



## An update on the coastal management issues and management options at Barton on Sea, Hampshire

### The background

There are a variety of issues and conflicts operating at most coastal locations, and Christchurch Bay in Hampshire is an excellent microcosm of these. The Bay extends 17 km from Hengistbury Head in the west to Hurst Castle Spit in the east, and is a sub cell of Dorset-Hampshire sediment 'littoral cell'.

A combination of unresistant geology and high energy processes has led to coastal recession rates averaging 1m per yr at the main focus of erosion: Barton on Sea (Figs 1 and 2). The area is heavily settled with developments perched precariously near to the erosion zone: a 1850m long frontage of continuous residential development at risk in the next few decades, with an estimated 15 properties to be 'probably lost in the next 20 years' (NFDC, 1997).

Fig. 1 A cross section through Barton on Sea showing main cliff and beach features.

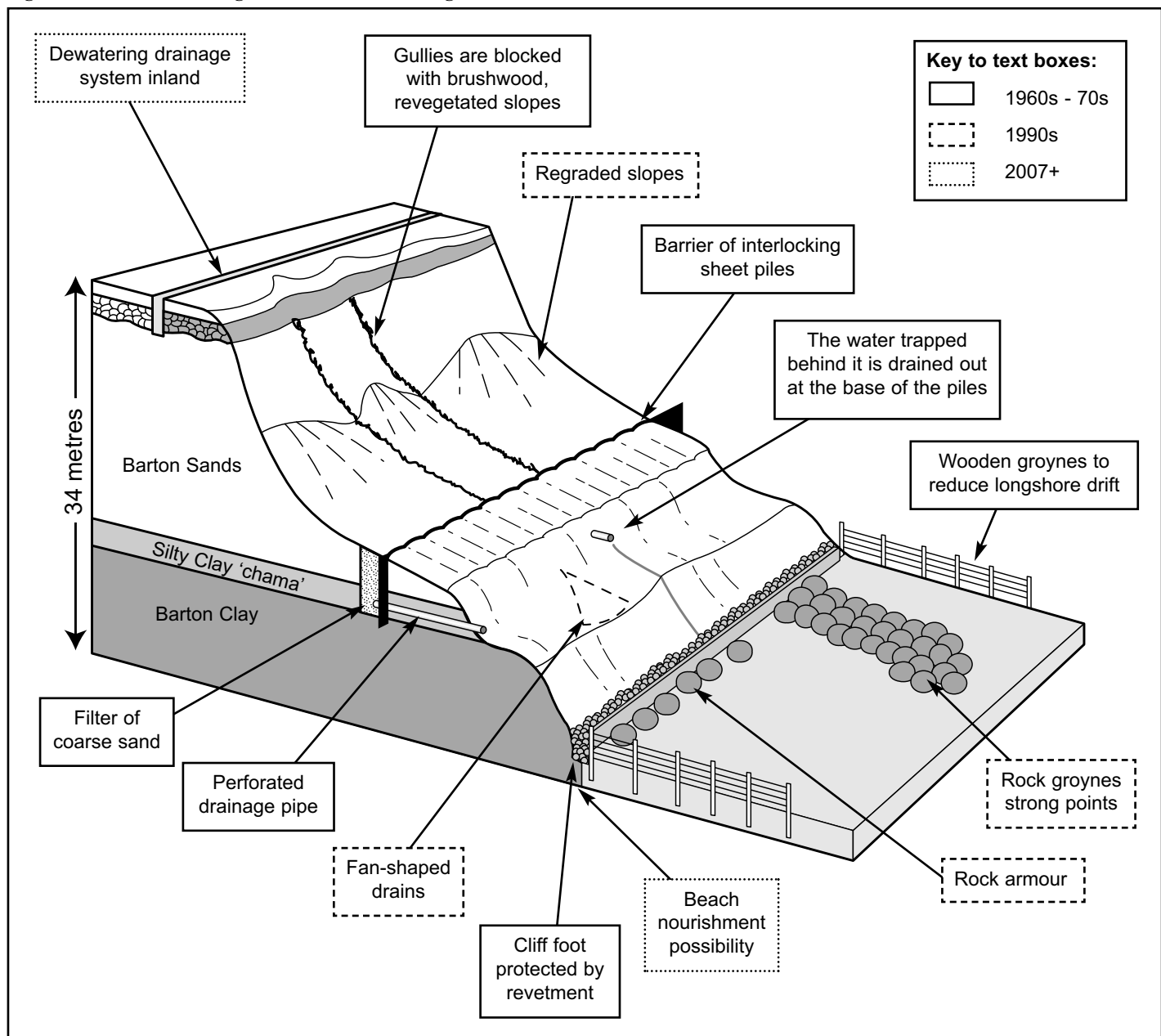
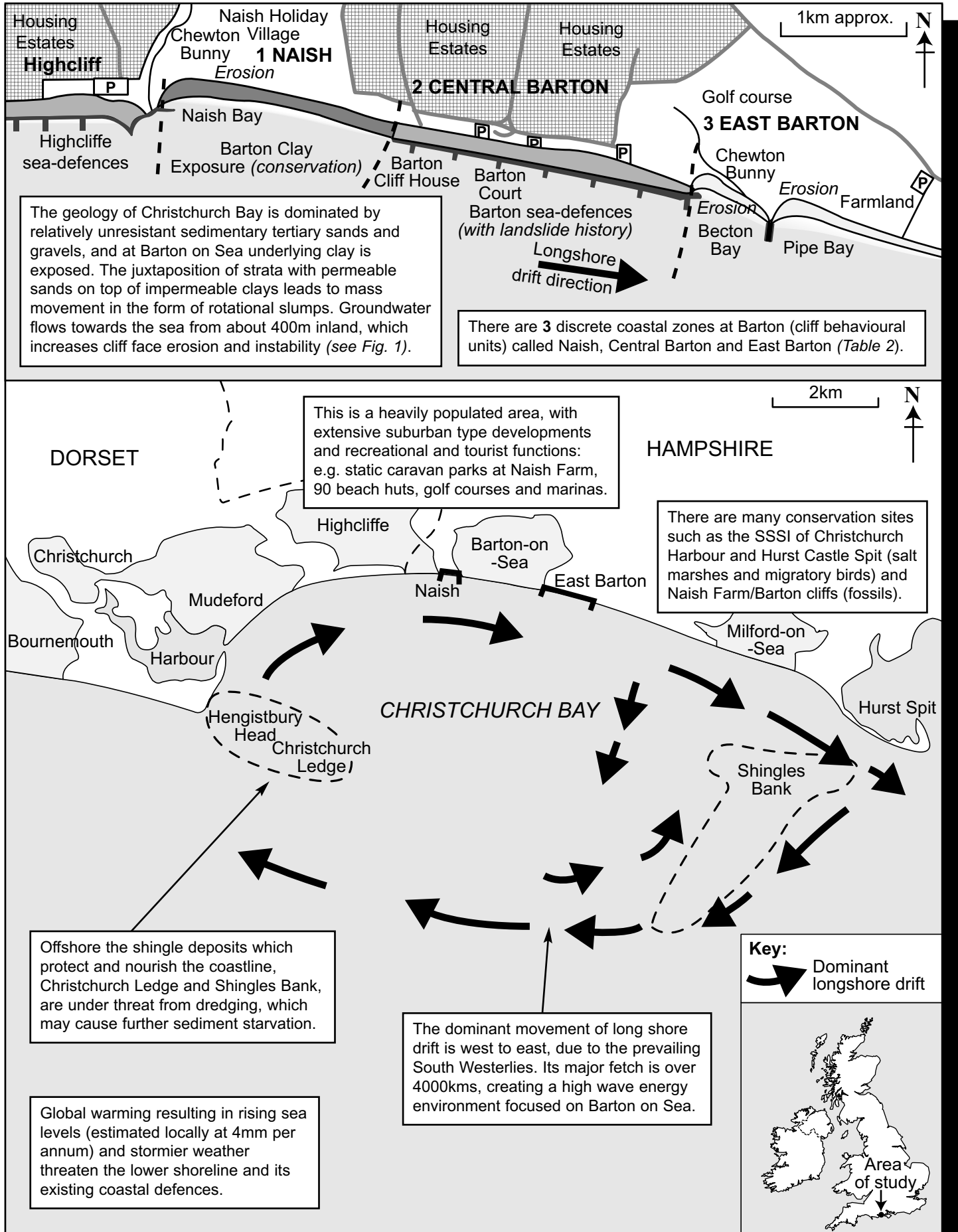


