**Coastal Environments – Case Study Sheet**

**Coral Reefs and The Great Barrier Reef**

**Location:** The GBR Marine Park is located off the coast of North East Queensland in Australia. It covers an area of just less than 350 000 sqKm and spans the Tropic of Capricorn.

**Characteristics:** The GBR is recognized as a world heritage site for it is blessed with the breathtaking beauty of the world's largest coral reef. The reef contains an abundance of marine life and comprises of over 3000 individual reef systems and coral cays. These corals support an abundance of sea life and the most biodiversity behind TRF.

**How do they form?**

Coral reef require a hard stone platform or sheltered lagoon to support their growth. They develop in warm tropical oceans over 26°C and require shallow coastal waters for photosynthesis to take place. Each coral cay, made up tiny polyps contain algae, which photosynthesize and excrete calcium carbonate to form the protective outer shell.

**Value:**

Coral reefs have enormous value. They support a massive biodiversity with a mean annual productivity of 2000 tons per year. They are unique natural habits with the GBR being recognized as a world heritage site. Reefs if sustainably managed can support many industries including small scale fishing and tourism. However both industries are recognized as key threats due to the impact they have when poorly managed.

**Threats:**

Reefs are under threat by many human activities in different places. Tourism is a major threat in places like Florida and the Red Sea. Overfishing which disturbs the natural balance in the ecosystem allows dominant species to develop which reduces the biodiversity. An example of which being the Parrot fish which feeds on Algae. Other examples of poor fishing practice is the widespread use of dynamite and poison fishing in the Asia which dam which kills all life. In addition to fishing, coastal development and pollution is a major effect. Coastal development disturbs the coast and increases erosion and runoff. This leads to sedimentation of the water, which reduces photosynthesis. This problem is widespread in the Indian Ocean off the coast of India. Furthermore, human waste and industrial effluence leads to an acidification of the ocean that can cause the species zouks to die, this causes a bleaching of the coral and eventually its death. Tourism is major impact in most reefs of the world. Damage is done through boats anchoring on the coral and large vessels damaging the reef. In addition many coral is an attractive memento and is often broken off for merchendise. Tourism also leads to more coastal development clouding the water. There is a significant problem in Dubai.

**Management of the GBR:**

**Zoning:** The Zoning Plan defines in broad terms a set of management objectives for each zone and describes the activities that are allowed, including those, such as tourism operations, that need a permit.

**Permits:** Permits are jointly issued by the Great Barrier Reef Marine Park Authority and Queensland Parks and Wildlife Service and are required for all commercial tourism activities. Permits usually contain some conditions that further ensure that tourism operations are sustainable

**Certification**: is a voluntary programme that allows tourism operations to demonstrate the high standards achieved. The Great Barrier Reef Marine Park Authority encourages operators to become certified with a recognised scheme and provides a range of benefits to certified high standard operations (including long-term permits).

**Education and training:** is also extremely important in management of the Marine Park. The Great Barrier Reef Marine Park Authority communicates information about the special values of the Marine Park, management requirements for tourism operations, and how operators can work in partnership through a range of quality information products and training programmes.

**Fishing:**

Management arrangements for commercial fisheries include:

Limits on the amount of fish that can be taken. Limits on the number of fishing licences. Spatial and seasonal closures. Restrictions on fishing vessel size. Restrictions on the length, mesh size and number of

nets used. Limits on the number of hooks. Restrictions on the take of some fish species. Restrictions on the minimum and maximum size of fish retained.

**Litter:**

The law provides for fines of up to $1.2 million for companies and $220 000 for individuals illegally discharging garbage at sea. The following are useful ways you can help to decrease the amount of litter being discharged into our oceans:

• Dispose of all litter and waste appropriately

• Remember that stormwater drains flow straight into our waterways – keep them clear and do not use them as rubbish receptacles

• If you go fishing, make sure you take all of your rubbish home with you

**This is not a definitive case study fact sheet. You are encouraged to addfurther your detail**

**Mangroves:**

**Location:** Mangroves are located in tropical waters, near coastal fringes. They typical establish in sheltered waters, such as bays, creeks and estuaries. They thrive best diluted sea water with 50% freshwater input. There are different types of mangrove, red mangroves exist in coastal waters and have prop roots which can breathe under water. Black mangroves are based on the mainland and reach greater heights.

**Characteristics:** Mangrove forest live coastal margin in shallow sea waters such as estuaries. They need freshwater input. Red mangroves are supported by prop roots which can breathe through aeroles underwater. There leaves are evergreen and drop leaf litter all year round providing rich nutrients to the se, which encourages greta biodiversity.

