Zoning Techniques in Coastal Zone Management

An examination of current practice in the UK.

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Report IT460
December 1996

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Summary

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This report presents a review of methodologies used to design zoning plans as part of coastal zone management plans. Concerned that zoning schemes appeared to be developed in the absence of any formal methodology, HR Wallingford investigated how specific zoning plans were developed.

HR Wallingford worked alongside the Department of Land and Construction Management of the University of Portsmouth on two studies investigating zoning issues. Study 1 concerned on appraisal of the recreational zoning plan implemented in Poole Harbour, UK. Study 2 concerned a review and analysis of the methodologies used in the formulation of coastal zoning schemes in the UK. This report is presented in two parts reflecting these studies. Both these studies were individually accepted by the University of Portsmouth as Master's thesis Coastal and Marine Resource management submitted by their respective Authors.

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PART 1

Appraisal of the Recreational Zoning Plan implemented in Poole Harbour, UK

S T Forsyth

August 1995

Glossary

ALARP	As Low As Reasonably Practicable
BMIF	British Marine Industries Federation
DCC	Dorset County Council
ERGO	Environmental Research Group Oxford
PHAMP	Poole Harbour Aquatic Management Plan (various drafts)
PHC	Poole Harbour Commissioners
PHCG	Poole Harbour Co-ordinating Group
PHSG	Poole Harbour Steering Group
PWC	Personal Watercraft, including jetskis.
RSPB	Royal Society for the Protection of Birds
SEB	Socio-economic benefit

1 Introduction

Estuaries are among the most important areas in the UK for wildlife and natural features. They are also of fundamental importance to the nation's economy and are subject to a wide range of human activities. The issue of estuary and coastal management was considered by the House of Commons Environment Select Committee in its report on Coastal Zone Protection and Planning in 1992. The Government response to this report identified the need to prepare integrated management plans for estuaries and certain stretches of coastline. This view was reaffirmed in the Planning Policy Guidance Note on Coastal Planning (PPG20).

In 1993, English Nature set out a strategy to secure the appropriate future management of estuaries. English Nature aimed to develop integrated management plans based on the concept of sustainable use and also to establish estuary management groups to implement these plans. A goal of implementing management plans for 80% of England's estuarial area by 1997 was set.

In 1995, the Department of the Environment announced that it had commissioned a consortium to produce a guide which would highlight the best practice for bodies preparing coastal management plans. However, many management plans have already been prepared and implemented with no indication as to what best practice entails. Further, it is unclear whether the process involved in preparing these plans has undergone any rigorous assessment at all.

The following report addresses this issue by documenting and analysing the development process of a management plan which has already been implemented. The targeted plan is the Poole Harbour Aquatic Management Plan (PHAMP), launched in 1994. More specifically, this report is directed at the recreational zoning plan prescribed in the PHAMP. The author is supported in this investigation by HR Wallingford Limited who have also identified a requirement for further research in this area.

1.1 Outline of Research

The process of development of the PHAMP was investigated and documented in July 1995. Through this investigation, assumptions and areas of uncertainty accommodated in the PHAMP were identified as well as the financial management of the process. The results of this investigation were then analysed in several key areas. These areas included the identification and minimisation of uncertainty, the sensitivity of the zoning plan and an assessment of the cost effectiveness of the PHAMP.

1.2 Outline of Report

This report is structured around three core chapters which represent the analysis of the recreational zoning plan adopted in Poole Harbour. The Evolution Analysis (Chapter five), aims to present an analysis of the decision making process which resulted in the adoption of a recreational zoning plan. Chapter six, Uncertainty Analysis, discusses methods of addressing uncertainty in management plans and is concluded by an assessment of the zoning plan's flexibility. Chapter seven, Investment Analysis, documents the investment made in developing the PHAMP and concludes by exploring areas of further investment.

These core chapters are preceded by a Description of Poole Harbour and an Outline Management Structure in chapters two an three respectively. The objective of these chapters is to provide the reader with sufficient background information so that the analyses which follow can be put in context.

Following the Conclusions of the report, a Summary of Legal Issues is provided as an Annex. This summary provides greater detail of the legal framework in which estuarine and coastal management plans exist.

2 Description of Poole Harbour

2.1 Natural Characteristics

2.1.1 Geology

The geology of Poole Harbour consists of a series of unconsolidated sands, gravels and clays of fluvial origin laid in the Eocene epoch. The Harbour has an entrance on its eastern boundary and extends back from the coastline to form a large, shallow expanse of water extending to approximately 3800 ha at high water spring tides (PHSG, 1995). The Harbour includes several islands and large intertidal sands, mudflats and salt marshes. The northern shore is urbanised whilst the southern and western shores are rural in character. A map detailing the morphology of the Harbour is included in Appendix 1.

2.1.2 Hydraulic Influences

Hydraulic conditions within the Harbour influence the morphological development. The small tidal variation restricts the vertical range over which wave action influences the shore. Due to the double high water, the presence of water above mean sea level for 16 out of 24 hours means that conditions within the Harbour approach those of a marine lake or lagoon. This exacerbates the flushing characteristics of the Harbour (HR Wallingford, 1995).

Wave action within the Harbour is dominated by locally generated waves which are fetch-limited. Tidal velocities increase towards the harbour entrance. In the Middle Channel, the flood tidal stream dominates whereas the ebb dominates the North and Wych channels (HR Wallingford, 1995).

It is believed that sediment processes within the Harbour are in a dynamic equilibrium. The reducing extent of saltmarsh vegetation has released large quantities of sediment into the harbour during recent years and man has a significant impact on the system both by reshaping the shoreline with land reclamations and by dredging the Harbour floor (HR Wallingford, 1995).

2.1.3 Wildlife

The large extend of intertidal mudflats and saltmarsh is important to the conservation value of Poole Harbour. Mudflat is important for wading birds and wildfowl who feed on mud-dwelling invertebrates. Saltmarshes provide roosting and nesting sites for waterfowl. Additionally, populations of terns and gulls nest on the Harbour's islands.

In 1990, Poole Harbour was renotified as a Site of Special Scientific Interest (SSSI) under the Wildlife and Countryside Act, 1981. This SSSI area fulfills the criteria for two further wildlife designations. It is a proposed Special Protection Area for birds under EC Directive 79/409 and also a proposed Wetland of International Importance under the Ramsar Convention due to the numbers of supported waterfowl (PHSG, 1995).

English Nature manages three National Nature Reserves which are found either within or overlapping the Harbour's boundaries. These are complemented by three local Nature Reserves as well as non-statutory reserves managed by the Dorset Wildlife Trust and the RSPB.

2.2 Commercial Characteristics

Commercial port activities are centred on the northern shore of the Harbour at the extreme south eastern end of the Hamworthy peninsula. Important commercial links with northern France and throughout Europe have been established via shipping routes at Cherbourg and elsewhere. The Port of Poole handles conventional tonnage as well as Roll-on/Roll-off trade which passes through the ferry terminal operated by Poole Harbour Commissioners. Principal cargoes include imported steel, various bulk commodities, general freight and passenger traffic.

Other privately operated berths in the port area are used to handle refined oil products for local distribution, timber and sea-dredged aggregates. BP operate a small, specialised terminal ferrying materials and personnel to Furzey Island within the Harbour for the maintenance of Europe's largest onshore oil field.

Plate 1 View south east from Fisherman's Quay, Poole

The Port of Poole is an important local and regional asset, where the normal total cargo handled exceeds 2 million tonnes annually. The commercial Port provides direct employment for some 500 to 600 persons and the revenues generated from the traffic and cargo handled by the Commissioners, Truckline Limited, Brittany Ferries Limited, the steel importers and the other clients, make a significant contribution to the economy of South-east Dorset (PHSG, 1995).

The building and repair of commercial and recreational vessels is undertaken by a number of companies within the Harbour.

Seasonal visitors are transported around the islands in the Harbour by the four pleasure boats concerns licensed by the Marine Safety Agency.

The Ministry of Defence uses Poole Harbour regularly for exercises involving the Royal Marines based by Hamworthy.

Commercial fin fisheries in the Harbour principally concern the exploitation of mullet, bass, flounder, sole, eel and plaice through a variety of methods. One netsman is licensed by the NRA to fish for salmon and migratory trout. Much of the Harbour bed is leased by the Southern Sea Fisheries District Committee and areas are leased for the cultivation of shellfish. This body also regulates the fishing of oysters, clams, cockles and mussels elsewhere in the Harbour.

2.3 Recreational Characteristics

Sailing is the most prominent recreational activity within the Harbour. Extensive areas of the water space are used for racing activities and swinging moorings, and there are nine local sailing clubs of which three have associated boat havens.

Motorboating, like sailing, takes place all over the Harbour and varies from large sea-going cruisers to small, fast craft trailored into Poole and launched from the public slipway at Baiter.

Most windsurfing occurs around the northern shores, especially at Whitley Lake, although casual use takes place throughout the entire Harbour.

Waterskiing has traditionally taken place in and around the Wareham Channel, to the north-west of the Arne Peninsula. Personal watercraft (PWC) launched from Baiter slipway often make their way out of the Harbour and into Poole Bay (PHSG, 1995).

The peak periods of water-borne activity within the Harbour are weekend daylight hours during the months April to September, 'Poole Week' and Bank Holiday weekends. During the summer of 1994 a mean of approximately 2400 craft were estimated to be on the water. At peak periods the total for all craft in the water reached 4200, of which about a third were in marinas (ERGO, 1994).

Poole Harbour is also a popular centre for informal recreation and shore-based recreational activities include walking and observation of the area's birdlife.

With the exception of yachting, most of the watersports which take place within the Harbour are of an informal nature and participants are usually not members of any particular local clubs. This can lead to wide variations in the standards of craft-handling skills witnessed on the water. Non-local harbour users are attracted to the area from all over the country, with the largest numbers coming from Hampshire, London and the South-east, and recreation in and around the Harbour brings a considerable amount of money into the local economy through Harbour dues, mooring and berthing fees and other private concerns catering for specific activities, for example chandleries and windsurfing schools.

Poole benefitted greatly from the rapid growth in water-borne recreation during the 1980s, but the economic recession of the early 1990s halted and reversed the increase in participation of some activities. The possible exceptions appear to have been the more expensive yachts and powered craft, and recreational fishing.

Figure 2.1 illustrates activity areas prior to the implementation of the recreational zoning plan.

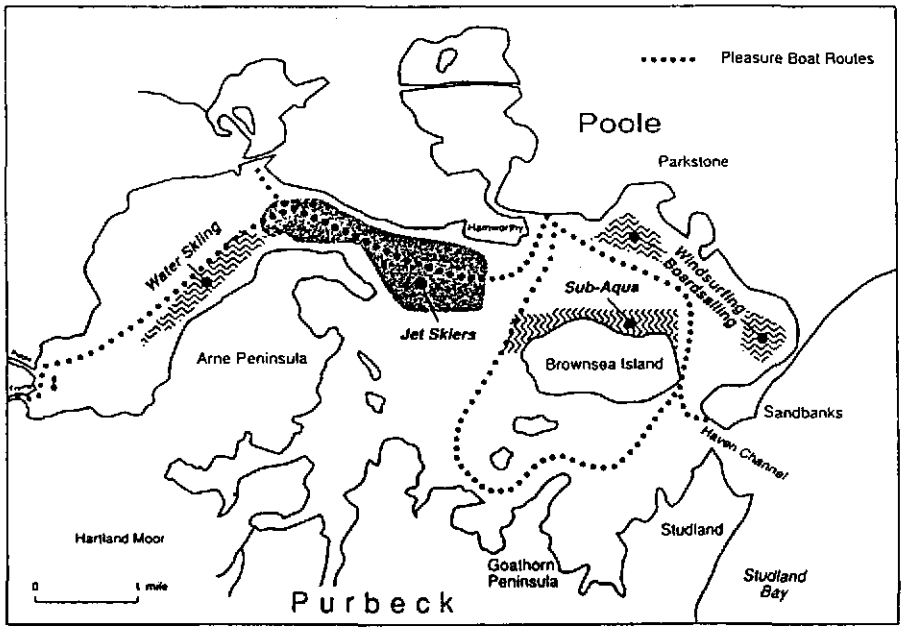

Figure 2.1 Existing areas of recreational use
(source: Edwards, from Littoral 94)

3 Outline Management Structure

3.1 Management Evolution

The first management group was formed in 1976 between Poole Harbour Commissioners and the 3 local authorities : Dorset County Council, Poole Borough Council and Purbeck District Council. The expansion of the Port during the '80's drew attention to the number of different interests which used the Harbour and highlighted the need for an overall management strategy.

In response to this requirement for Harbour management, the Poole Harbour Management Policies (PHCG, 1987/91) was published. This document provided a series of clear and agreed guidelines for the Harbour to recognise and protect local interests through advice for the planning and management of the area. The policies described sought to be implemented through local plans and other statutory mechanisms.

Poole Harbour Management Policies was prepared by the Poole Harbour Co-ordinating Group, which consisted of representatives from :

Dorset County Council

Poole Harbour Commissioners

Poole Borough Council

Purbeck District Council

Nature Conservancy Council

Southern Sea Fisheries District Committee

Wessex Water Authority

National Rivers Authority

In 1991, Poole Harbour Management Policies was revised when the need for integrated management of the whole harbour, including the water body and the areas below the low water mark, was recognised. The Group decided that specific policies should take the form of an Aquatic Management Plan. Figure B1 provides a diagrammatic outline of the Plan's evolution from this point.