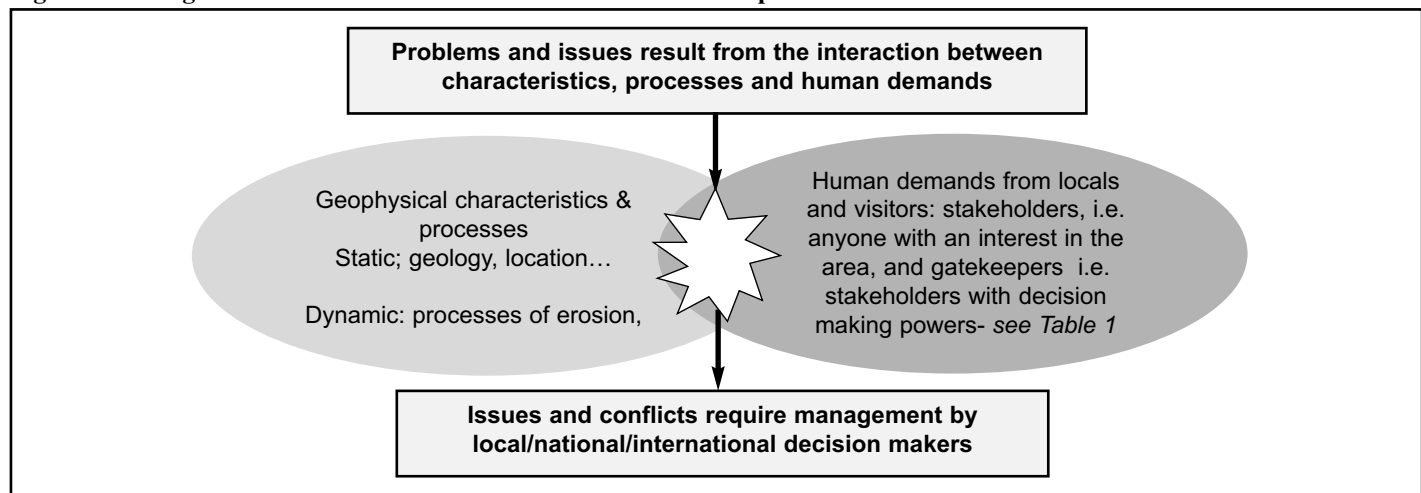
Fig. 2 Location and overall characteristics of Barton on Sea in the context of Christchurch Bay.



**The causes of coastal issues at Barton on Sea**

At Barton on Sea, the main issue is how to devise a sustainable solution after years of management with varying effectiveness (Figs 3 and Table 1). This is a technically difficult and very costly scheme.