**How do they form: Mangroves form at coastal fringes**

**Value:** 75% commercial fish spend part life cycle in mangroves or dependent on food chains that can be traced back to mangroves. Protect coast from erosion by waves and wind.They also trap sediment in their root, systems and thus protect coral reefs who depend on clear water. Numerous medicines are derived from mangroves. Can also recycle harmful pollutants (heavy metals, dioxins) into harmless compounds. Mangroves take up about 1.5million tones of Co2 per/hectare/year through carbon sequestration. Healthy mangroves can act as a buffer zone between the coastal fringes and inland areas. Increases are expected in hurricanes and cyclones and the mangrove can help protect land. Protect against coastal erosion

**Threats:**

Over 50% of the world’s original mangroves have now been lost. Currently the rate of loss is 1% p.a. Thailand has lost over half of its mangroves since 1961. The Philippines 40% were lost to aquaculture between 1918 and 1988. By 1993 123,000 hectares were left (70% loss in 70yrs). Asia has lost 50% due to aquaculture (38% Shrimp. 14% fish) 25% due to deforestation. 11% to upstream freshwater diversion.

Latin America – Mainly due to the expansion of agriculture and cattle rearing, as well as the cutting of fuelwood and building materials as well as the establishment of a shrimping industry.

**The shrimp industry** has not only caused deforestation due to its expansion but also badly damages water quality through leaking effluence.

**Over harvesting** is causing rapid losses. Mangrove trees serve many purposes

Fuelwood,Construction material, Wood Chip and pulp production, Charcoal, Animal fodder, Harvesting has been going on for centuries but it is no longer sustainable

**Over Fishing:** Unregulated fishing is depleting fish stocks. As stocks of one become uneconomic to exploit people are simply turning to another. Decline in biodiversity, loss of income and jobs. Over fishing alters the food chain and webs and mangroves communities can be altered as a result

**Climate Change:** Climate change threatens mangroves due to melting ice caps and rising sea levels which drown

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**The Daintree Coast: a coastline under pressure**

**Location:** The Daintree coast is located in North -east Queensland in Australia

**Tourism**

Until recently, the tourist market in northern Queensland was quite specialized, and appealed only to a few. Although Cairns has several large resort-style hotels, most tourist investment further north was limited. Most tourists have been back packers, or travelers who have taken a year out from university or employment. They tended to be attracted to the area, as it remained relatively unaffected by mass development.

Now investment is changing.

* Japanese investment here has resulted in several golf courses.
* The Sheraton and Radisson international hotel chains have developed large resorts in Port Douglas.
* A number of Hollywood films have been made here, helping to publicize the area to a more ‘up market’ clientele.

**Growth and change in Port Douglas**

Although the population of Port Douglas is only 3000, it is rising rapidly, and expanding as more accommodation is developed for tourists. The number of apartments and hotels has also led to other developments.

* A large supermarket built in the village centre, has changed the way people shop and small local shops have suffered.
* McDonalds built.
* A property boom has led to rises in house prices, which is affecting local people.

**Environmental Groups**

They are concerned, as they want to protect the ‘special’ nature of the Daintree. Several protests have taken place against the development, as they feel it will take over the coast. They believe that the coast is fragile and needs protection. A protest took place in the late 80s about the extension of a road northwards through the Daintree; protestors felt it would bring unwelcome change to the coast and rainforest environment.

**Farming**

This has been the main economic activity along this coastal region for over 100 years. Although the sugar cane industry has been hit by falling world demand for sugar, it still occupies large estates consisting of huge fields of cane. In addition, the climate is ideal for growing a range of tropical fruit, and mangoes, pineapples and banana plantations are common; They crops support the other industries, such as the sugar mill at Mossman.

**Timber**

The timber industry would dearly love to cut the timer in the forests. They argue that less than one fifth of rainforest in Queensland is used for timber and that there is still plenty to cut. In the past, rainforest has been cut to make way for sugar-cane farms. The timber companies say nobody complained then. They support those who want to build and extend the road. They say that environmentalists who want to protect the forest are depriving people in Queensland of jobs.

**Home-based industries**

As well as large employers, such as the sugar cane factory, the Daintree has attracted many small, home industries, run by people who were originally attracted to the Wilderness quality of the Daintree. Many ‘alternative’ lifestyles have developed here with industries such as organic farming and pottery – making.

**Challenges:**

**See your case study sheet in your files.**

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**Coastal Protection Case Study: Holderness Coast**

**Location:** The Holderness Coast is located on the east coast of England and is the coastal margin with the North Sea. It extends 61km from Flamborough in the north to Spurn Point in the south.