A sub-committee, Poole Harbour Steering Group (PHSG), was formed to create and implement this plan, which consisted of representatives from:

Dorset County Council

Poole Borough Council

Purbeck District Council

Poole Harbour Commissioners

English Nature

National Rivers Authority

Southern Sea Fisheries District Committee

Royal Society for the Protection of Birds

As part of an existing research programme in early 1992, Dorset County Council undertook a survey of boatyards, sailing clubs and principal commercial organisations to find out what the perceived conflicts of uses were in the Harbour (DCC, 1992).

Late in 1992, the Steering Group invited tenders from 4 consultancies to formulate an Aquatic Management Plan for Poole Harbour from the data previously gathered. This included the results of the aforementioned survey. The finance for this stage came from English Nature. The Centre for Coastal Zone Management (University of Portsmouth) were awarded the project but the document produced (Pickering, et al, 1993) was criticised by PHSG as being too much a 'straight' description of Poole Harbour.

Hence, by autumn 1993, the Plan had been redrafted by PHSG into the Consultation Draft (PHSG, 1993) of the Aquatic Management Plan. However, the only real evidence of change from the previous document was in the further development of the recreational zoning plan.

In April 1994, a Harbour Survey Project Officer was appointed to launch the Management Plan, publicise it and collate the suggestions and comments received during the consultation process into a report on future recommendations. The Project Officer was also tasked to undertake ground and aerial

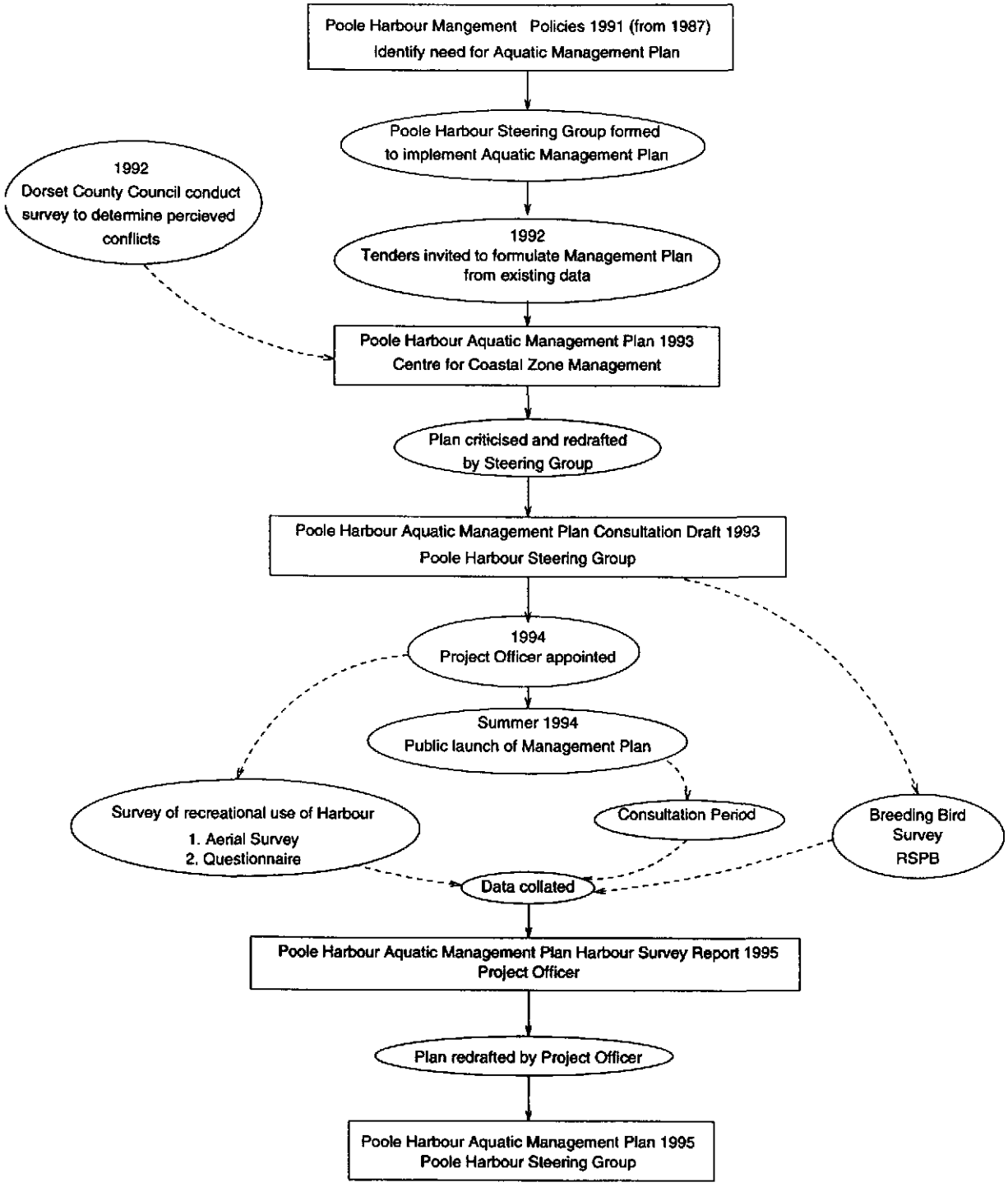

Figure 3.1 Diagrammatic outline of management development process

surveys of the recreational use made of the Harbour in an attempt to estimate the carrying capacity of the Harbour for recreational traffic.

The plan was publicly launched in July 1994, which also initiated the consultation period. The Consultation period ended in September 1994. The results of this exercise heavily criticised the Aquatic Management Plan as using redundant data. Many cited lack of prior consultation as being detrimental. However, general support of the Plan was received as well as identification of improvement areas, such as access problems.

The data gathered from the consultation process, aerial and ground surveys, and a birdlife disturbance report (RSPB, 1994) was collated and a report of the 1994 surveys published (Fairgrieve, 1995). This data represented the first real baseline data gathered on recreation.

The Aquatic Management Plan was revised to take into account the previous summer's work. The final Poole Harbour Aquatic Management Plan (PHSG, 1995) was published in July 1995.

3.2 Description of Aquatic Management Plan

The rationale for the Management Plan has been two-fold. Firstly, there is an empirical rationale for a management strategy. Secondly, it is common sense to avoid problems through forward planning.

There are 3 management policies:

1. Recreational Zoning Plan

   The designation of zones will assist in the reduction of disturbance to ecologically sensitive areas, and in the dangers associated with the mixing of powered and non-powered craft.

2. Revision of Aquatic Management Plan

   The proposed actions need to be monitored to confirm effectiveness and remain flexible.

3. Poole Harbour Forum

   An annual meeting of representatives to discuss the implement any required changes to the management of the Harbour.

The legal foundation for a management plan has existed since 1993 with the granting of byelaws to the Poole Harbour Commissioners which enforces a 10 knot speed limit throughout the main Harbour, and includes an area taken as a radius of 1400 metres extending seaward to the east of South Haven Point. The existing 6 knot speed limit in Little Channel, Holes Bay and the southern reaches of the Harbour has been maintained. Additional byelaws ensure the rights of sports such as windsurfing, waterskiing and the use of personal watercraft to use their designated zones within the limits of the Harbour.

The Poole Harbour Steering Group has recognised the need for management policies to be identified via the non-statutory Aquatic Management Plan and co-ordinated with local land use plans. The Poole Harbour Aquatic Management Plan has been adopted by the Poole Harbour Commissioners, Poole Borough Council, Purbeck District Council and Dorset County Council.

A series of notice boards have been installed at the major launch points around Poole Harbour publicising the recreational zones, speed limits, access channels, and byelaws and reminding users of the penalty for breaking a byelaw.

The promotion of the zoning plan is reinforced by publicity leaflets outlining the management strategy and listing the byelaws. These leaflets are widely available at the Harbour Office, chandlers, watersports shops, yacht clubs, and other local outlets.

Although not implemented, an effective method of promoting the recreational management plan would be through an attendant situated at Baiter car park and slipway. This person would assist with the public launching of craft and would draw the attention of users to the existence of byelaws and the relevant zones for their sports. The absence of such a person leaves an important gap in the enforcement and publicity of the management plans (PHSG, 1995).

With the completion of a second public slipway it is envisaged that road signs will be erected guiding users to the access point most suitable for their sport.

There is a requirement for more resources and greater manpower to police the extensive activities and area of the Harbour (PHSG, 1995). Poole Harbour Commissioners currently dedicate one patrol boat to the enforcement of Harbour byelaws and a second vessel would be made available for an increased presence on the water, if required. The Marine Section of the Dorset Police also provides valuable reinforcement at busy periods. A system of self-regulation operates within the waterskiing zone, and the Poole Harbour Waterski Association provides a safety warden at weekends and on Bank holidays.

It is intended to promote a system of voluntary registration of craft within the Harbour in the absence of a national boat registration scheme. This initiative is being headed by the British Marine Industries Federation and would be a major benefit to the byelaw enforcement procedure.

Penalties and a statutory means of enforcing the zones and codes of behaviour associated with the different activities are required to maximise the effectiveness of the implementation of the management plan.

4 Introduction to Analyses

The objective of this chapter is to introduce the reader to the three analysis chapters which follow. This introduction is required because each of these chapters represents a discrete and involved analysis with little ground given to background information. Hence, the objectives, methods and conclusions of each chapter are summarised below.

Chapter 5, the Evolution Analysis, aims to present an analysis of the decision making process which resulted in the adoption of a recreational zoning plan. An outline of all research and design input is provided as well as an analysis of the assumptions made in producing the PHAMP. It is concluded from this analysis that no clear methodology was used to develop either the PHAMP or the recreational zoning plan and that certain factors in the design of the zones appear to be neglected.

Chapter 6, the Uncertainty Analysis, aims to discuss methods of addressing uncertainty in management plans and is concluded by an assessment of the zoning plan's flexibility. The author explores risk assessment and sensitivity techniques as methods of reducing uncertainty. It is concluded from this analysis that areas of uncertainty previously identified in the development of the PHAMP have been addressed by further research. However, an assessment of the effects of introducing a zoning plan did not occur in the development process and this represents an area of neglect.

Chapter 7, the Investment Analysis, begins by presenting a documentation of the investment made in developing the PHAMP and concludes by exploring areas of further investment. It is clear that areas of further research have been identified. However, such research has not been assessed using cost-benefit techniques which would justify their funding. Areas of further investment which were not identified in the PHAMP are also explored.

5 Evolution Analysis

5.1 Objectives of Section

This section aims to present an analysis of the decision making process which resulted in the adoption of zoning as the technique to meet the objectives of the PHAMP. An analysis of the assumptions made towards the final format of the zoning plan is included.

5.2 Method

The analysis commences by documenting the objectives of both the PHAMP, as described by Poole Harbour Steering Group, and the zonation plan which has been implemented.

The evolution of the PHAMP from conception to final introduction is not outlined comprehensively, although the decision making process which resulted in adopting zonation is presented. It must be noted that the process which resulted in the adoption of the zoning plan is not distinct from the overall evolution. The author has attempted to clarify the pathway and includes all relevant research, inputs and assumptions.

The design criteria used in designating zonation areas are outlined. These criteria have been suggested in the consultation draft document (PHSG, 1993) and by individuals involved in the design process (Pickering, 1995).

The analysis of this section is concluded by documenting the assumptions which were made in adopting the recreational zoning plan and suggests which inputs and evidence these have been based upon.

5.3 Management Objectives

The strategic aim of the Poole Harbour Steering Group is expressed as :

To promote the sustainable use of Poole Harbour, balancing the demands on it's natural resources and resolving conflicts of interest. (PHSG, 1995)

The most recent management plan (PHSG, 1995) states, as it's objectives, the following:

- to protect and maintain the special natural features of the harbour
- to promote the sustainable and wise use of the Harbour for commerce, recreation and amenity
- to provide a framework for the co-ordinated management of the Harbour and improve communications between Harbour users and managers

Various policies exist which are designed to achieve these objectives, including a recreational zoning plan and annual forum. In particular, the recreational zoning plan is tasked with managing recreation in the Harbour. The objective here is to reduce the disturbance to ecologically sensitive areas and minimise the dangers associated with multi-use by powered and non-powered craft.

5.4 Evolution of Recreational Zoning Plan

This section aims to document the development of the recreational zoning plan from the initiation of the decision making process to the final outputs.

5.4.1 Initiation

The perceived need to manage the use of the Harbour, especially an increasing recreational sector, was initially realised and indicated in the Poole Harbour Management Policies (PHCG, 1991). Various activity areas were considered:

- Whitley Lake was particularly recognised as an area used for windsurfing. A potential hazard/conflict to bathing children, moored craft and local residents was perceived, as well as possible congestion.

- Water skiing was encouraged by Poole Harbour Commiossioners (PHC) in the area around Wareham Channel because it was lightly used by other craft. This was partly self-policed by the local waterskiing club.

- Although not fully recognised yet, conflicts due to personal watercraft (PWC) use were perceived in the southern areas of the Harbour and related to disturbance of natural habitats.

- The South-western area of the Harbour is protected by the planning authorities on the landward side and by various conservation designations elsewhere. PHC designated this as 'quiet area' where noisy activities were prohibited.

It was concluded that Poole Harbour was not threatened by the present level of activity and that no serious conflict between users existed. However, a trend towards increased leisure was recognised. From this, a set of general policies were developed for each use area. Those relevant to recreation, particularly zoning, are listed below.

Policy G7 *Specialist craft and watersports will be encouraged to confine their activities within appropriate waters of the Harbour. The establishment of clubs or associations should be encouraged with the aim of achieving some regulation over these activities.*

Policy G8 *The Authorities will use their powers to minimise conflict between different recreational activities.*

Policy G15 *A management plan is to be prepared under the auspices of the Nature Conservancy Council, PHC and local authorities with the aim of improving wildlife habitats and enhancing the landscape of the Harbour and it's shores.*

The Co-ordinating Group formed the Poole Harbour Steering Group (PHSG) to produce and implement an aquatic management plan. PHSG identified the plan as being urgently needed to successfully undertake the co-ordinated management of the Harbour. Hence, tenders were invited to complete a study which would form the basis of the plan.

