate on one side of a wall, growing beyond the wall and then forming bars across the river entrance. Dredging is often required to maintain navigational channels. Can cause a change to the tidal prism of the estuary. This can have detrimental effects on coastal processes and the estuary ecology.
2. SAND TRANSFER/SAND BYPASSING  Tweed Sand Bypassing Sand Jetty. Source: Tweed Sand Bypassing	Sand is pumped from one location to another through mechanical means (e.g. Tweed Sand Bypassing, Noosa Beach Sand Shifter, Queensland).	Restores sand. Can be used to bypass training walls and structures that may otherwise impede natural sand movement.	The infrastructure is expensive to build and operate. Requires ongoing monitoring and the ability to adapt to changing conditions such as storm erosion.
3. BEACH NOURISHMENT  Dredge placement at the Gold Coast. Source: City of Gold Coast	Sand is added to a beach though mechanical means. Nourishment can be onshore (e.g. delivery of sand by truck to a beach) or offshore (e.g. dredge placement).	Restores and widens a beach. Enhances amenity. Fast and effective short-term solution to erosion.	Over time its likely that nourished sand will be lost. Usually needs to be repeated after a period of time. It can be expensive to continually replenish eroded sand.
4. GROYNES  Kirra Point Groyne. Source: Tweed Sand Bypassing	Shore perpendicular structure to the coast, aimed at trapping sand that is moving along the beach. Typically constructed using rocks or geotextile containers.	Traps sand and stabilises the beach updrift. Can increase surf amenity (e.g. Kirra beach).	Typically causes erosion on the downdrift side of the structure. Expensive as it requires an engineered solution. Can be visually unattractive. Can decrease surf amenity.
5. SEAWALLS  Sea wall construction at Palm Beach, Queensland. Source: City of Gold Coast	A shore parallel structure used to provide protection to beach and waterfront land from erosion.	Effective in protecting land and property from erosion. Can utilise a number of different designs and materials. Can be attractive and enhance beach amenity and access (e.g. Manly Beach, NSW).	Can cause increased erosion in front and at the ends of the seawall. Expensive as it requires an engineered solution. Maintenance required over the lifetime of the seawall. Can be visually unattractive.
6. BEACH SCRAPING  Beach scraping at Wooli, NSW. Source: NSW Government	Sand is moved from the lower beach onto the upper beach to increase dune sand volumes. Typically used with dune catch fencing to assist in stabilising dunes.	Low-cost solution. Builds beach and dune sand volumes to provide protection from coastal erosion.	Revegetation strategy required following scraping to assist with dune stabilisation. Over time it's likely that scraped sand will be lost. Can produce an artificially high dune which is easily eroded during a storm event.
7. OFFSHORE BREAKWATER OR ARTIFICIAL REEF  Narrowneck artificial reef, offshore of Surfers Paradise. Source: City of Gold Coast	A rock or geotextile bag structure built parallel to the shore.	Reduces erosion by making waves break further offshore and reducing wave energy at the shore. May increase surf amenity. Low maintenance. Supports marine ecosystems.	Expensive to create. Not always effective.
8. MANAGED RETREAT  Clarkes Beach Caravan Park managed retreat, Byron Bay, NSW. Source: NSW Government	Development relocated from vulnerable coastal zones. No new development.	Long-term solution. Reduces future threats to property. Restores natural processes.	Expensive. Community resentment.
9. BUYBACK  Collaroy Beach, NSW. Buyback at this coastal erosion hot spot would be very expensive. Source: UNSW WRL	Governments purchase vulnerable properties, remove structures and ban further development.	Minimises property losses in vulnerable areas.	Very expensive. Community resentment.