**Fig. 3 Venn diagram to illustrate the causes of coastal issues and problems.**



**Table 1 Key Stakeholders and Gatekeepers at Barton on Sea.**

Key Stakeholder groups at Barton on Sea (Grey=main gatekeepers)	Role in coastal defence decisions
Local residents	Vote in/out local authorities, lobby for more protection, desire for non-hazardous environment
Local businesses	Local economy, such as cafes, restaurants, hotels, need for non-hazardous environment
Visitors	Tourism, recreation, seeking amenity value, inject money into local economy if attractive coastline
Conservationists e.g. English Nature	Aim to preserve/enhance habitats of cliffs+ fossil exposures
Local Authority: New Forest District Council	Mandated to plan for long term viability of area: not just coastal defence but the local economy, amenity, conservation, and public safety, by creating <b>Coastal Management Plans</b> . Barton cliff area was designated a Green Belt to create strict restrictions on development.
County Council - Hampshire	Strategic Development control and land use planning on a larger scale than Local Authority
Defra Who have to abide by European Union legislation/directives e.g. Water Framework 2000	This government department promoted <b>Shoreline management plans</b> from 1995, covering 6000 kms of England and Wales. These are large-scale assessments of the risks associated with coastal processes (floods and erosion) creating a long term policy framework (100years) to reduce risks to people and the developed, historic and natural environment in a sustainable manner. Each littoral sub cell is managed in integrated way, taking into account local opinion and liaising between differing authorities and neighbouring sub cells. The second generation of SMPs will be finished by 2010, and take more consideration of rising sea levels. This is a good example of <b>adaptive management</b> . Defra can give grant aid of 35-80% of capital costs, and weighs up bids from local authorities across England and Wales.
Advisory groups e.g. SCOPAC	The Standing Conference on Problems Associated with the Coastline gives Strategic advice on shoreline management: brings together different groups to integrate planning. The NFDC takes a leading role in this in the Barton on Sea area.
Research groups e.g. Coastal Observatory	Funded by Defra, Local authorities and the Environment Agency from 2002, this large scale survey programme covers about 1000km of open coastline and estuaries between Portland Bill, Dorset and the Isle of Grain, Kent. Such information is used by the gatekeepers for informed decision making

**Four general principles of coastal management applied to Barton on Sea**

**1. FACTORS INFLUENCING COASTAL MANAGEMENT**

- a. **Sources and amount of funding.** The main decision maker in the Barton area is the New Forest District Council, which has 60 km of dynamically changing coastline, extending from Chewton Bunny, Christchurch Bay in the west to Southampton Water in the east. The NFDC bids for grant aid from Defra, who have a prioritisation scoring system. At present this is based on 3 criteria:
  - **Priority** - for floods
  - **Urgency** - has failure already happened, or is it likely to occur?
  - **Economic** - benefit cost ratio for initial capital costs & following maintenance
- b. **Available knowledge of local processes and technology** to deal with these effectively
- c. **Pressure from locals/visitors** to save coasts & keep amenity/aesthetics
- d. **Pressure from conservationists** to save ‘natural sites’
- e. **External influences:** physical such as global warming and human such as EU Directives

**2. OVERALL AIMS of COASTAL MANAGEMENT**

- Reduce impact of coastal processes on human activity - **coastal squeeze**
- Protect coastal ecosystems
- Manage pressure on coastal zone for residential use, industry, recreation ,tourism and conservation

**3. FOUR BASIC OPTIONS (the first 3 are seen at Barton on Sea)**

- Do nothing
- Hold the line
- Managed Retreat
- Advance the line

**4. TWO MAIN METHODS (both seen at Barton on Sea)**

- Hard management (sea walls, groynes, revetments etc)
- Soft management - land use planning to restrict coastal squeeze, and use of technology which works with natural systems. The latest and increasingly popular method of shoreline management is **active beach management**, e.g. beach recycling (nourishment from same location i.e. in bay) or beach recharge (nourishment from external sand/shingle source).

**A management timeline for Barton on Sea**

There has been a long history of management, but decisions are complicated from having several local authorities involved in Christchurch Bay:

- In the 1930s some basic measures like wooden groynes were started but by 1968 approximately 1,750m was protected costing over £1million. This was in the form of mainly hard management: cliff toe rip rap, revetments, gabions, boulder groynes, cliff face drainage, regrading & re-vegetation to reduce risk and slow down the erosion of the cliffs.
- In 1991 a 1,800m rock revetment was built, costing £4.5m and designed to last 30 years. New drains and regrading and some beach nourishment were established.
- Major collapses in the 1990s and more recently in 2001 have been tackled by small scale remedial works and closure areas for the public.
- Since the Shoreline Management Plan of the late 1990s there have been some moves towards more sustainable forms of management, since the millions of pounds spent on defending this crumbling coastline have not solved the basic problems to date. In 2006 feasibility studies were carried out by the NFDC to introduce a new technology of siphoning drainage pipes to reduce cliff recession at central Barton in a more sustainable manner. The timescale now used by the dominant managers, the New Forest District Council, is of a 100 year stretch. Such long scale management relies on accurate prediction but it is only recently with the advent of sophisticated computer programming and GIS techniques that really quantitative measurements were available. Using digitally converted photographs from the 1930s to today, the erosion rate has been tracked down to quite precise limits. Extrapolations are then made, taking into account global warming, rising sea level and fiercer storms to predict future coastline positions.