5.4.2 *Commissioned Study*

The first Poole Harbour Aquatic Management Plan (Pickering, et al. 1993) was prepared by the Centre for Coastal Zone Management at the University of Portsmouth. The inputs used in the development of the plan are listed below.

- An increase in watersport participation and the significance of Poole Harbour to watersports was expected. This is especially true for windsurfing, for which Poole Harbour is recognised as being natonally significant. This input was based on information collected before 1990 by the South Western Council for Sport and Recreation.

- A potential for 4000 vessels to be on the water existed at peak times. This figure was based on a research paper centred on watersports management in South Wales and a previously conducted questionnaire survey of recognised user groups (Dorset County Council, 1992).

- Perceived conflicts were cited, especially the potentially dangerous cocktail of jetskis, waterskiers and speedboats between themselves and other users such as windsurfers and sailing craft. Also, a safety risk was associated with recreational use of the main commercial channel. It was felt that Poole Harbour represented a detrimental combination of a largely undisturbed and ecologically important natural environment with activities involving high speed craft.

It should be noted that the consultation process which followed in 1994 largely removed any inaccuracies involved with these inputs.

Importantly, a zoning plan was proposed because it represented the most effective and expedient management option for rationalising existing patterns of activity. This plan should address conflicts previously identified and account for the significance of those activities. The proposed zonation plan from this report is included as Appendix 2. Significantly, the proposed zoned area in the Wareham Channel was split between waterskiing and jetskiing activity. Although appropriate marking would be possible, jetskiing participants would require access at Lake, including a zoned area in the car park and beach and jetty access, to reach this area.

5.4.3 *Consultation Draft*

Based on the preceding report, PHSG produced the Poole Harbour Aquatic Management Plan Consultation Draft (PHSG,1993). Although PHSG criticised the initial report as being too much a 'straight' description of Poole Harbour, there is very little change between the actions proposed by this report and by those presented in the consultation draft.

The zoning plan proposed on the consultation draft is included as Appendix 3. The significant area of variance from the initial work is the separation of the waterskiing and jetskiing zones, the latter now being situated to the north of Brownsea Island. However, the replacement access area is not identified, only the requirement for such a facility.

The complete zonation plan allowed for participation in various activities and comprised: a jetskiing/PWC zone; a waterskiing zone; a measured half mile for production testing; a windsurfing zone; a sub-aqua zone; and a quiet zone. The granting of new bye laws imposed by PHC in October 1993 allowed for the implementation of the zoning plan. The bye laws are listed below.

- Bye law 2(aa) Speed Limit

  A speed limit of 10kts exists throughout the Harbour for all power driven vessels.

- Bye law 2(bb) Windsurfing

  Windsurfers intending to pass through the Harbour entrance or cross shipping channels must do so by the shortest possible route.

- Bye law 2(e) Waterskiing

  Waterskiing and jetskiing are to take place in approved areas and marked zones only.

5.4.4 *Consultation Period*

The official launch of the recreational zoning plan was in July 1994. The launch was planned to coincide with new areas of research which would establish baseline data for Harbour use from year one

of the zoning plan implementation. However, establishing baseline data before implementation may have been more useful. The new areas of study consisted of:

1. A Breeding Bird Survey (Summer) by the RSPB.
2. The Consultation Exercise and report thereof.
3. Aerial Survey of waterborne craft
4. A Questionnaire Survey.

1. Breeding Bird Survey (RSPB, 1994)

Brief: Assess disturbance to birdlife

Method: Survey 6 key species in Spring/Summer 1994

Results: No real quantifiable evidence of disturbance, although anecdotal evidence may suggest disturbance due to craft landing on Brownsea Island.

2. Consultation Exercise Report (Fairgrieve, 1995)

Brief: Assess public perception of Plan

Method: The exercise will commence at plan launch and continue for a 10 week period.

Results: From 100 copies sent asking for a reply, 36 were returned. General support for the management of the Harbour and a recreational zoning plan was expressed, with many accepting that a plan was inevitable. The main concern was seen as a need for increased access and an integration of Harbour activities with landside facilities.

3. Aerial Survey of Waterborne Craft (ERGO, 1994)

Brief: Survey the number and distribution of craft in Poole Harbour and Poole Bay.

Method: Aerial survey using visual techniques enhanced by photography. Conducted on pre-designated busy or non-busy days. Observers differentiated between 7 classes of craft and whether they were moving or static.

Results: There was an average of 2400 vessels in the Harbour, 1200 of which were in marinas. Approximately 11% of craft were moving, with little temporal variation from day to day.

Although zoning was not strictly observed, 90% of activity occurred outside designated non-disturbance areas.

4. Recreational Activity Questionnaire Survey (Fairgrieve, 1994)

Brief: Provide human evidence of Harbour activity.

Method: Questionnaires distributed to cover watersports participants and landbased participants (60/40 split) on days coinciding with aerial survey.

Results: General agreement for recreational zoning and no significant conflict perceived. The Harbour was popular because of it's good conditions, safety, proximity and access. Although certain areas appeared busy, it was agreed that the Harbour was not overcrowded yet.

5.4.5 Final Report Phase

The conclusions and recommendations from these inputs were reported to the PHSG (Fairgrieve, 1995). The main points are listed below.

a) The western end of the Wareham Channel, Lytchett Bay, the northern part of Holes Bay and the north shore of Brownsea Island should be considered as possible extensions to the Quiet Zone. This would only be possible if the PWC zone were moved from the area north of Brownsea Island.

b) The PWC zone should be moved closer to the shore within reasonable distance of a suitable car park and access point. This would increase safety and decrease disturbance on the north shore of Brownsea Island.

c) The waterskiing permit issuing system should be rethought so that problems with self-regulation identified in the consultation can be addressed.

d) The sub-aqua zone should be discontinued because there was no evidence of it's use for sub-aqua activities.

The final document (PHSG, 1995) was formally issued for public information in July, 1995. The final format of the zoning plan is included as Appendix 4 and is described in brief below.

As mentioned, the basis of the zoning plan is the enforcement of speed limits to powered craft, except those used for emergency purposes, and the designation of activity specific zones, exempt from restrictions. These restrictions will be relaxed between October 1 and March 31 in certain areas. The zones comprise:

a) A waterskiing zone which will remain in the area previously designated, although there will be no improvement in the permit scheme. The policing of this zone is the responsibility of the Poole Harbour Waterskiing Association's Safety Warden.

b) The PWC zone will remain in the area north of Brownsea Island, however the designated access is now from Baiter and not Lake, where it is now prohibited.

c) The windsurfing zone will remain at Whitley Lake.

d) A measured half mile marked by transits and controlled by the Harbour Master will be used for the speed testing of production craft. Specific approval must be sought.

e) The area designated as a Quiet Zone remains unchanged and the proposed extensions are still under consideration.

5.4.6 Conclusion

Through investigation of the process, it is evident that a clear methodology was not present. The consideration and evaluation of various options to achieve the objectives did not occur. The process which resulted in the choice of the zoning plan was influenced by three factors.

a) Suggestion

The RSPB had initiated the idea of using a zoning plan as a management option. Since then, the idea had been propagated at various other stages of the process until, eventually, it facilitated it's choice as the appropriate course of action.

b) Popularity

In recent years, zoning has become a popular choice for estuary and recreation management. In their guidance issued to planners, English Nature refer to zoning as a management option in two areas (English Nature, 1993). In the first instance, it is considered as an option for filling legislative gaps in management plans. Here, voluntary zoning combined with byelaws can facilitate a voluntary/statutory mixed approach. Secondly, English Nature suggest that on a site-specific basis, plans should be developed to include concepts such as zoning access to areas to reduce disturbance to nesting birds.

c) Alternatives

Once it was realised that this option is suitable for achieving the objectives, the search for alternative options could have been decreased. There is no evidence of further alternative options being identified or compared.

Importantly, other management options which might achieve the objectives set by the PHSG were not explored. One such option would involve approaching manufacturers of PWC and influencing them into developing a quieter craft. This could be reinforced by restricting the use of the Harbour to participants with certified quieter craft only (Environment Committee, 1995).

5.5 Design Criteria

A set of criteria has been identified which can be used to determine and design a desired zone and are listed in the Consultation Draft document (PHSG, 1993). The criteria are described below.

Physical	water depth, tidal conditions and sea bed material.
	climate
	surrounding environment
Access	proximity to zone
	suitability of facilities
	landside access
Administration	ease of policing
	marking, signage and publicity
	timing of use
Safety	uses by non-zoned activity
	controlling the use of the area (direction and numbers)
	positive exclusion of conflicting users

Importantly, these criteria are not assessed as to whether they are fundamental or merely desirable. Individual criteria were not weighted to indicate priority when common sense prescribes they should have been. Although the identification of areas of existing activity use is highlighted as a significant input in the management initiative (Pickering, et al. 1993), it is not included in the design criteria outlined above. This is an important exclusion, especially if the zoning plan desires to reflect existing use patterns and thus ease the policing and education load.

5.6 Assumptions in Inputs

5.6.1 Level of Participation 1994

It has been assumed that 1994 was a quiet year due to the link between waterborne activity and a still recovering economic situation. Marinas reported a decline in use in 1994. A claim which was supported by the aerial survey which reported that the 3 major marinas were only at 60% capacity. Also, the sale of new windsurfing equipment had declined, although the significance of this figure is debateable. PWC

activity had declined since 1993 when Poole Borough Council introduced a policy of active discouragement by restricting access. Although it is clear that the perceived significant conflict caused by PWC in 1992 (Dorset District Council, 1992) has probably declined when compared with 1994 survey data, no figures were supplied to support this.

5.6.2 Harbour Capacity for Recreational Activity

It is assumed that the Harbour has not reached its capacity for absorbing recreational activity. The questionnaire survey (Farigrieve, 1994) concluded that less than 20% of interviewees on the busiest day of the season stated that the temporary mooring area was crowded, although the area appeared congested. Similar conclusions were reached in the busy windsurfing zone.

It is also assumed that recreational activity is not causing significant disturbance to breeding birds, based on a lack of real evidence to the contrary from the RSPB study (RSPB, 1994).

Access to and into the water is assumed by PHSG to be the major determinant of the Harbour's capacity for recreational activity. This is supported by congestion on roads witnessed in 1994 which may have been caused by a greater volume of users requiring access than there were car parking spaces, especially at Baiter (Fairgrieve, 1995).

In the recent development of the Plan, it is assumed that it is impracticable to prescribe a single set figure for the number of recreational craft which can safely use the Harbour without causing significant disturbance to the natural environment. However, this assumption is based on limited evidence and may be area which has been neglected.

5.6.3 Zonation Plan Option

It is assumed that designating zones for certain activities will reduce the dangers associated with the multi-use of the Harbour. The most significant safety concern of the Harbour is not the number of craft but the mixture of different user groups, hence their separation will increase safety. It is also assumed that users will adhere to these zones, although there is evidence to the contrary from the aerial survey.

The aerial survey (ERGO, 1994) concluded that 90% of users remained outside areas of disturbance. This might support the assumption that the designation of zones will protect natural habitats.

It is assumed that the adoption of a recreational zoning plan will not decrease the popularity of the Harbour as a recreational venue. The Harbour was identified as being popular because of it's conditions and safety (Fairgrieve, 1995) and therefore any improvement in safety would be welcomed.

5.7 Conclusion

The aim of this section was to present and document the decision making process which resulted in the adoption of a recreational zoning plan. It is clear that no consistent methodology was practised throughout. The adoption of zoning was not the result of a comparison of management options. Further, the methodology used for designating individual zones was not clearly stated nor did it appear to prioritise individual design criteria. Whilst the zoning plan mimics the previously existing use pattern to some extent, this was not stated as a criterion in the design stage.

The consultation exercise in conjunction with further research in 1994 appears to have addressed the information uncertainties from the initial draft. However, a major source of funding required that the management plan was in place before funding was secured. Hence the zoning plan was implemented before the research commenced and data gathered cannot be truly considered as baseline. Further, although this research introduced new evidence regarding the recreational use of the harbour, the only revision to the zoning plan was the removal of the sub-aqua zone.

Does this mean that the choice of using a zoning plan as the management option was less affected by actual behaviour than it was by other possible influences, such as popularity and attractiveness to funding sources? It is more probable that the zoning plan was implemented on ill-founded data and that although further research showed that these conditions do not exist at present, they may exist in the future and so a zoning plan should be continued to accommodate this eventuality.

6 *Uncertainty Analysis*

6.1 Objectives of section

The aim of this section is to discuss how uncertainty was addressed in the development of the recreational zoning plan. Included in this analysis will be a description of the modes of failure and a statement of robustness. This section also aims to assess the flexibility of the zoning plan and illustrate how the plan can be modified to an optimal level.

6.2 Method

After initially defining uncertainty, the process of the plan's development is examined and any uncertainty is documented. The causes and modes of failure are then explored using an event tree. This forms the initial stage of an informal risk analysis of the zoning plan which concludes with recommendations for risk management. The sensitivity of the zoning plan is then explored to assess its robustness in a changing environment. The process of modification to the zoning plan is outlined to assess the likelihood of change. The section concludes with a brief discussion on limits to modifications and optimisation.

6.3 Addressing uncertainty

6.3.1 Definitions

It has been suggested (Hayes, 1995) that there are various types and sources of uncertainty which influence human environment relations and management decisions, including reducible and irreducible uncertainty. In the context of coastal zone planning, we can target our efforts on the reducible uncertainty. Two further divisions can be identified: model uncertainty and personal uncertainty.

