

## GEOGRAPHICAL INVESTIGATIONS CASE STUDIES

### 1. Coastalisation in Australia

- Most urbanised country in world with 90% urban
- 60% living in 5 largest cities on coast
- Why? Main ports and industries provide jobs
- Rainfall greater near coast so most farming 300-400km from coastline
- Droughts inland have made farming difficult so young people move to coast to work in service sector jobs
- New immigrants move straight to coastal settlements
- Outdoor lifestyle at coast as well as urban attractions eg culture, restaurants
- house prices cheaper in small towns at coast so young families choose to move there

### 2. Coastalisation in Spain – Costa Geriatrica (ie old people!)

- 65% of Mediterranean is urbanised and by 2025 there are expected to be 135 million people just of the N coast of the Mediterranean
- 1.2% per year growth of population at the coast in Spain since 2000 as people migrate from inland cities and international migration of people from countries like UK
- In 2005 22% of people at the coast were over 65

### 3. Coastalisation in Florida

- 75% of people in Florida live at the coast
- Value of property along the Florida coast in \$1.9 trillion
- Florida Everglades wetlands has shrunk by 80% and providing freshwater to locals is becoming a problem
- 9% of Florida coast is low-lying and more people are moving in and becoming at risk from hurricanes, flooding, storm surges etc

### 4. Coastalisation in Bournemouth

- Bournemouth is Dorset's largest city and it is rapidly growing
- In 1851 there were 695 people and by 2001 163,600
- Highest population in SW of UK with 3543 people per km squared
- 1995-2005 growth of 6.4%
- Natural population decrease of 300 people in 2005 as births below deaths
- BUT inwards migration (especially over 50 years of age)  
Why?
- Climate – second sunniest place in UK with less frost and snow
- High environmental quality – attractive area to live in near the World Heritage Jurassic Coast
- Accessibility – local urban amenities easily available as less than 2 hours by train from London
- **How did Bournemouth grow?**
- Started back in the Victoria period with the development of the railway.
- In 1859 railway was built from London to Bournemouth to bring in tourists
- Wealthy tourists came as the 'Grand Hotel' and the Winter Gardens for the symphony orchestra were added as attractions
- 1880s pier was built to appeal to the mass market – including people with lower wages as day trippers
- 1960s and 1970s package holidays to Europe meant that less tourists arrived
- 1980s regeneration – railway was upgraded and it now took less than 2 hours to reach London
- Airport linked people with channel islands and later Europe – attracting major employers
- Growth of service sector in Bournemouth – banking, finance and tourism
- Financial institutions (like JP Morgan Chase, Barclays Bank) employed 14889 in 1999 and by 18300 by 2003
- These industries are footloose and are attracted to Bournemouth because of :  
Land with planning permission available  
University to supply highly skilled workers  
Access to London easy and airport allows access to Europe  
Wages lower than SE and London  
House prices also lower than SE
- Retirement boom – as people from SE move in and downsize their homes releasing money to reinvest and

many facilities for the elderly like day centres, clubs and social activities

- University expanded in recent years attracting younger people for vibrant nightlife

#### **Results of growth?**

- Coastal squeeze as city is squashed between the coast and rural green belt on the edge of city (where planning permission not granted)
- Bournemouth council encourages people to renovate existing buildings and to use brownfield sites (99% of new homes), not build new ones
- Many hotels on seafront now converted into flats or student accommodation

#### **5. Conflict on the Jurassic coast**

- In 2001 UNESCO named the Jurassic coast of Dorset and East Devon a World Heritage Site – so it is of global importance because the geology spans several periods
- GEOLOGY AND LANDFORMS-**
- The rocks vary greatly on the coastline and create a varied landscape
  - Resistant Purbeck and Portland limestone form steep cliffs and headlands.
  - Less resistant clays and sands form bays or coves, like Lulworth
  - The cliffs of Kimmeridge are less resistant and fossils can easily be found there
  - Fossil hunters can disturb the marine rocky shore, where people look at crabs and limpets, as the shale from the cliffs is crumbles and falls as they look remove fossils.
  - There is the Limpet Protection Zone there which tries to educate tourists to stop this!!
- ECOLOGY-**
- Studland has sand dunes and much of it is a SSSI (site of special scientific interest)
  - The dunes are home to rare plants (eg marsh gentian), insects (eg ladybird spider), birds (eg Dorset nightjar) and reptiles (eg sand lizard)
  - Inland the dunes change to heathland with heather and then trees like birch.
  - 1.5 million tourists visit the beach and dunes here each year
  - In summer queues of cars can extend all the way along the Studland peninsula
  - On bank holidays 35,000 people may come in one day
  - There are problems with traffic congestion, litter and dune trampling
  - Also jet skiing and water skiing is noisy, causes swash to affect the plant life and dolphins are threatened by outboard motors