Table 1: Geographical tools and TSB monitoring

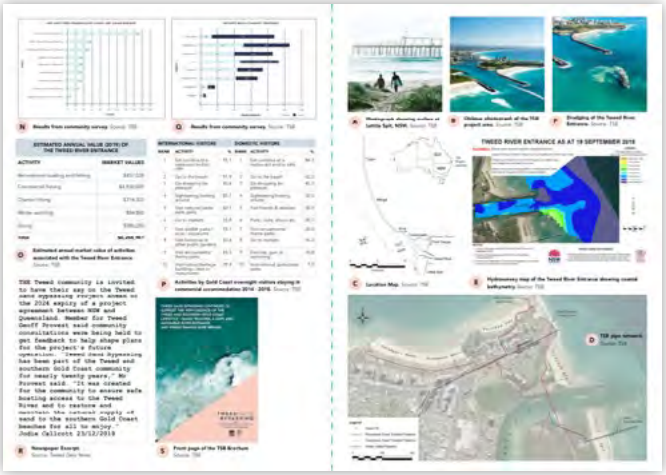
PRIMARY DATA SOURCES	GATHERING PRIMARY DATA: FIELDWORK	PURPOSE
	1. Vertical aerial photographs of the project area (Fingal–Currumbin) are taken from an aeroplane at a fixed height. This has historically occurred in autumn and spring.	Aerial photographs are georeferenced and used in GIS to carry out spatial analysis Changes to beaches, offshore sand banks and reef exposure can be measured and analysed
	2. Oblique photographs taken from helicopters every 3 months.	Series of photographs are used to: › make visual comparisons of change over time › identify and annotate potential causes of change such as storms and seasonal wave conditions.
	3. Ground-level beach photographs taken › from 5 locations at the main project area beaches every few months. or › by community members at the Gold Coast CoastSnap station at Kirra Hill (City of Gold Coast)	
	4. ARGUS camera network – a series of cameras on tall buildings in Coolangatta take photos every minute of Kirra, Coolangatta, Greenmount and Rainbow Bay.	Images are merged using computer programs and the location of the shoreline for each beach is determined. The images are used to make time-lapse videos which are used to examine and communicate beach change over time.
	5. Wave monitoring using a wave rider buoy in the ocean off Fingal to record wave height, period and direction.	Computer models use wave data to predict how much sand is moving along Letitia Spit by longshore drift. Wave data is also used to: › interpret changes shown on hydrographic surveys and photographs › create wave roses.

Table 1: Geographical tools and TSB monitoring

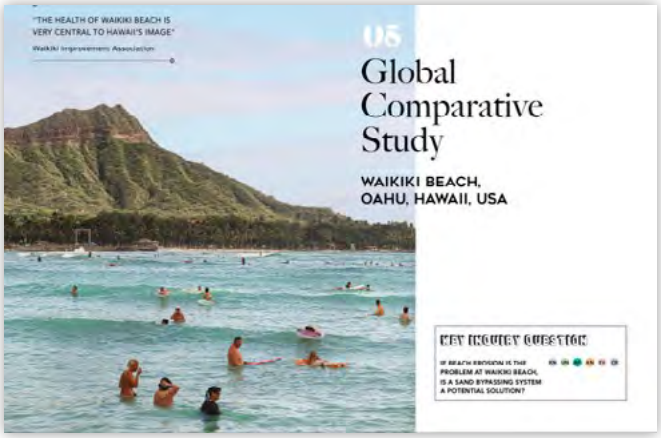
PRIMARY DATA SOURCES	GATHERING PRIMARY DATA: FIELDWORK	PURPOSE
	6. Hydrographic surveys collect bathymetry – the depth of the ocean floor – using sonar from a boat or jet-ski.	Computer programs analyse the data to determine the change, over different time scales – by comparing surveys and calculating differences. Maps and diagrams are also produced to visualise changes in the sea floor.
	7. Boat crossing data is collected by Marine Rescue at Point Danger.	The crossing data is graphed over different time scales to determine patterns and trends.
	8. Dredge logs are used to record exactly where TSB sand is being collected and placed.	The data is collated into tables and graphed.
	9. Surf quality – visual records. Qualitative data from observations, surfing photos and videos obtained by or from: › the TSB Project team › sites such as Coastal Watch › the TSB Advisory Committee › the surfing community.	Wave peel analysis is used to determine surf quality at Duranbah Beach.
	10. Community consultation is the primary mechanism of gaining opinion and sentiment about Tweed Sand Bypassing. It includes: › quantitative data collected through online survey › qualitative data collected through questionnaires, interviews and ongoing discussions (particularly with the Advisory Committee).	Feedback from community consultation is used to: › incorporate local coastal processes knowledge when planning for sand delivery › figure out what the information needs of the community are › understand how the community feels about Tweed Sand Bypassing and what improvements can be made (adaptive management).