(a) Model uncertainty

The uncertainty associated with modelling systems operating in the coastal zone can be characterised by:

- uncertainty regarding the choice of model
- uncertainty regarding the parameter values within the model.

However, as no real model was used in producing the zoning plan, it is invalid to assess this area.

(b) Personal uncertainty

This can be addressed by ensuring that the management strategy in place optimises communications between all parties in the management process, particularly scientists, policy-makers, policy enforcers and resource users. The objective in this context is to ensure that management decisions are made, and resource user behaviour directed, in the face of all the information available, or perhaps more accurately in complete awareness of uncertainty.

Hence, three levels of uncertainty can be identified:

1. Uncertainty identified and addressed by subsequent research.
2. Uncertainty identified and requiring further study.
3. Uncertainty not identified and therefore not accommodated in plan.

Various information inputs utilised in the production of the PHAMP have been documented and listed below, and the associated uncertainty of these inputs have been identified. No attempt is made to quantify the level of uncertainty, however, it is clear which are to be considered significant and which are not.

6.3.2 No significant disturbance to breeding birds by users.

This input is based on the results of the 1994 survey by the RSPB which was commissioned in response to uncertainty identified in previous stages. The assumption is valid only for the summer months, because no survey has been completed which represents winter behaviour. However the PHAMP (PHSG, 1995) identifies this as an area of uncertainty and stresses the need for further study.

Questions also arise when defining the level of significance. Difficulties arise in surveying breeding birds, and it may be more feasible to consider the situation of the area used for breeding. It must also be noted that this will be susceptible to natural fluctuation.

In considering what level of disturbance is significant, it has been informally suggested (Sterling, 1995) that nest abandonment may be an indicator, as this will affect the sustainable recruitment of the population.

6.3.3 The recreational carrying capacity has not been reached.

Research aimed at quantifying a recreational carrying capacity was dismissed (Fairgrieve, 1995) as being invalid and impossible. However, the author understands that methods for calculating or estimating a capacity threshold for safety may exist, and is certainly an area for future research.

It is hoped that the periodic repetition of the questionnaire survey (Fairgrieve, 1995) will provide an indicator of the approaching capacity limit. This methodology relies on the subjects' perception of how busy their activity environment is.

It is not clear, however, what actually happens when this capacity is reached. Although such consequences have not been considered, they have clear implications for the feasibility of future access improvements.

It must be noted that the aerial survey was commissioned to establish the existing recreational use of the Harbour and as such addresses previously identified uncertainty.

6.3.4 No real evidence of adherence to prescribed zones.

This input is based on the results of the aerial survey (ERGO, 1994) which suggested that many participants were using areas outside their prescribed zones. This information does not appear to have been utilised in the final production of the PHAMP, although the data added evidence which was considered in support of increasing signage around the Harbour.

Clearly, a period of adjustment is expected with the implementation of a new management system. However, the lack of adherence may be more fundamental and should be addressed. This argument may be reinforced by survey evidence concluding general support for the PHAMP.

Eventually it may depend on the cost of the required policing to determine a level of acceptable adherence. However, the cost of appropriate policing may be substantial and may require further justification of the zoning plan.

6.3.5 Poole Harbour is popular for recreation because of its conditions and safety.

Two areas of uncertainty are cause for concern here. Firstly, although water quality was considered at earlier stages of the PHAMP (PHSG, 1993), it was subsequently removed from consideration in the final stage of development. Obviously, water quality has a significant effect on participants perception of the Harbour's conditions, especially in contact activities such as windsurfing.

Can it be assumed that water quality is an insignificant input to the development of the zoning plan? This may be valid at present but future levels may not have been considered, especially in the context of proposed developments. Neglect in this area may affect the designation of bathing beaches and associated health problems.

The main area of concern is in Holes Bay (Curtis, 1995) where pollution from a sewage outlet and accumulation of heavy metals in the sediment from past industry may cause a problem. Tidal mixing in Holes Bay is relatively poor compared with the channels of the main harbour area.

Secondly, it is assumed that a recreational zoning plan will improve the safety of participants. However, no analysis has occurred which supports this statement. A risk analysis of the zoning plan may outline areas where hazard probability can be reduced. In this case, however, it may be necessary to record subsequent incidents to determine a trend which would support the safety claim.

6.3.6 Increase in recreational activity expected.

The interpretation of the most recent figures from the British Marine Industries Federation (BMIF, 1994) which was adopted suggest that confidence in the marine industry sector appears to be returning. An analysis of sales of equipment through chandleries (PHSG, 1995) is used as an indicator.

The results illustrates a comparative rise in chandlery turnover estimates in the period 1992-93. However, an ambiguous interpretation can be drawn from the same set of figures, ie sales value excluding VAT in the retail sales sector illustrate a drop of almost 8% in the period 1992-93. Unfortunately, the results from the 1994 BMIF survey were unavailable at time of research.

It may be possible to establish a relationship between an economic scenario and recreational activity. However, the question must be asked, 'How significant an input is a prediction of future activity?' If this does influence the management of the zoning plan, how reliable must these predictions be?

6.4 Failure Analysis

The methodologies of modes of *failure analysis and risk analysis* are associated mostly with assessment of structures or systems. However, as the zoning plan is also a system, it is both valid and useful for risk assessment to occur.

Failure to meet certain criteria would indicate failure of the zoning plan. Consequence paths of events will determine the modes of failure which result in satisfying the criteria. By then considering the probability of these events it may be possible to produce a risk statement of the zoning plan by summing the probability and consequence of this undesired event. Based on this statement, an assessment of the significance of each risk would conclude the analysis and lead to risk management action areas.

6.4.1 Failure definition

One of the objectives of PHAMP is to promote the sustainable use of the harbour for commerce, recreation and amenity. The recreational zoning plan, being the most tangible resultant action, must seek to achieve at least part of this objective as well as maintain the safety of Harbour users.

Hence, failure of the zoning plan might be considered failure to achieve this objective, and more importantly, failure to maintain safety. Three areas of failure might be considered, each with a set of criteria defining the undesirable event.

(a) Human Safety

The undesirable event is obviously human injury. Many risk analyses use human fatality as the unit of measure of consequence and limits to acceptability.

(b) Environmental Safety

The criteria for failure may be less simple to define but systems do exist which establish parameters for measurement so that significant damage can be defined (Department of the Environment, 1991).

(c) Economic Risk

Although economic failure may be associated with external factors, it may also be affected by human or environmental safety. Criterion used would require comparison with national, regional and sectorial trends to determine failure.

6.4.2 Modes of failure

Figure 6.1 outlines various consequence paths which might lead to failure of the recreational zoning plan, here defined as non-sustainable use of Poole Harbour. Clearly, the modes illustrated are centred on the human safety aspect of hazard. These modes will be affected by the effectiveness of enforcement of the zones and control of access. An assumption is also made here about human behaviour which supposes that participants will rationally evaluate their own safety and that of others and take action to prevent deterioration.

Figure 6.1 is not comprehensive and a full multi-scenario modes of failure outline could be produced. However, this method illustrates a technique of identifying possible hazards within a system and represents an initial stage of risk analysis.

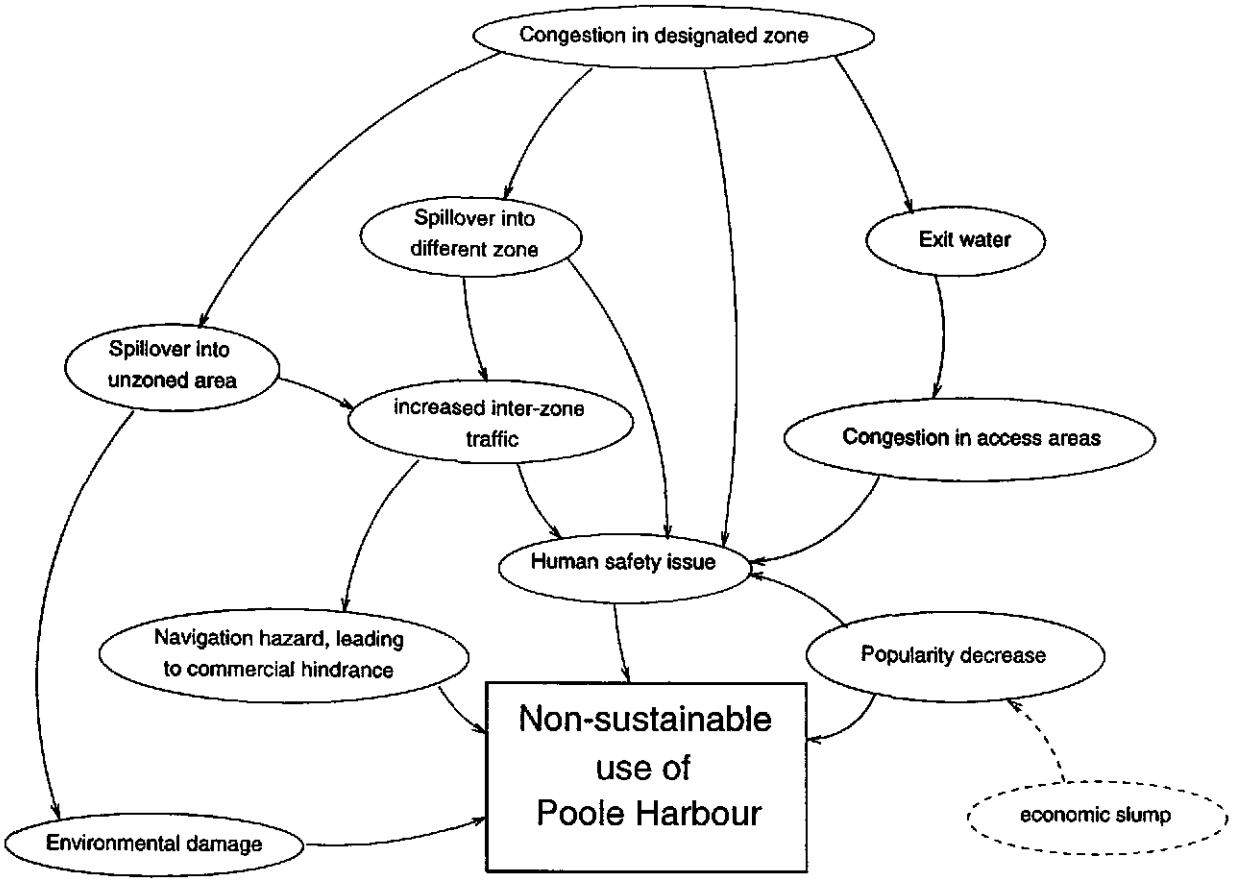

Figure 6.1 Failure Mode Paths

6.4.3 Risk assessment

The technique of risk assessment can be described as a systematic methodology characterised in six stages (Side, 1993):

1 Hazard identification

2 Postulate accident

3 Estimate likelihood of accident occurrence

4 Estimate quantitatively the consequences

5 Calculate risk levels

6 A 'so what' assessment or judgement stage

The aim of this section is to point to a method which might be utilised in developing future zonation plans. Hence, the six stages will be introduced without a formal assessment occurring.

Hazard identification - accident postulation

All stages of a risk assessment should have a clear indication of the form of the undesired event in terms of outcomes. The modes of failure outlined above illustrate the multi-scenario nature of possible outcomes. Tools such as event trees and existing incident data might be used to explore possible failure paths.

Estimate likelihood of accident occurrence

The purpose of this stage is to evaluate the frequency of the undesired event or accident scenarios identified in the initial stages of assessment. However, difficulties may arise in determining a quantified probability which reflects human nature, i.e. the frequency of activity spillover into unzoned areas will be dependent of participants perception of conditions within the zone. It will be possible to present a 'rational unit participant' which will react in a predicted way. Hence, this will allow frequencies to be estimated based on the likelihood of a certain number of participants present at any one time.

Information can be gathered from many sources, including local Tourist Board surveys, marina or club memberships, byelaw infringement data, access car parking revenues and aerial surveys.

Estimate quantitatively the consequences

As before, the consequences of failure of the plan can be categorised into human safety, environmental safety or economic risk. Section 6.4.1, Failure definition, identifies units in which each can be measured. However, it may still be necessary to provide descriptive measures of the consequences when considering environmental safety.

Calculate risk levels

Risk is a function of both frequency of an undesired event and its consequences, therefore we can calculate the individual risks associated with each hazard. These risks can be expressed both numerically, in the form of a matrix for instance, or descriptively, which may be more suitable for expressing environmental risk.

Regarding human safety, it may be possible to identify a level of activity which represents a serious deterioration of safety. By attaching a probability of reaching this level of activity, a risk value can be estimated. However, discussions should arise over the criteria which deems any deterioration as 'serious'.

A 'So What' assessment or judgement stage

This stage assesses the statement of risk produced in the context of significance by questioning the importance of the perceived risk. Two principles can be introduced here,

- The ALARP (As Low as Reasonably Practicable) Principle
- Acceptability Limits

The ALARP Principle identifies two thresholds: an upper threshold above which risk cannot be justified on any grounds; and a lower threshold below which the cost of risk reduction would not be supported because the risks were so trivial.

Between these two regions lies the ALARP region where risk is undertaken only if the benefit is desired. It may be useful to use Cost-Benefit methodology when assessing risk minimisation measures in this region.

Towards the upper threshold, the risk may only be tolerable if risk reduction is impracticable or if the cost is grossly disproportionate to the improvement gained. However, towards the lower threshold, the risk is tolerable if the cost of reduction merely exceeds the improvement gained.