#### **6. Conflict on the Dorset coast: Boscombe surf reef**

- Boscombe's new surf reef is 2.5km from Bournemouth pier
- It was completed in 2008
- Large sand geotextile bags have been laid over a hectare of sea floor
- It forces waves to break out to sea and creates a greater wave height so that surfing can take place
- £1.4 million in costs
- Flats, restaurants, cafes and shops have also been developed in what was previously a run down area
- 10,000 surfers a year could be attracted
- These spend 8% more than average tourists
- Council expects to earn £10 million annually
- 60 full time and 30 part time jobs created
- But noisy for locals, especially for elderly retired people, as surfers are young (so may have more hoody culture to deal with!!!)
- Also most surfers will not pay to stay in local hotels
- Car parking shortages
- Some people argue that this quantity of money should not have been spent on a minority sport

#### **7. Industry on the coast: Southampton Water**

- Southampton water and the Solent together are one of Britain's best natural harbours
- It has many advantages for industry – it is sheltered from storms in the English channel by the Isle of Wight, it has a deepwater channel for large ships and around the estuary is a large area of flat land for development
- Competition for land and conflicts occur as:
  - a) expansion of suburbs as high demand for new homes eg coastal squeeze at Hythe and Fawley

b) Industrial development at Fawley oil refinery and Southampton docks

c) Sewage disposal from housing estates

d) Sailing and leisure craft on Southampton water

#### FAWLEY OIL REFINERY

- Opened in 1951
- Largest oil refinery in UK with 3000 employees
- Owned by ESSO
- Handles 2000 ships and 22 million tonnes of crude oil a year
- Location of Solent is suitable for all tankers from Europe
- When opened in 1951 planted 50,000 trees and shrubs
- Environmental impacts :  
Salt marsh reduced in size as the refinery has expanded in size – changes plant succession, ecology and reduced sheltering  
Effluent – liquid water may be as warm as 30 degrees and hard clams breed more and consume more algae, leaving less for other species  
Metal pollution – metals like cadmium, lead and mercury as well as phosphates are emitted, at legal levels.  
Oil spills – 1 October 1989 ship offloading oil spilt 20T of oil into water, which spread to Calshot spit. Beaches, saltmarsh and 800 birds affected
- Sewage – pipes discharge 300 million litres of treated sewage every day into the Solent. Clams and Oysters are harvested for food from Southampton Water and they are dangerous if contaminated
- Runoff from farmland is high in nitrates and phosphates causes the Solent to become eutrophic with algal blooms – it encourages the growth of algae and waterweeds which produced toxins that kill off plants and sunlight is blocked out (eutrophication).
- Waste – Solid waste like sanitary towels and marine litter from boats ends up on beaches
- Metal pollution – paints used to stop organisms like barnacles growing on the side of boats contain lead (and it is legal to use them on large container ships). Tin levels in UK waters are high and they get trapped in sediments
- DIBDEN BAY
- In 2001 Associated British Ports (ABP) announced plan to build a container port next to Southampton water
- 2.1km of docks on 350 hectares opposite the Southampton docks proposed
- They wanted to do this as Southampton could not compete with other UK ports like Felixstowe and so would go into decline
- They would dredge the bed to get the channel deeper to allow larger container ships and cruise boats
- £700 million costs
- 3000 jobs would be created
- New road and rail links would be added
- There were many protests by Friends of the Earth, English nature etc
- Dibden is a SSSI with 50,000 wading birds
- Local homes would lose their views
- Traffic would increase in the New Forest
- Increased fuels spills would be a risk to the ecosystem
- In 2004 the Transport Secretary announced the scheme would not go ahead as the environmental effects would be worse than economic benefits