**Recent management options and techniques**

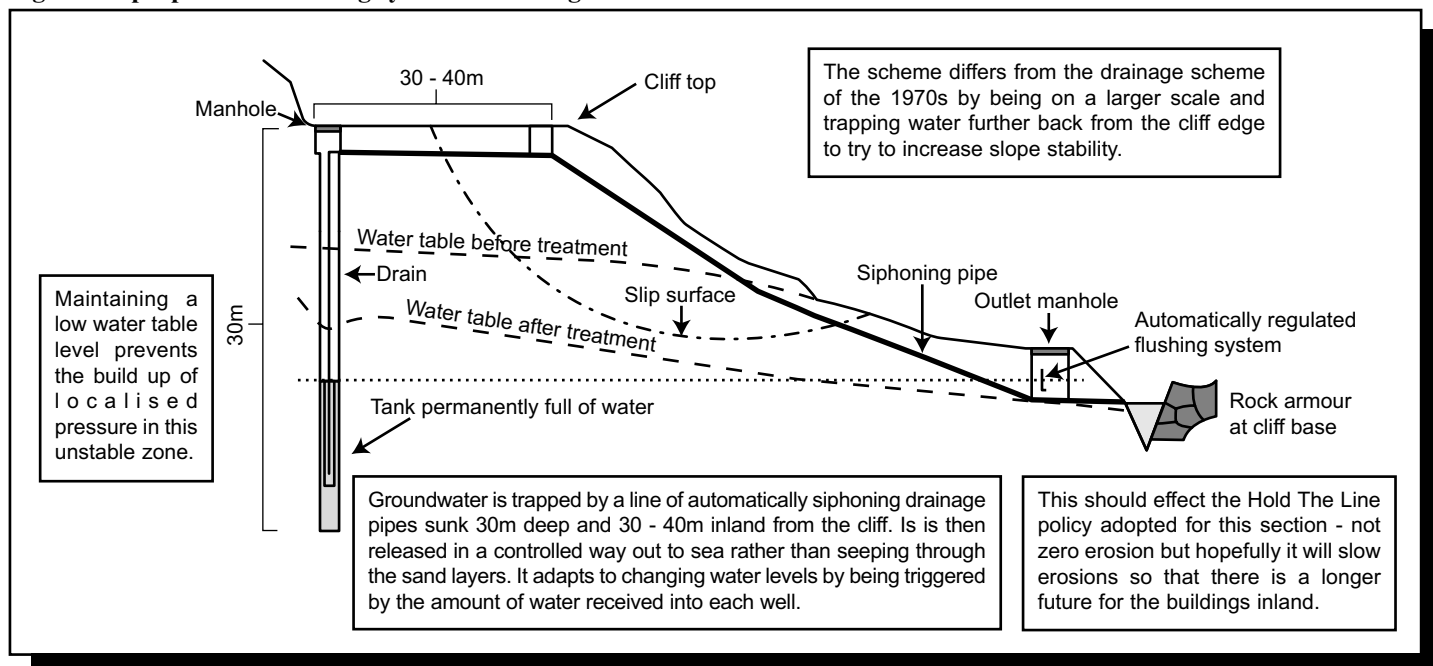
The main difference from previous management techniques is the precise targeting of different sections of coastline, i.e. **behavioural units** (Table 2) whilst operating in the larger framework of the coastal system. Engineers and planners are increasingly using the following spatial units for their planning, replacing the littoral cell approach of the late 20<sup>th</sup> C which only highlighted long and offshore sediment erosion, transfer and deposition:

1. At the largest, regional scale is the **Coastal Behavioural System**
2. Next down is the bay/headland scale called **Shoreline Behaviour Units**
3. The smallest scale are the **Geomorphological Units (GU)** such as dune, cliff, mudflat, saltmarsh, banks and shoals. A shoreline can change from one GU to another over time as processes act on it. At Barton on Sea three **cliff behaviour units** are identified, emphasising the linkage between cliff and offshore characteristics and processes (see Fig. 1).

**Table 2 Cliff behavioural units and issues - the situation by 2006.**

Cliff behavioural units and issues	Management options and decisions
1. <b>West to Naish Farm and Highcliffe</b> - Area is a retreating and collapsing cliff, with good exposure of fossiliferous Barton Clay hence its SSSI conservation status. Active cliff recession escalated from 0.4m/yr in 1950s to 1.9m/yr in the 1970s, partly from the ‘terminal scour’ resulting from Highcliffe defences to the west. If no management is carried out erosion may seriously affect the main Barton defences.	No major sea defences because low value cliff top use (mobile caravans), and need for fresh fossil exposures and some sediment to feed Barton and Hurst castle spit down drift.  The Shoreline Management Plan’s (SMP) preferred defence option for this zone is <b>‘managed retreat’</b> in the central part of the zone whilst retaining the rock defences at its eastern and western boundaries at Barton and Highcliffe respectively, Soft’ defence techniques, such as shingle recharge, will allow some cliff erosion to continue whilst keeping the beach front in its present location.
2. <b>Central Barton on Sea</b> - Barren gravely, defended cliffs despite part of SSSI because of property risk. An area of previous high erosion rate of >1m/yr now reduced by extensive coastal protection work since the 1930s, but still suffering periodic collapses of parts of the cliffs as in 2001.	The main focus for coastal defences: No new developments at cliff edge (designated a green belt by the NFDC effectively a type of <b>Red lining</b> where planners literally draw a line on a map to show which side planning permission will be given/refused). New or redeveloped properties up to 400m inland must have special soakaways to reduce groundwater build up.  The SMP’s preferred option is to <b>‘hold the existing defence line’</b> justified by a cost benefit ratio from the loss of economic value of properties inland - but needing major grant aid from Defra to fund, from 2007, a revolutionary inland drainage scheme.
3. <b>East of Barton to Becton Bunny</b> - still part of the SSSI with major retreats in the cliffs but only losses to the golf course.	The SMP option is to <b>‘do nothing’</b> because of the low value of developments inland, with re-routing of the coastal footpath.

**Fig. 4 The proposed dewatering system to tackle groundwater and mass movement at Barton on Sea.**



### The Future options at Barton on Sea

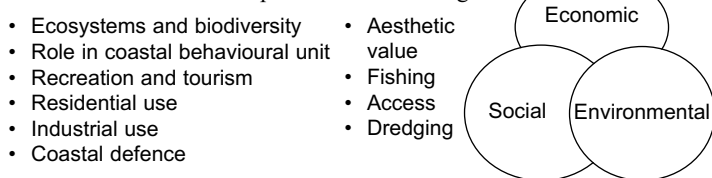
- No more major investment, basic maintenance allowing natural processes to operate and up to 1m recession/year - hence increasing loss of properties, highly unpopular locally!
- Regrade cliffs artificially to create a more stable angle of repose. This would further damage the SSSI and lose public open space on top of the cliff. Highly unpopular with locals.
- Reduce groundwater entering into cliff system, by stopping extensions/new buildings with soakaways and a new drainage system. This should keep the angle of cliffs as near to present as possible. More likely to find public favour - but will it get enough funding?