Importantly, the thresholds need to be based on the acceptability of that risk. Those responsible for the management of a recreational area will have a perception of what is acceptable in terms of human safety. This might be expressed as an acceptable incidence of serious injury, one fatality in 20 years for example.

Hence, management actions, such as a recreational zoning plan, can be assessed according to the significance of their risks. Further, a cost-benefit methodology can be applied to risk management options.

Further investigation might suggest that the number of participants on the water at any time is proportional to the probability of serious injury. Hence, by identifying an acceptable level of human risk, a safe capacity for harbour use can be obtained. Based on this capacity, zoning plans can be adopted to allow safe management of the area.

Management options could include temporal variation and spatial variation. In the latter case, the area of individual zones could be increased once an intermediate threshold of participation had been reached. Once the critical threshold had been reached, participation would have to be restricted. Thresholds could be identified for individual zones and for the Harbour as a whole. It must be assumed here that adherence to zones has improved.

In the former case, seasons of use may be established. However, it should be noted that most zoned activities in the Harbour occur at similar times. The aerial survey of activity in the Harbour (ERGO,

1994) suggested a rise in craft numbers through the summer, from May to August. Obviously, as the survey occurred in the summer only, is is impossible to compare with winteresults. However, the initial rise in activity in May suggests that more activity occurs in the summer than in the winter. With respect to PWC and waterskiers, it is difficult to extract a pattern due to the small absolut numbers. Winsurfing activity varies with wind conditions, and not seasonally. Appendix 5 contains figures from the survey which illustrate these conclusions.

However, various limitations apply to these options. Firstly, the safe carrying capacity of the zone will vary depending on tidal and weather conditions. Secondly, the system relies on an ability to accurately determine how many participants are on the water at any time. Lastly, the cost of such control might be too great a burden in terms of extra policing, markings and education programmes.

6.5 Sensitivity

The purpose of sensitivity testing is to test whether the preferred management option is robust to different values of key assumptions, thereby testing the sensitivity of option choice (MAFF, 1993). The management action is said to be robust if it can successfully deliver the objectives of the plan, regardless of the input. Hence, if the action is sensitive to one or more inputs, it's robustness is questionable.

An action might be successful in meeting objectives in two ways. Firstly, the management action might be based on information so sound that all possible future outcomes can be determined and accounted for. This is improbable and may involve expensive research. Secondly, the management action can be designed so that it is flexible and can accommodate any variation of input by adaptation. However, a distinction must be identified which illustrates the difference between an action which adapts to meet the objectives and an action which is fundamentally changed to meet the objectives.

If we consider the recreational zoning plan as a management action, we can assess its sensitivity. The objective of the plan is the sustainable use of the Harbour by maintaining its attractiveness to the commercial and recreational sector. This attractiveness might be assessed as a notional scale of socio-economic benefits (SEB). Hence, any key assumption into the plan can be varied and the level of

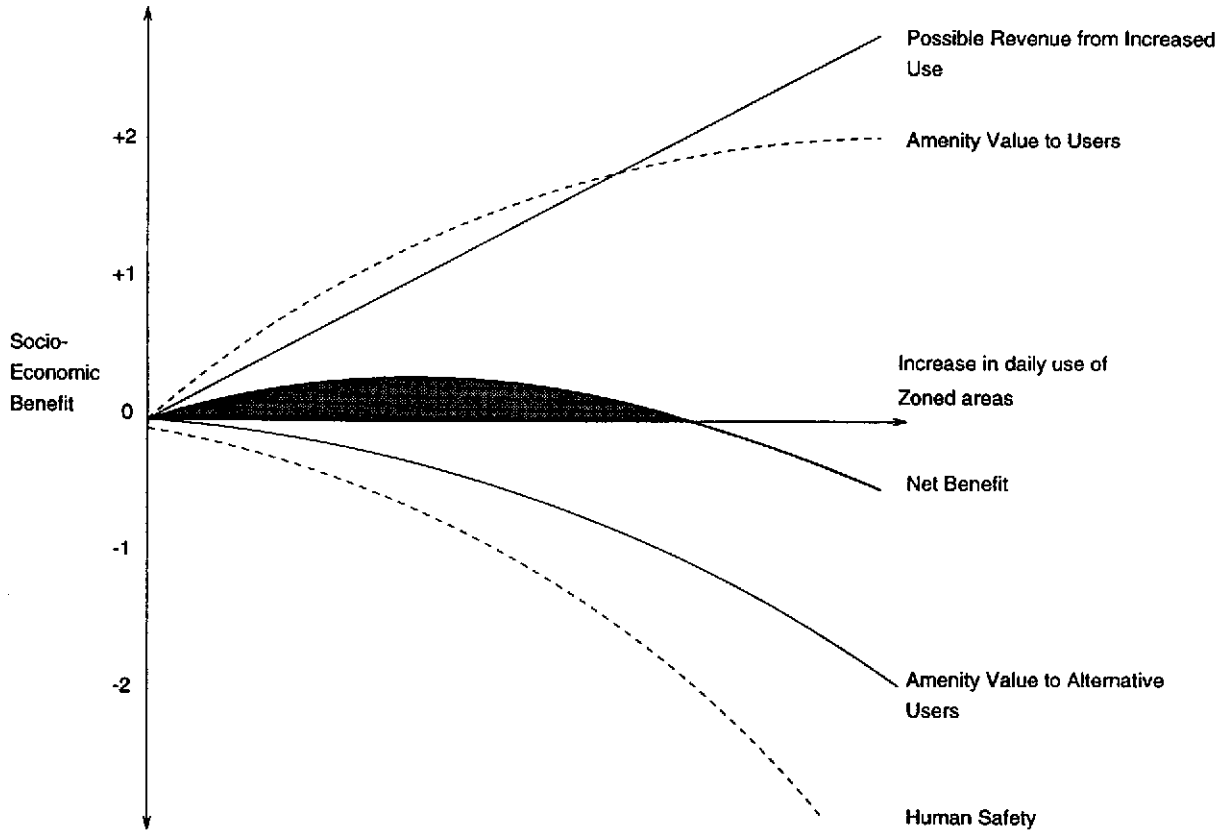

Figure 6.2 Sensitivity of Recreational Zoning Plan to Increased Recreational Use

variations in SEB will determine the plans sensitivity.

Figure 6.2 informally illustrates this approach. Here, the socio-economic values of various effects such as safety and revenue are measured individually on the same scale. Identifying units for the scale would be difficult, and would ultimately rely on qualitative and descriptive judgements. An illustration of net benefit can be estimated which would reflect the respective gradients and significance of each effects. Hence the sensitivity of the action can be illustrated.

Figure 6.2 is an example and reflects a hypothetical situation. From this example it could be suggested that the plan is sensitive to the variation of recreational use. Here, the net benefit is described as a curve which is sensitive to increased activity initially in a positive manner, before becoming negatively sensitive at a certain level of activity. The point at which the net benefit becomes negatively sensitive could represent the carrying capacity of the Harbour. Further, the size and shape of the area described by the net benefit curve above the zero SEB axis can be used to compare the benefits and sensitivity of various plans and inputs. This method would be useful in the development and management processes. This poses the question, 'if the plan was sensitive to an input in a positive way, would this be acceptable?'. In our example, the plan would be deemed to be not robust, but, up to a certain point, *achieves agreater socio-economic benefit than the 'do nothing' option.*

6.6 Flexibility

If the zoning plan aims to deliver the required SEB at all inputs, it must be flexible and, hence, robust. However, there may be an elasticity associated with the flexibility which represents an unacceptable *lag in adapting to change.*

6.6.1 Change process

Sections 11.2 of the PHAMP (PHSG, 1995) identifies the need for the Plan to be a flexible document which will readily adapt to trends in recreation. Further, Section 11.3 of the Plan introduces the Poole Harbour Forum. This will be an annual meeting of invited representatives whose sole purpose will be

to discuss matters arising during the previous season, to identify ways in which the strategy may be improved for the forthcoming season.

The advantages of good communication between all concerned parties cannot be ignored. However, it may be unrealistic to expect a response time of the next season for two reasons.

Firstly, although difficult to document, rational judgement may be influenced by political issues in the decisions making process, even in the presence of appropriate evidence. Secondly, each change in action may require a secondary change in support. Hence a decision to increase the size of a particular zone would increase demand for improvement of the respective access point.

The plan should be considered flexible in that it has initiated a process which can identify possible changes required, however, an appropriate time scale should also be considered to allow for implementation.

6.6.2 Plan optimisation

In approaching the definition of an optimal level of management performance, a cost-benefit methodology may be most useful. The cost associated with modifying a zoning plan includes the cost of extra research, extra publication and the required education initiative. The increase in socio-economic benefit (SEB) may be measured in similar units assuming the indicators used are a truly inelastic reflection of the sector's growth. Hence, an optimal level might be achievable where any further increase in SEB requires a disproportionate increase in investment.

However, it may be invalid to measure SEB in monetary units. If the recreational zoning plan aims to provide amenity to all users of the Harbour, then user group amenity might be a more suitable measure. In this case, the PWC zone may appear unsuitable due to its position relative to its access point. Hence changing the zone and access point might optimise the recreational use of the harbour, although this may then decrease the amenity of local residents. Therefore, plan optimisation in isolation will provide a different level of amenity compared to optimisation of an integrated Harbour plan.

6.7 Conclusion

The aim of this section was twofold. In the first case, the objective was to assess how uncertainty was addressed in the development of the recreational zoning plan. Clearly, areas of uncertainty had been identified in the development process which had been addressed by further research. Importantly, further areas of uncertainty were identified which should be the subject of future research. However, certain areas, such as water quality, were not addressed and this represents an area of neglect.

The question must be asked as to whether any area of uncertainty was subsequently researched adequately. Although the research provided useful information, did it fully address fundamental areas of uncertainty? The determination of a recreational carrying capacity for Poole Harbour illustrates this point. The 1994 research provided data on recreational behaviour and people's perception thereof. But it did not go as far as to say what further capacity the Harbour had for absorbing participation, or what would happen when the capacity was reached.

The assessment of uncertainty was completed by an illustration of the use of risk assessment techniques in addressing uncertainty. This type of analysis was not used in the development of the plan and would be a recommendation for future management initiatives, because it allows the identification of hazards and an assessment of their significance and management. Importantly, this analysis highlights modes of failure which could decrease human safety, an area of obvious importance.

The second objective of this section was to determine the flexibility and sensitivity of the zoning plan. Sensitivity was illustrated by the variation of recreational use and the subsequent effect on various outcomes measured on the same socio-economic scale. This method could be used to address other inputs and allows both a comparison between options and option optimisation.

7 *Investment Analysis*

7.1 Objectives of section

This section will present a documentation of the investment made in developing the PHAMP to enable an appraisal of the financial management of the process. An outline of possible improvements to the success of the plan is provided. These could be achieved by future investment or increased investment during development.

7.2 Method

The investment appraisal is presented as a chronological account of expenditure and income. The information is taken from business plans and should be treated with the appropriate confidentiality. This loosely follows a cost-benefit analysis methodology so that the section concludes with an outline of benefits realised.

The outline of further investment opportunities is based on areas identified in the development of the PHAMP and also on interviews conducted during the research phase of this report.

7.3 Expenditure and funding

The intention of this section is to document the expenditure and funding of the production and implementation of the PHAMP. Although the previous analysis sections have aimed to segregate the recreational zoning plan as a discrete action, it may not be possible to do so here.

The information is presented chronologically and includes figures used in the proposed PHAMP Business Plan.

7.3.1 Pre 1994

Following the earlier identification of a need for such a plan (PHMG, 1987/91), tenders were invited from four consultancies to formulate an Aquatic Management plan suitable to Poole Harbour and

accommodating existing data. The submitted document (Pickering, et al, 1993) was redrafted to complete the PHAMP Consultation Draft. The finance for this stage came from English Nature.

7.3.2 Financial year 1994-95

Estimated expenditure of the Production and implementation of the PHAMP

	£('000)	
Personnel	(16)	(Project Officer)
Consultancy fees		
Wildlife survey	(7)	
Aerial survey	(24)	
Questionnaire survey	(6)	
Administration, publication and contingency	(17)	
TOTAL	**(70)**	

The implementation was funded by:

	£('000)
English Nature Estuaries Initiative	15
Dorset County Council	5
Poole Harbour Commissioners	5
Purbeck District Council	2
Poole Borough Council	3
British Marine Industries Federation	5
Sub-total	**35**
European Commission Atlantis Programme	35
TOTAL	**70**

Notes

The sum funded by English Nature was set aside under the Estuaries Initiative (English Nature, 1993) to support the implementation of the management plan. Previous funding was associated with the production of a plan. Through this initiative, English Nature seeks to act as a catalyst to develop and implement management plans by the provisions of advice and financial support. Their goal is to help prepare plans for 80% (by area) of England's estuaries by the year 2000 (English Nature, 1993).

The sum funded by the European Commission was secured through a bid to the Atlantis Programme as a Wetland Pilot Project. Specifically, the application was to co-fund monitoring the implementation of the zoning plan, seen as the most significant recommendation of the PHAMP. The aim of this project was to identify and test practical methods of ensuring user co-existence. The grant was awarded on a pound for pound basis.

7.3.3 Financial year 1995-96

The following information is taken from the draft Business Plan for the Implementation of PHAMP (PHSG, 1995).