#### **8. Exxon Valdez Oil spill**

- 24 March 1989
- Oil tanker Exxon Valdez ran aground in Prince William Sound, Alaska
- 1.2 million barrels of crude oil were being carried and of these 240,000 were spilled
- Oil spread out over 2300km square affecting 1750km of coastline
- 100,000-300,000 seabirds died

#### **9. Erosion and Management : Holderness coast, UK**

##### **Erosion**

- Holderness is a coastline that is 61km long
- It is in East Yorkshire

- It is the fastest eroding coast in Europe
- It stretches from Flamborough Head in the North to Spurn Head in the South
- In some places like Cowden it has been eroding at 10m per year in recent times

#### **Why?**

- Geology – the cliffs on this coast South of Flamborough Head are mainly till/boulder clay and this is easily eroded by corrosion, corrosion and hydraulic action. It is prone to slumping and mass movements when wet.
- Narrow beaches – do not provide a lot of protection for the cliffs. They are narrow as Flamborough Head stops sediment from the North replenishing the beaches along Holderness. Also it is made of chalk which dissolves when eroded rather than making sand for the beach. Also the coastal defences at Mablethorpe lead to narrow beaches
- Powerful waves – the fetch is long- all the way from the Arctic Ocean
- The sea floor is deep so there is less friction to slow down the wave
- The coast faces the dominant wind and wave direction – from the NE.
- Low pressure weather systems pass in from the North Sea
- SO destructive waves – with large wave height and high frequency crash on the cliffs. Many storms increase their action.
- Weathering – physical, chemical and biological weathering

#### **Effects?**

- Around 30 villages have been lost to the sea since Roman times
- Property prices along the coast have fallen dramatically due to risk of erosion
- Visitor numbers dropped 30% between 1998-2006 in Bridlington
- Many caravan parks at risk from erosion eg Ulrome is losing about 10 pitches a year on average
- Very expensive to protect the coastline - £2 million spent to protect Mablethorpe in 1991
- Gas Terminal at Easington is at risk as it is only 25 metres from the cliff edge. This accounts for 25% of Britain's gas
- 80,000 square metres of Britain's best farmland lost per year – which has a huge effect on farmer's livelihoods
- SSSIs (sites of special scientific interest) are threatened. Eg at Easington there are lagoons where terns (a type of bird like a sea gull) breed. 1% of British terns are from there. The lagoons are separated from the sea by a narrow band of sand and shingle if this erodes the lagoons would be destroyed.

#### **Management**

- 11.4km out of 61km currently protected by hard engineering
- Bridlington protected by 4.7km of sea wall as well as timber groynes
- Hornsea village protected by concrete sea wall, timber groynes and rip rap
- Gabions just south of Hornsea protect Hornsea caravan park
- Mablethorpe – in 1991 two rock groynes and 500m long revetment were built, They cost £2 million and were built to protect the village and the B1242 coast road
- Withernsea – groynes, sea wall have been built and rip rap placed in front of all when damaged in severe storms in 1992
- Easington gas terminal protected by a revetment
- Eastern end of Spurn Head protected by groynes and rip rap

#### **Effects of the management**

- Groynes trap the sediment but down the coast the erosion increases eg downdrift of Mablethorpe the cliffs in the South are eroding and Cowden farm may fall into the sea
- Sediment does not flow down to the Humber estuary due to the protection and tidal mudflats are decreasing so flooding may be more problematic
- Protection is encouraging bays to form and this may increase pressure on headlands and it may be too expensive to protect them
- Many of these schemes are unsustainable

#### **Management in future?**

- Shoreline Management Plan (SMP) for Holderness for next 50 years recommends holding the line in some places eg (Bridlington, Withernsea, Mablethorpe and Easington Gas Terminal) where there are villages and industry
- Do nothing in more unpopulated stretches – unpopular with locals
- Coastal realignment of businesses eg Caravan parks move further inland – but should they be financially

compensated?

- Sea wall proposed at Easington gas work – would cost £4.5 million but would erode Easington more (where 700 people live) If longer sea wall to protect both would cost £7 million
- Offshore reefs of tyres suggested – but would these harm the environment?