The latest phase of coastal defence works at Barton is a £10m bid to Defra in 2006/7 by the NFDC. A revolutionary drainage system, effectively a 'dewatering system' (Fig 4) aims to reduce the ground water load. This scheme was pioneered in the 1980s in the landslip areas of the Rhone Alpes area of France and has recently been installed on the Isle of Wight at Castlehaven near Ventnor. A trial will be carried out between Naish farm to Cliff House Hotel, which if successful will be expanded to the whole central CBU. Public consultation is currently taking place on this scheme.

### Student Exercises

1. What potentially conflicting uses need to be reconciled in coastal management? Use below diagram to help structure your answer

Fit below into best suited part of this Venn diagram:



- Ecosystems and biodiversity
  - Role in coastal behavioural unit
  - Recreation and tourism
  - Residential use
  - Industrial use
  - Coastal defence
  - Aesthetic value
  - Fishing
  - Access
  - Dredging
2. **Typical Exam Qs for which Barton on Sea would be a useful case study:**
    - Referring to a named stretch of coastline, examine the success of management policies in dealing with coastal erosion.
    - With reference to a named stretch of coastline, assess the statement that hard engineering causes as many problems as it solves.
  3. **Role Play:** Imagine you are working for the New Forest District Council during your AS/A2 summer break or as a gap year project and create an information brochure to justify to the local residents the next stage of Barton on Sea coastal management strategy.

### Points to consider

- The 3 behavioural units at Barton must be included.
- It must be accessible to all residents, whether teenagers or OAPs.
- Use of diagrams and maps is essential to make an attractive package.
- Any technical terms must be explained.
- It must be less than 500 words long to make into a brochure.
- It should have references/sources/contact details at the end.

### Useful Websites

- Overview of Barton on sea geology - [www.soton.ac.uk/~imw/barton.htm](http://www.soton.ac.uk/~imw/barton.htm)
- NFDC and Coastal Management Plans - [www.nfdc.gov.uk/index.cfm?articleid=2513](http://www.nfdc.gov.uk/index.cfm?articleid=2513)
- Tyndale research climate change and Christchurch Bay littoral cell 2004 - [www.tyndall.ac.uk/publications/working\\_papers/wp60.pdf](http://www.tyndall.ac.uk/publications/working_papers/wp60.pdf)
- Channel Coastal Observatory – a new data management and regional coordination centre for the Southeast coasts funded by DEFRA - [www.channelcoast.org/](http://www.channelcoast.org/)
- DEFRA/NFDC Shoreline Management Plan SMP from N FDC 2004 - [www.nfdc.gov.uk/coastal/cmp/CMPPartA1.pdf](http://www.nfdc.gov.uk/coastal/cmp/CMPPartA1.pdf)
- Main link to CMP 2004 [www.newforest.gov.uk/index.cfm?articleid=2513](http://www.newforest.gov.uk/index.cfm?articleid=2513)
- DEFRA on sustainable coastal & flood management [www.sfc.org.uk/public\\_documents/FD%202015%20SFCM%20Consultation%20Paper.pdf](http://www.sfc.org.uk/public_documents/FD%202015%20SFCM%20Consultation%20Paper.pdf)
- DEFRA cliff behavioural units - [www.defra.gov.uk/science/project\\_data/DocumentLibrary/FD2002/FD2002%20CSG15.doc](http://www.defra.gov.uk/science/project_data/DocumentLibrary/FD2002/FD2002%20CSG15.doc)
- Glossary on issues at coasts and strategies from Friends of the Earth - [www.foe.co.uk/resource/briefings/uk\\_coastal\\_habitats.html](http://www.foe.co.uk/resource/briefings/uk_coastal_habitats.html)
- SCOPAC integrated management. Includes excellent maps - [www.scopac.org.uk/scopac\\_sediment\\_db/chrst/chrst.htm](http://www.scopac.org.uk/scopac_sediment_db/chrst/chrst.htm)
- Siphon drainage systems by engineers WJ Groundwater Ltd - [www.wjgl.com/files/wj\\_tjgeo.pdf#search=%22castlehaven%20siphon%20drain%22](http://www.wjgl.com/files/wj_tjgeo.pdf#search=%22castlehaven%20siphon%20drain%22)

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