Estimated expenditure of the implementation of the PHAMP

	£('000)
Production and promotion	
of final plan (1995 season)	(7)
Signage around harbour	(7)
Assistant Harbour Master post	
contributions July 95 - March 96	(7)
Project officer	(3)
TOTAL	**(24)**

The implementation was funded by:

	£('000)
Poole Harbour Commissions	5
Dorset County Council	5
Purbeck District Council	1
Poole Borough Council	3
English Nature	10
Sale of management plans (estimate)	1
TOTAL EXPECTED INCOME	**25**

Notes

The cost of the contribution towards the Assistant Harbour Master (AHM) post by Poole Harbour Commissioners includes the monitoring and review of the PHAMP. The funding of a project officer was the continuation of that post until May 1995. Project targets which are identified as being undertaken by the Poole Harbour Core Group appear to be uncosted. These targets include : setting up methods for monitoring recreational activity; begin review of Harbour Management Policies; and begin review of management of Harbour hinterland.

7.3.4 Financial year 1996-97

The total expected expenditure for this period is £26,000. The largest area of perceived spending is in improvement of access control where PHC are expected to contribute to implementation, signage and due collection facilities. It is intended that these facilities will then be self-financing. The continuing contribution of the AHM represents a further significant contribution and includes the ongoing monitoring and review of the management plan.

However, at present, this expenditure is not fully funded and a significant amount remains to be raised from constituent organisations.

7.4 Benefits from investment

Obviously, the expected benefits from the development and implementation of the PHAMP are the successful achievement of the objectives. Hence, the benefit should be considered as the maintained sustainable use of the Poole Harbour. Specifically, the benefits from the recreational zoning plan are the safety and continued amenity to all recreational users of Poole Harbour. Although these benefits may not be immediately realised other benefits have been identified and realised.

a) The process of developing the PHAMP has involved the collection of previously unknown data through survey work. The process has also involved increased communication between users and policy makers through consultation and fora. Hence, the foundation for future sound management of the Harbour has hopefully been established merely through the process of developing the PHAMP, and not necessarily through the recommendations of the Plan.

b) The implementation of a recreational zoning plan is more attractive to possible sources of funding than other, less tangible management processes. Sources of funding, such as the European Commission, may be more willing to fund such a finite process.

c) Future management decisions may be assisted by the existence of a management strategy or framework. Hence, the cost of lengthy negotiation may be avoided.

d) Any future obligation to implement a management plan for the Harbour is removed. The development of a shore-side management plan will now be required to accommodate the PHAMP, and not vice versa. Hence, Poole Harbour Steering Group have successfully completed their objectives on their own terms.

7.5 Further investment

The likelihood of obtaining future funding for work associated with the PHAMP has not been assessed. The outlined budgets in the previous section illustrate a decrease in funding from the European Commission and English Nature and possible difficulties securing funding from the constituent local authorities. However, there may be sufficient funding to meet the business plans objectives through the introduction of self-financing sectors and the possible integration with other management plans.

Areas which should be the subject of future research have been identified in the PHAMP process. These areas will be outlined below, as will possible future investment opportunities not indicated.

7.5.1 Identified future investment

It is recommended in the PHAMP that the aerial survey of density and dispersal of craft be repeated after a period of 3 years, or whenever the numbers of craft on the Harbour appear concerning. It is hoped the survey methodology can be precisely duplicated in future to allow for continuous monitoring. However, it is unclear where funding for this particularly expensive process will come from and hence its frequent repetition is debateable. The user questionnaire survey is also recommended to be repeated in future years.

Although the birdlife is regularly monitored as part of the Wetland Bird Survey, further studies of recreational disturbance may be required. The RSPB suggest these studies are focused on areas identified as being the most likely to suffer significant disturbance (RSPB, 1994).

Although the ultimate aim of full integration of Harbour management strategies is an important area of future work, it is unclear whether this will be funded discretely.

7.5.2 Other opportunities

An assessment of the effectiveness of different control options has not occurred. The recreational zoning plan is controlled by bye-law introduction which is enforced by PHC and Police patrols on the water. However, a cost-benefit analysis of other options has not been fully considered.

Other options centre on the ideas of groups of users self-policing their activities. This might be facilitated by national or regional bodies adopting codes of good practice as illustrated by the Poole Harbour Waterski Association.

A programme of registrations would aid the self-policing initiative and also ease PHC and Police patrol workloads. Such a programme could be jointly funded with other organisations, although the author

is aware of differing opinions throughout the marine sector. The BMIF are adopting a system of registration due to be launched in September 1995.

Whatever option is considered, any further investment must be assessed on it's likely affect on the success of the zoning plan. Increased information may be useful, but if it is unlikely to improve the management of the harbour then it's requirement should be fully justified. Hence, although future investment should occur to maintain the effectiveness of the zoning plan, any option should be appropriately assessed before-hand.

7.6 Conclusion

The aim of this section was twofold. Initially, the objective was to document the investment made in developing the PHAMP through a chronological account of it's financial management. From this it is clear that PHSG have been successful in obtaining funding from various organisations. Further, the development of a business plan will identify future shortfalls in funding which can be addressed immediately. This is standard management practice and no more than would be expected.

The second objective of this section was to outline possible areas of future investment. Included in the PHAMP are areas identified for further research which would add to our knowledge and provide current data to enable monitoring. However, research into more efficient control of the recreational zones was not identified and would be beneficial, especially if future funding is decreased. Options for policing and regulating should be identified and compared using cost and effectiveness criteria. It was also concluded that although further research on disturbance and recreational activity would be useful, it should be assessed on a cost/benefit basis before commencement.

8 Conclusions

1. Through analysis of the decision making process which resulted in the adoption of a recreational zoning plan, it is clear that no consistent methodology was practised throughout. The decision to adopt a zoning plan was not the result of a comparison of management options and, further, the methodology used in the design of individual zones is not transparent.

2. The consultation exercise in conjunction with further research in 1994 appears to have addressed the information uncertainties from the consultation draft of the PHAMP. The zoning plan was implemented on ill-funded data because the 1994 research showed that the previously assumed harbour conditions did not exist at present. However, they may exist in the future and so a zoning plan should be continued to accommodate this eventuality.

3. By assessing how uncertainty was addressed in the development of the recreational zoning plan, it is clear that areas of uncertainty have been identified and addressed by further research. Further areas of uncertainty were identified for future research although other areas, such as water quality, appear to be neglected.

4. The use of risk assessment and sensitivity analysis techniques should be recommended for future management initiatives. These methods allow for both the identification and management of hazards as well as the comparison of different management options.

5. The benefits from the implementation of a recreational zoning plan are the safety and continued amenity to recreational users. Although these benefits may not be immediately realised, other benefits have been identified and realised. These benefits include:

    - the process of developing a plan involves increased communications and collection of previously unknown data
    - the implementation of a zoning plan is attractive to possible sources of funding

- future management decisions will be assisted by the existence of a management strategy or framework.

6. PHSG have been successful in obtaining funding from various organisations and the development of a business plan will enable future financial management.

7. Research into more efficient control of the recreational zones would be beneficial. Options for policing and regulating should be identified and compared using cost and effectiveness criteria. Although further research on disturbance and recreational activity would be useful, any research should be assessed on a cost/benefit basis before commencement.

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Annex

Summary of Legal Issues

The legal status of an estuary is governed by a combination of local and national legislation, common law, European Community law and international law. The foreshore and bed of estuaries are either Crown property or may have passed into private ownership through Crown grants since the early Middle Ages. Property rights, however, can be complicated, obscure and subject to dispute. Independent of ownership, the public enjoy common law rights of navigation and fishery throughout estuarial waters. Jurisdiction over activities in estuaries is divided among a wide range of official bodies, each governed by its own legislation. In addition to general Acts of Parliament and statutory instruments, there are local Acts and orders conferring special powers and duties (particularly in relation to local authorities and harbour authorities), and many bodies also have the right to make subordinate local legislation in the form of byelaws. European Community law is increasingly important in the coastal zone, especially in the context of fisheries, conservation and environmental assessment. In addition, international treaties deal with sovereignty over coastal resources and with the protection of the marine environment. These areas are discussed in the following paragraphs.

1. Ownership

The foreshore is legally defined as the land between the high and low water marks of mean tides. In principle, the foreshore belongs to the Crown, and is administered by the Crown Estate Commissioners (CEC). However, in many places the foreshore has historically been given by the Crown to its subjects, and only about half the foreshore in England still remains Crown property. The CEC also own the sea bed beyond mean low water mark as far as the 12-mile limit of the territorial sea. Petroleum under the foreshore, territorial sea bed and continental shelf is vested in the Department of Trade and Industry, and submarine coal belongs to British Coal.

Ownership of the foreshore of sea bed applies only to the soil and does not confer property rights over the superjacent waters. Instead, the public have general rights to navigate and fish through the tidal waters. Public activities on the foreshore, apart from navigation and fishing, are not normally based on legal rights but they are often tolerated by the proprietor (English Nature, 1993).

The foreshore in Poole Harbour is of mixed ownership. The CEC have rights in half of Lytchett Bay and the southern and western margins of the Harbour. The remaining foreshore on the Northern margins is under the ownership of the Poole Harbour Commissioners (PHC), Poole Borough Council and private interests. The half of Lytchett Bay not under CEC ownership belongs to the Lees Estate (PHSG, 1995).

2. Planning

The planning system is administered by local planning authorities and cannot extend outside local government areas. Under the Local Government Act 1972, section 72, the ordinary seaward boundary of local government areas on the coast is the mean low water mark, although in a few places they have been extended further out to sea by historic charter or local legislation.

Even where local government areas extend outside low water mark, it is now generally considered that planning control cannot be exercised beyond that point. The Planning Policy Guidance Note on Coastal Planning (PPG20) states that decisions on development proposals below mean low water mark are generally outside the scope of the planning system.

PPG20 states that local planning authorities should recognise that onshore development can often have an impact offshore and should take this into account when making planning decisions. On the other hand, while planning authorities can take account of the effect of marine activities on landward areas, they have little influence over them. Further, many coastal developments span the mean low water mark, and their seaward portions are artificially excluded from planning control.

The traditional adoption of river boundaries between local government areas means that many estuaries are divided among several planning authorities. The Town and County Planning (Development Plan) Regulations 1991 require a local planning authority to consult with all other local planning authorities in or adjacent to its area before a draft development plan is placed on deposit. This should help to ensure that the policies adopted in the statutory development plans of each authority are compatible in relation to a common estuary. However, because the Planning and Compensation Act 1991 now imposes a statutory requirement on each district council to prepare a single local plan covering the whole of its area, it is no longer possible to produce a statutory subject plan relating solely to an estuary.

Although PPG20 advises that local planning authorities and other agencies and interest groups may cooperate to prepare estuary or coastal management plans, such plans can only be non-statutory. This means that they can have no legally prescriptive status under the new section 54A of the Town and Country Planning Act 1990, whereby planning decisions must now be made in accordance with statutory development plans (unless material considerations indicate otherwise). However, the same result could be achieved if planning authorities amended their statutory district-wide local plans to include corresponding provisions (English Nature, 1993).

With respect to Poole Harbour, Dorset County Council is the strategic planning authority for the county and produces the County Structure Plan. Purbeck District Council and Poole Borough Council are the local planning agencies for the southern and northern margins of the Harbour respectively.

3. Byelaws

Byelaws are local regulations made by public authorities under statutory powers, and normally require confirmation by a Government minister. They are a form of delegated legislation, which allows the imposition of local control enforceable by criminal penalties, and provides a faster and more flexible procedure than central Government action.

Although this is a wide power, it is of limited value for the purpose of estuary management (English Nature, 1993). Although restrictions on the common law right of navigation would probably be deemed unreasonable in the absence of express statutory authority, the imposition of byelaws in Poole Harbour in 1993 allowed the implementation of the PHAMP recreational zoning plan (PHSG, 1994).

4. Coast protection and flood defence

District councils are coast protection authorities responsible for coast protection under the Coast Protection Act 1949. Their jurisdiction is largely confined to stretches of open coastline, and does not extend inland beyond defined lines near the mouths of rivers. District Councils, in addition to their coast protection functions, have permissive powers to undertake sea defence works in their area under Land Drainage Legislation. In practice, District Councils often carry out both coast protection and sea defence functions within major urban coastal areas.

The National Rivers Authority (NRA) has responsibility for flood defence throughout England and Wales under the Water Resources Act 1991 and the Land Drainage Act 1991. Its functions are discharged by regional flood defence committees. It also has a general duty under the Water Resources Act to promote environmental protection in so far that it is compatible with its statutory objectives. Non-statutory agreements determine the division of functions where coast protection authorities and the NRA overlap, and the Ministry of Agriculture, Fisheries and Food exercise central government supervision over both bodies. The functions of the NRA are expected to be transferred to the Environment Agency (English Nature, 1993).

5. Conservation

Most of the current legal designations for nature conservation are intended for the protection of land areas, and are not well-suited to integrated estuary management. National and Local Nature Reserves under the National Parks and Access to the Countryside Act 1949 and Sites of Special Scientific Interest under the Wildlife and Countryside Act 1981, are limited to areas above the mean low water mark, and cannot be enforced over the sub-tidal parts of estuaries. Since status as a Site of Special Scientific Interest is treated as a pre-condition for the establishment of a Special Protection Area (SPA) under the EC Birds Directive or for designation under the Ramsar Convention on Wetlands, these European and international measures are only applied down to the mean low water mark. The primary legal mechanism available beyond that line is the Marine Nature Reserve under the Wildlife and Countryside Act 1981, which is applicable from high water mark to the 3-mile limit (or within territorial waters by an Order in Council), but has been found difficult to implement in practice. Areas of Special Protection for Birds under Section 3 of the Wildlife and Countryside Act 1981, have been created to control activities below low water mark which, otherwise, would have caused excessive disturbance to breeding birds (English Nature, 1993).