#### **10. Coastal flooding and sea level rise: Thames estuary**

- The Thames Gateway is at risk from rising sea levels and storm surges
- Thames barrier protects central London but not the Thames Gateway
- 160,000 new homes planned for the area as there is a severe housing shortage in the SE
- Southend-on-Sea will have a new university, retail, nightlife venues and a new airport
- There is over 10% unemployment so job creation is vital
- Much of the farmland is low grade so it will not be a loss to farming, although many salt marshes may be threatened
- BUT 1.25 million already at risk of flooding
- Sea level rise of 26-86cm expected by 2080
- By 2100 sea level rise could increase flood frequency by 8-12 times
- Flood walls are planned for the riverbank to protect urban settlements
- There are plans to have areas set aside as reserves that will be allowed to flood

#### **11. 1953 storm surge/flooding**

- The **1953 North Sea flood** was a major flood caused by a heavy storm, that occurred on the night of Saturday 31 January 1953 and morning of 1 February 1953. The floods struck the Netherlands, Belgium, England and Scotland.
- A combination of a high spring tide and a severe European windstorm over the North Sea caused a storm surge
- The combination of wind, high tide and low pressure had the effect that the water level exceeded 5.6 metres above mean sea level in some locations.
- The flood and waves overwhelmed sea defences and caused extensive flooding.
- In England, 307 people were killed in the counties of Lincolnshire, Norfolk, Suffolk and Essex.
- As a result of the widespread damage, the Netherlands particularly, and the United Kingdom had major studies on means to strengthen coastal defences. The UK constructed a storm surge barrier on the Thames River below London, as well as one on the Humber estuary.

#### **12. Tsunami /Coastal flooding: Boxing Day Tsunami 2004**

- Submarine earthquake in Indian Ocean - 9.0-9.3 Richter so one of the biggest ever recorded
- Over 100 times bigger than the 1995 Kobe earthquake in Japan
- Huge volume of water above displaced as the thrust heaved the floor of the Indian Ocean towards Indonesia 15m
- Travelled across the Bay of Bengal at speeds of 800km/hr and radiated outwards in a ripple effect
- Waves struck the shallow coast of Banda Aceh in Sumatra, Indonesia in only 15 minutes – Indonesia worst affected with 236169 deaths
- 17 metre high wave hit Sri Lanka – second worst affected country with 31,147 deaths
- India, Thailand, Somalia, Burma, Maldives, Malaysia, Tanzania, Seychelles, Bangladesh, Kenya all affected
- 4 metre high swell hit Maldives
- Total 289,601 deaths
- In **Ampara, Sri Lanka:**

12.9% of 3533 people died

More than double the number of women died than men

56% of victims were children

15% of deaths were over 60

People at home were more likely to die – women and children

Quality of building made a difference – 14% of deaths were in buildings that collapsed and only 5% were in buildings that held up well

Fishing families had 15% of deaths

Those with higher education to secondary level were 20% less likely to die

60% less chance of dying if educated to university level as could afford to live in less risky areas

Fewer deaths occurred in higher earning families

- In areas where tourism has increased the damage was higher
- In Thailand and Sri Lanka where mangroves had been destroyed the damage was worse as a natural buffer had been lost
- Places that maintained mangroves, reefs and beach forest had far less damage
- There was no early warning system in the Indian Ocean, which made the people less able to cope and increased vulnerability
- By the time it reached Africa the US Geological Survey had let the governments know that it may strike and warnings had been given where possible
- Loss of tourism industry for a long time
- Loss of fishing industry as boats destroyed
- Fear, stress and psychological impact
- Loss of agriculture – crops and animals

### **13. Sustainable management of the coast at Abbott's Hall Farm, Essex, UK**

- Abbott's Hall farm in Essex is part of the Thames gateway
- It is part of the Blackwater estuary
- The salt marshes here are going to be protected and extended as sustainable coastal management
- The sea has been allowed to breach the seawall to convert 84 hectares of farmland back to saltmarsh
- This will act as a natural form of defence for the land behind it
- If sea levels rise as expected the salt marsh will migrate inland naturally
- Marsh birds like Brent geese and salt marsh plants like sea lavender will benefit greatly
- Several groups support this decision to allow coast to retreat the line with new sea walls established further back etc