WEB RESOURCE: TWEED SAND BYPASSING

The downloadable **stimulus booklet** contains a variety of geographical tools including maps, graphs, tables and statistics, diagrams and photographs. All of the stimulus material relates to the Tweed Sand Bypassing Case Study. A thorough set of **student activities** require students to demonstrate their knowledge, understanding and geographical skills.

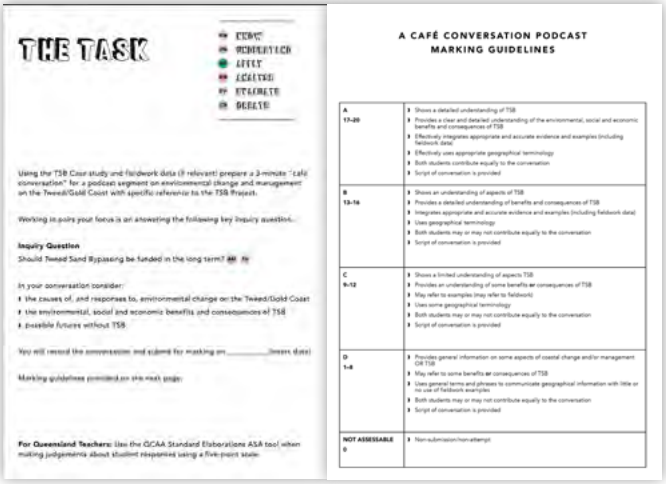


Waikiki Beach is an interesting **Comparative Study** for Environmental change and management challenging students to decide whether a sand bypassing system would work as a coastal management strategy in Hawaii.

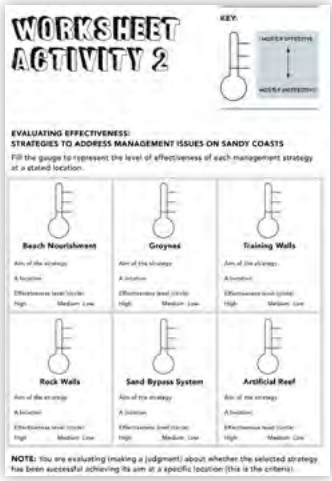


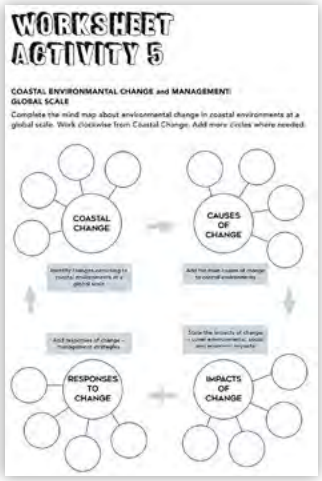
Suggested fieldwork activities and a **summative assessment** are based on the Tweed Sand Bypassing Case Study.

WEBSITE RESOURCE: TWEED SAND BYPASSING



Student activity worksheets can be used to guide geographical inquiry or test knowledge and understanding at the completion of the topic.





All images from Tweed Sand Bypassing Schools Package: https://www.tweedsandbypass.nsw.gov.au/school-students/school-information-package.html

BONUS VIDEO ACCESS FOR GTA BULLETIN USERS

The following link will take you to a presentation from the 2020 Digital Professional Learning Package made available to schools during Term 4. Lorraine Chaffer and Catherine Kerr discuss development of the package and most of the key features. https://vimeo.com/469682666/b8897b0a44

Password: **2021specialBULLETINaccess**