6. Water quality

The NRA has statutory responsibility for the regulation of water quality in estuaries and coastal waters under the Water Resources Act 1991. Its jurisdiction for this purpose covers all water up to three miles from the baseline of the territorial sea. In performing this function, the NRA is subject to EC Directives, in particular those on dangerous substances, bathing water quality, shellfish waters and urban waste

water treatment. The NRA authorises discharges into estuaries and coastal waters from the land through pipelines, including those pipelines which extend beyond the three mile limit (English Nature, 1993). In Poole Harbour, pollution from ships is the responsibility of the PHC (Curtis, 1995).

7. Fisheries

The European Community has ultimate authority over fisheries, but national policy is administered by the Ministry of Agriculture, Fisheries and Food. At local level, there are 12 sea fisheries committees around the coast, which function under the Sea Fisheries Regulation Act 1966, and make and enforce byelaws for the regulation of fishing for sea fish. The local orders constituting the committees identify lines near the mouths of rivers, upstream from which the powers of a sea fisheries committee are exercised instead by the NRA. Sea fisheries committees are mainly concerned with commercial species of white fish and shellfish, the control of fishing for salmon, sea trout and eels is primarily the responsibility of the NRA (English Nature, 1993).

8. Navigation

Within many estuaries, there are harbour authorities with statutory responsibilities for navigation. Each harbour authority is governed by its own local legislation, which takes the form either of local Acts or of harbour revision or empowerment orders made under the Harbours Act 1964. *The Transport and* Works Act 1992 has imposed a statutory duty on all harbour authorities to take environmental considerations into account when deciding on the exercise of their functions. In addition, this Act now enables harbour revision orders to confer powers and duties on harbour authorities for nature conservation, including the power to make byelaws for that purpose. This widens the potential role of harbour authorities in estuary management, although it depends on their willingness to apply to the Department of Transport for a revision order. In areas where there is no harbour authority, the National Rivers Authority has powers under Schedule 25 of the Water Resources Act 1991 to make byelaws regulating the use of navigable waters and associated land (English Nature, 1993). PHC exercise navigational control of Poole Harbour's waters and have the power to create byelaws and issue licences to control Harbour activities.

9. Wildfowling

The Firearms Act 1968 (as amended) makes it a criminal offence for a person who has a firearm with him to enter, or be on, any land including foreshore as a trespasser and without reasonable excuse. There is no public right to wildfowl on England's estuaries, and wildfowling clubs must take leases of estuarine areas to facilitate this activity (British Association for Shooting and Conservation, 1991).

10. Legal options for estuary management

Estuary management using existing legal powers will necessarily be subject to the limitations described in the preceding sections. The avoidance of those limitations would require legislation. The following are the principal legislative options.

10.1 Joint local authority action

The Local Government Act 1972 allows two or more local authorities to arrange for almost any of their functions to be discharged jointly, and they may also delegate those functions to joint committees. This applies to county, district and parish councils.

These powers could be used to enable local authorities to co-operate formally in the exercise of their existing legal functions in estuaries. The provision for joint executive committees and advisory committees would also enable other organisations to be involved in estuarial management. However, joint action does not enlarge the scope of local authorities regulatory powers in the coastal zone, and would thus be subject to the same deficiencies, particularly in relation to planning control and byelaws (English Nature, 1993).

10.2 Transfer to the National Rivers Authority

The Water Resources Act 1991, Schedule 2, empowers the NRA to apply to the Secretary of State for the Environment and the Minister of Agriculture, Fisheries and Food for an order transferring to it any of the functions of a navigation, harbour or conservancy authority. A transfer of functions can also be effected by mutual agreement. This would enable the National Rivers Authority to take over statutory responsibility for the conservancy of an estuary and the control of navigation from an existing harbour authority. However, this option only involves a redistribution of responsibilities rather than the creation of new ones (English Nature, 1993).

10.3 Harbour Revisions and Empowerment Orders

The Harbours Act 1964, section 14, provides a procedure whereby harbour revision orders modifying the functions of a harbour authority can be made by the Secretary of State for Transport. The Transport and Works Act 1992 simplified the procedure for obtaining a harbour revision order. Such an order could be used to amend the constitution of an existing harbour authority in order to improve its role in estuary management, for example by widening the representative structure of its decision-making or by conferring the power to make byelaws for nature conservation purposes.

Section 16 of the Harbours Act 1964 provides a corresponding procedure for "harbour empowerment orders" to create a new harbour authority where either none previously existing or existing powers are insufficient. This could be used to set up a new harbour authority to administer a previously *unregulated estuary.*

10.4 Private Bills

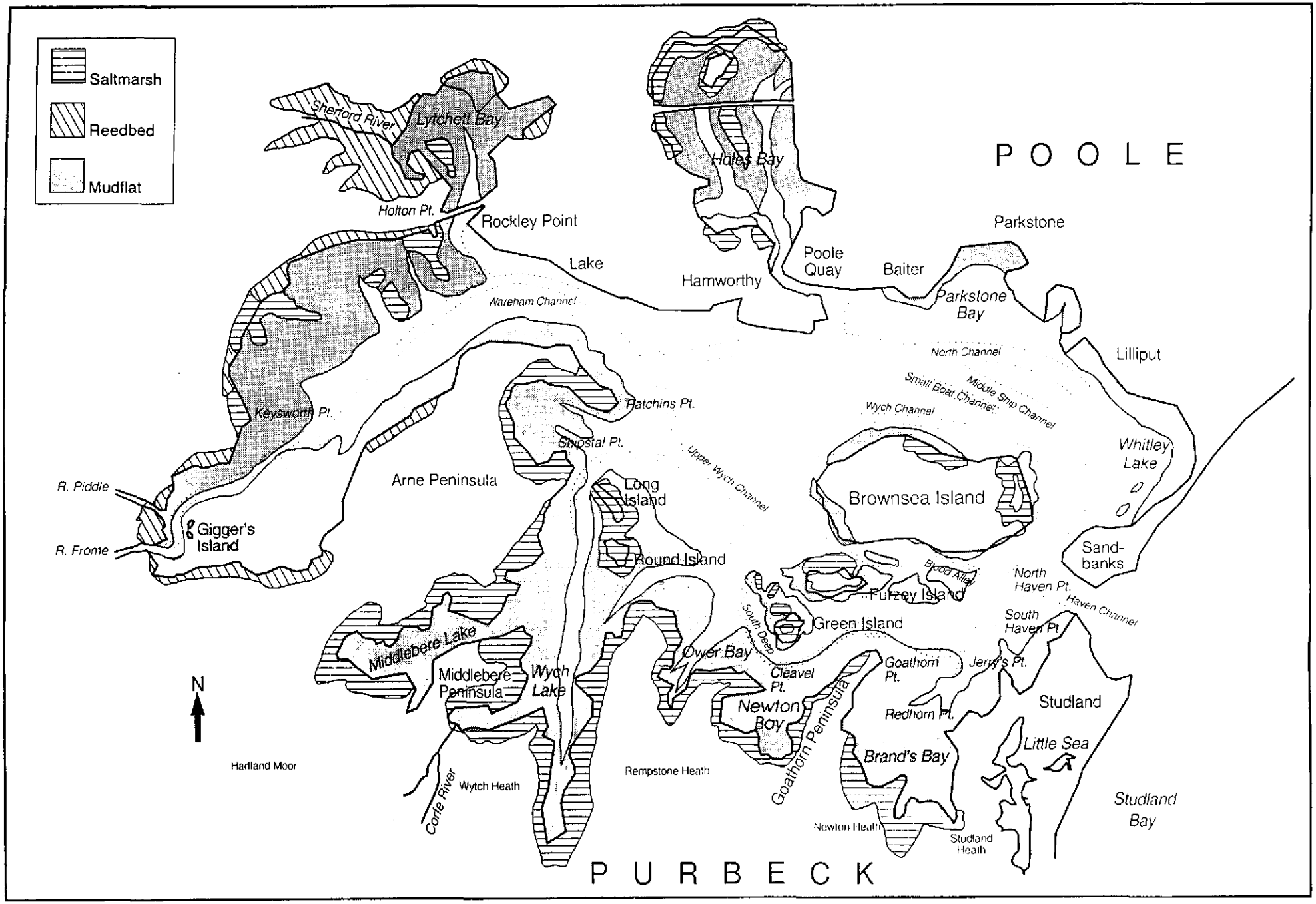
Private legislation is a means of conferring particular powers or benefits on persons or bodies that are not available to them under the general law. It also provides a procedure whereby public authorities can amend the effect of general legislation in a local area. It can thus be used to remove some of the limitations of the existing law for estuary management or facilitate the establishment of a new statutory body to manage an estuary. However, a private bill must be limited to purposes that cannot be achieved by other legal means, and it could therefore be rejected by a parliamentary committee if, for example, it sought to duplicate provisions within the potential scope of a harbour revision or empowerment order (English Nature, 1993).

Appendices

Appendix 1

A map illustrating the morphology of Poole Harbour.

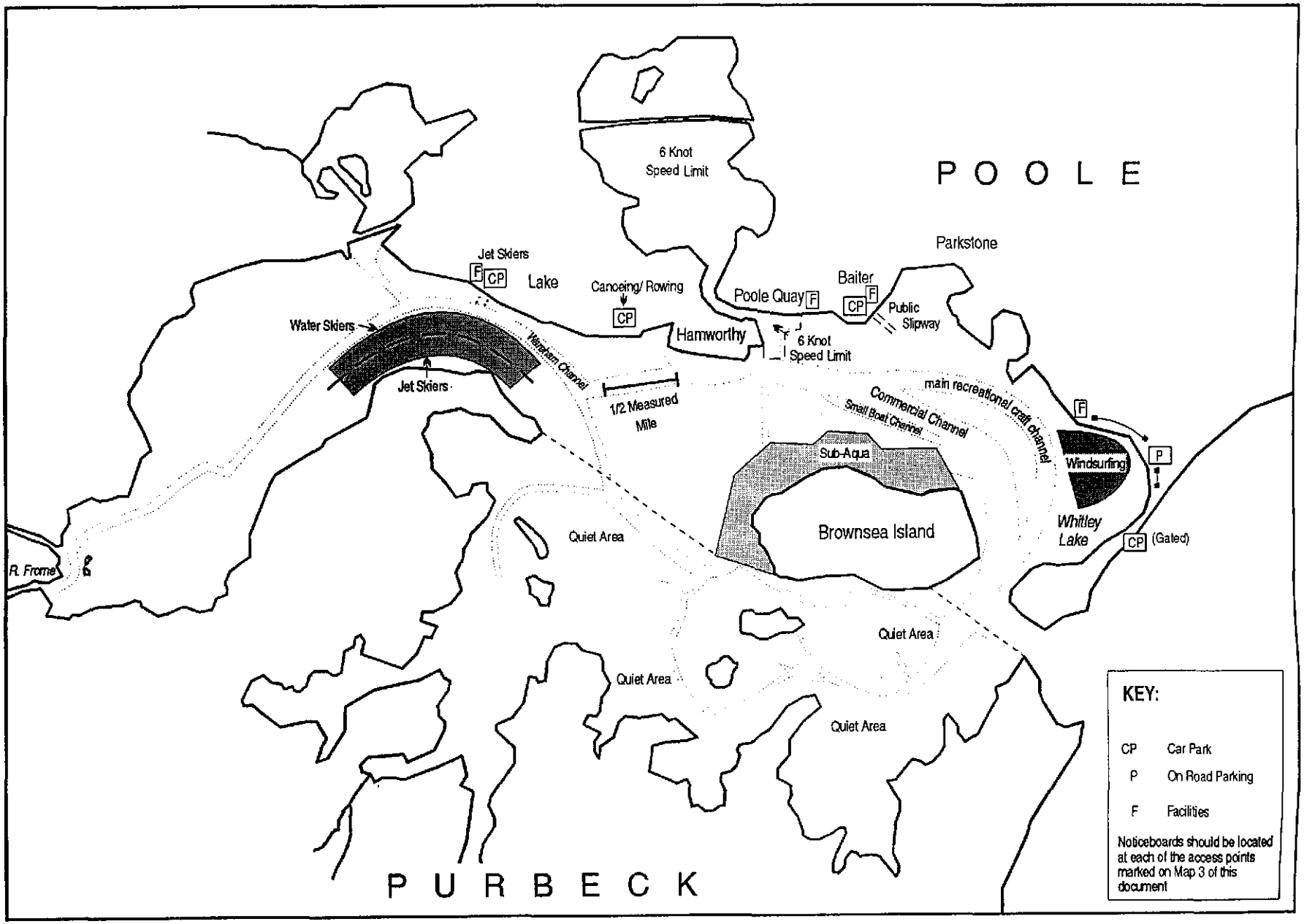
(source: PHSG, 1995)


Saltmarsh
Reedbed
Mudflat
POOLE
PURBECK
Sherford River
Lytchett Bay
Holton Pt.
Holes Bay
Rockley Point
Lake
Hamworthy
Poole Quay
Baiter
Parkstone
Parkstone Bay
Lilliput
Wareham Channel
North Channel
Small Boat Channel
Middle Ship Channel
Wych Channel
Keysworth Pt.
Patchins Pt.
Shipstal Pt.
Upper Wych Channel
Arne Peninsula
Long Island
Brownsea Island
Whitley Lake
R. Piddle
R. Frome
Gigger's Island
Round Island
Sand-banks
Blood Alley
Furzey Island
North Haven Pt.
Haven Channel
South Haven Pt.
Green Island
South Deep
Middlebere Lake
Middlebere Peninsula
Wych Lake
Ower Bay
Cleavel Pt.
Goathorn Pt.
Jerry's Pt.
Newton Bay
Goathorn Peninsula
Redhorn Pt.
Studland
Little Sea
Brand's Bay
Studland Bay
N
Hartland Moor
Corfe River
Wytch Heath
Rempstone Heath
Newton Heath
Studland Heath

Appendix 2

The recreational zoning plan proposed in the first draft of the PHAMP.