**Characteristics:**. The Holderness Coast is a great case study to use when examining coastal processes and the features associated with them. The area contains 'text book' examples of coastal erosion and deposition. The exposed chalk of [**Flamborough**](http://www.geography.learnontheinternet.co.uk/topics/flamborough.html) provides examples of erosion, features **such as caves, arches and stacks**. The soft boulder clay underlying [**Hornsea**](http://www.geography.learnontheinternet.co.uk/topics/hornsea.html) provides clear evidence of the erosional power of the sea. [**Mappleton**](http://www.geography.learnontheinternet.co.uk/topics/mappleton.html)is an excellent case study of an attempt at coastal management. [**Spurn Point**](http://www.geography.learnontheinternet.co.uk/topics/spurn.html) provides evidence of **longshore drift** on the Holderness Coast. It is an excellent example of a **spit.** Around 3% of the material eroded from the Holderness Coast is deposited here each year.

**Coastal Retreat:** The Holderness Coast is one of Europe's fastest eroding coastlines. The average annual rate of erosion is around 2 metres per year. This is around 2 million tones of material every year. Under lying the Holderness Coast is bedrock made up of Cretaceous Chalk. However, in most places this is covered by glacial till deposited over 18,000 years ago. It is this soft boulder clay that is being rapidly eroded

**Reasons for rapid retreat:** The fastest eroding stretches of coastline are mad up of soft boulder clay, which is a form of glacial till. It is loose and fragmented and easily eroded. The coastline is subject to dominant north easterly prevailing winds with a sizeable fetch creating large waves. The North Sea is also subject to storms with frequent depression in the winter which creates even larger waves. The coast line is subject to long shore drift which moves sediment in southerly direction. A lot of sediment is removed and transported away to sea. In addition, in places such as Mappleton coastal management has attempted to halt LSD to prevent cliff retreat. Whilst this has prevented cliff retreat at Mappleton it has only speeded up cliff retreat further down the coast as it starves the coast from vital sediment which would protect it.

**Coastal Management:**

**Flamborough Head**

Steep Vertical cliffs of resistant Chalk, Contains headland features (Stump, stack, geos etc). Erosion rate of about 2mm a year. Currently no coastal protection due to resistant Chalk

**Bridlington**

Small coastal Town sits on chalk base has harbour and leisure facilities. Erosion rates around 2mm a year. Used by tourists and fisherman. Little or no protection apart from promenade

**Hornsea**

Tourist destination Suffers from erosion of weak boulder clay and loss of beach due to LSD. Complaints about loss of livelihoods lead to some hard engineering. Building of sea wall and groynes. Beach has grown and acts as a defence. Issues have been created further down the coast at Mappleton due to removal of sediment.

**Mappleton**

The sea defences at Hornsea have starved area of sand and beaches being washed away due to LSD. This led to a campaign by residents. Boulder Clay under cliff foot marine erosion (Hydraulic Action and Attrition)

2 boulder Groynes built, and boulder revetments for £2m (Part funded by EU) More deposition and less LSD

This has worked but caused major issues at Great Cowden further south

**Great Cowden**

Erosion of boulder clay and glacial till has been very rapid 1 – 2m per year. Properties and farms at risk. High winter tides cut notches at the foot of cliffs and focuses marine energy leads to partial collapse (Rotational Slump). Becomes worse when saturated through rainwater. These sub-aerial processes do a great deal of damage. Retreat can be up to 20m a year. Fastest erosion rates in the world.

**Easlington**

2 miles North of Spurn Head. Easington Gas Terminal owned by British Gas and BP Built 1968 – 50m from shore with expected lifespan of 25yrs. More gas found therefore now needs protecting to avoid falling into the sea.

New defences built including. Cliff drainage to avoid slumps and rotational slides. Cliff regarding and rock revetments.

**Spurn Head**

Long history of settlement. Used during WW1 as a look out post, connected to the mainland by railway. This has been reduced to only a lifeboat station and the families attached to it by a single track road. Also used by the Pilot boat men of the Humber Estuary. On the Point there is a wildlife reserve. Spit is moving westwards and may become an island.. Eventually families will have to move, currently under review as to whether it should be protected or not. Removing the lifeboat station will result in their not being a station in the area

**Managed Retreat – strategic realignment**

This allows the cliff to retreat in selective places such as Cowden. There no additional external problems created and so environmental problems are reduced. There are cost involved in terms of loss of farmland and acquiring new land for caravan sites and selective functions. Some people will lose out as individual homes will not be compensated.

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