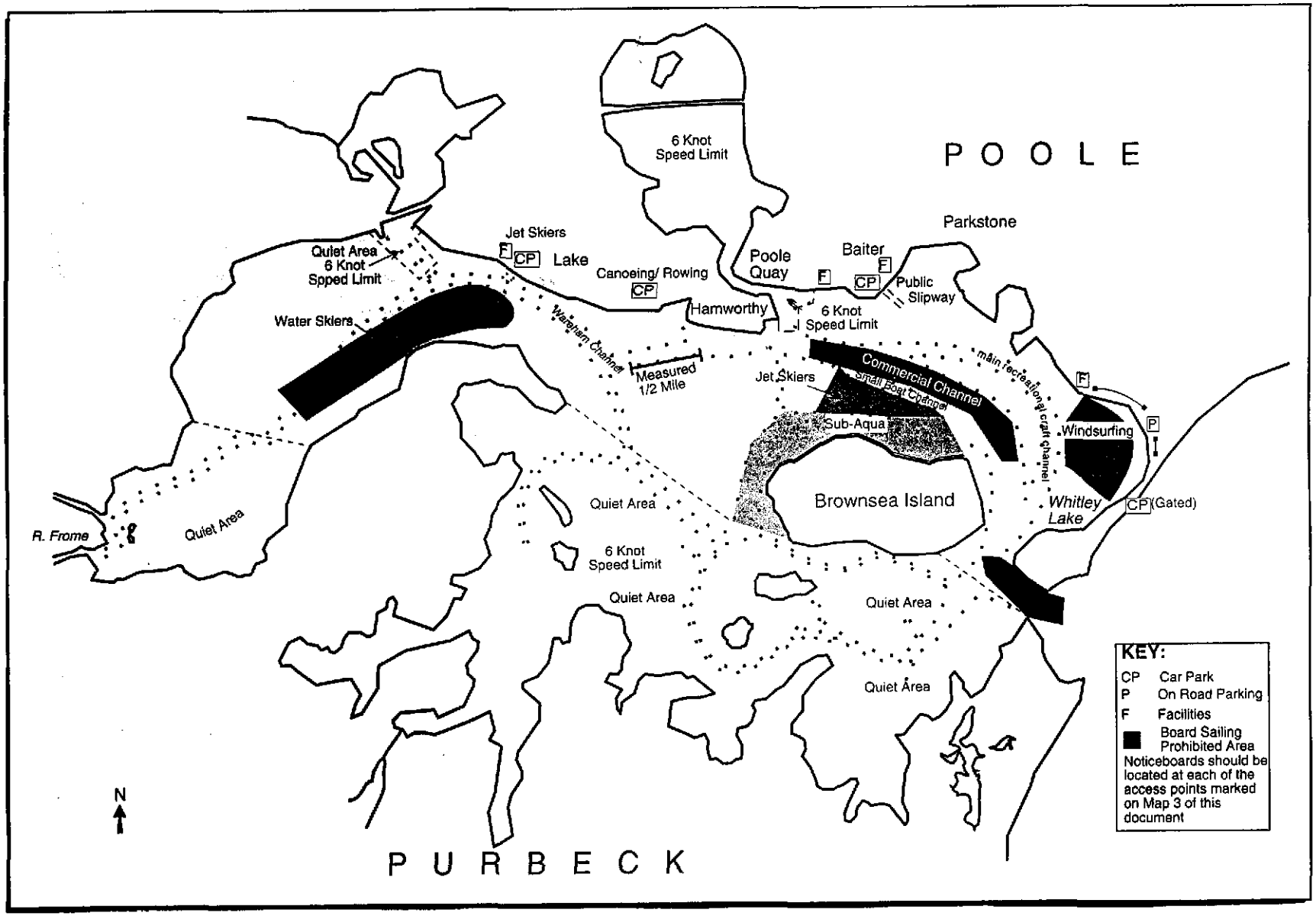
(source: Pickering, et al, 1993)


POOLE
PURBECK
6 Knot
Speed Limit
Parkstone
Jet Skiers
F
CP
Lake
Canoeing/ Rowing
CP
Poole Quay
F
Baiter
F
CP
Public
Slipway
Water Skiers
Wareham Channel
Hamworthy
6 Knot
Speed Limit
Jet Skiers
1/2 Measured
Mile
main recreational craft channel
Commercial Channel
Small Boat Channel
F
Sub-Aqua
Windsurfing
P
Brownsea Island
Whitley
Lake
CP
(Gated)
R. Frome
Quiet Area
Quiet Area
Quiet Area
Quiet Area
KEY:
CP Car Park
P On Road Parking
F Facilities
Noticeboards should be located at each of the access points marked on Map 3 of this document

Appendix 3

The recreational zoning plan proposed in the Consultation Draft of the PHAMP.

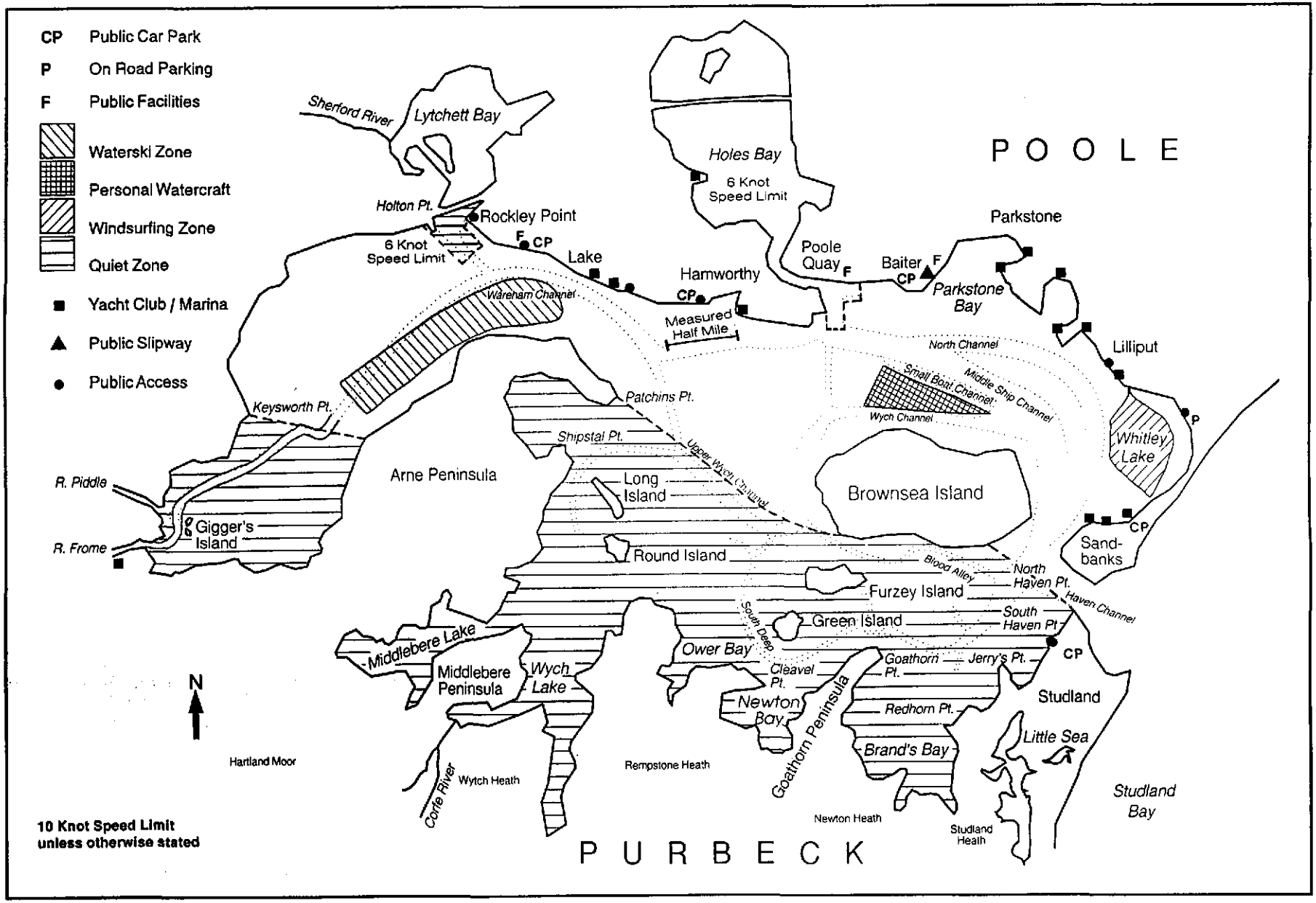
(source: PHSG, 1994)


POOLE
PURBECK
6 Knot Speed Limit
Parkstone
Jet Skiers
Quiet Area
6 Knot Spped Limit
Lake
Canoeing/ Rowing
Poole Quay
Baiter
Public Slipway
Water Skiers
Wareham Channel
Measured 1/2 Mile
Hamworthy
6 Knot Speed Limit
Jet Skiers
Commercial Channel
Small Boat Channel
main recreational craft channel
Sub-Aqua
Windsurfing
Brownsea Island
Whitley Lake
(Gated)
R. Frome
Quiet Area
Quiet Area
6 Knot Speed Limit
Quiet Area
Quiet Area
Quiet Area
N
KEY:
CP Car Park
P On Road Parking
F Facilities
Board Sailing Prohibited Area
Noticeboards should be located at each of the access points marked on Map 3 of this document

Appendix 4

The recreational zoning plan proposed in the current draft of the PHAMP.

(source: PHSG, 1995)


CP Public Car Park
P On Road Parking
F Public Facilities
Waterski Zone
Personal Watercraft
Windsurfing Zone
Quiet Zone
Yacht Club / Marina
Public Slipway
Public Access
POOLE
Sherford River
Lytchett Bay
Holton Pt.
Rockley Point
F CP
6 Knot Speed Limit
Lake
Holes Bay
6 Knot Speed Limit
Poole Quay F
Baiter F CP
Parkstone
Parkstone Bay
Harnworthy CP
Wareham Channel
Measured Half Mile
North Channel
Small Boat Channel
Middle Ship Channel
Wych Channel
Lilliput
P
Whitley Lake
Keysworth Pt.
Patchins Pt.
Shipstal Pt.
Upper Wych Channel
Arne Peninsula
Long Island
Brownsea Island
R. Piddle
R. Frome
Gigger's Island
Round Island
Blood Alley
North Haven Pt.
Furzey Island
Haven Channel
Sand-banks
CP
South Haven Pt
Green Island
South Deep
Middlebere Lake
Middlebere Peninsula
Wych Lake
Ower Bay
Cleavel Pt.
Goathorn Pt.
Jerry's Pt.
CP
Studland
Newton Bay
Goathorn Peninsula
Redhorn Pt.
Brand's Bay
Little Sea
Studland Bay
N
Hartland Moor
Corfe River
Wytch Heath
Rempstone Heath
Newton Heath
Studland Heath
10 Knot Speed Limit unless otherwise stated
PURBECK

Appendix 5

Figures from the aerial survey of waterborne craft undertaken in the summer of 1994.

(source: ERGO, 1994)

Figure 4: Numbers of Major Types of Craft in Harbour

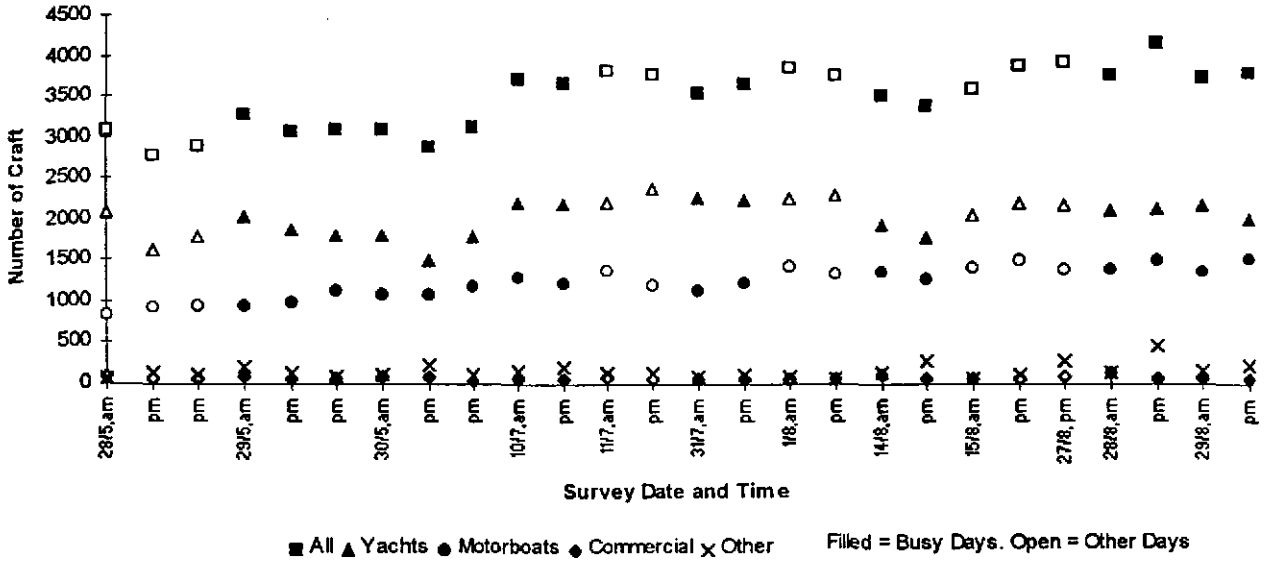


Figure 5: Numbers of Minor Craft in Harbour

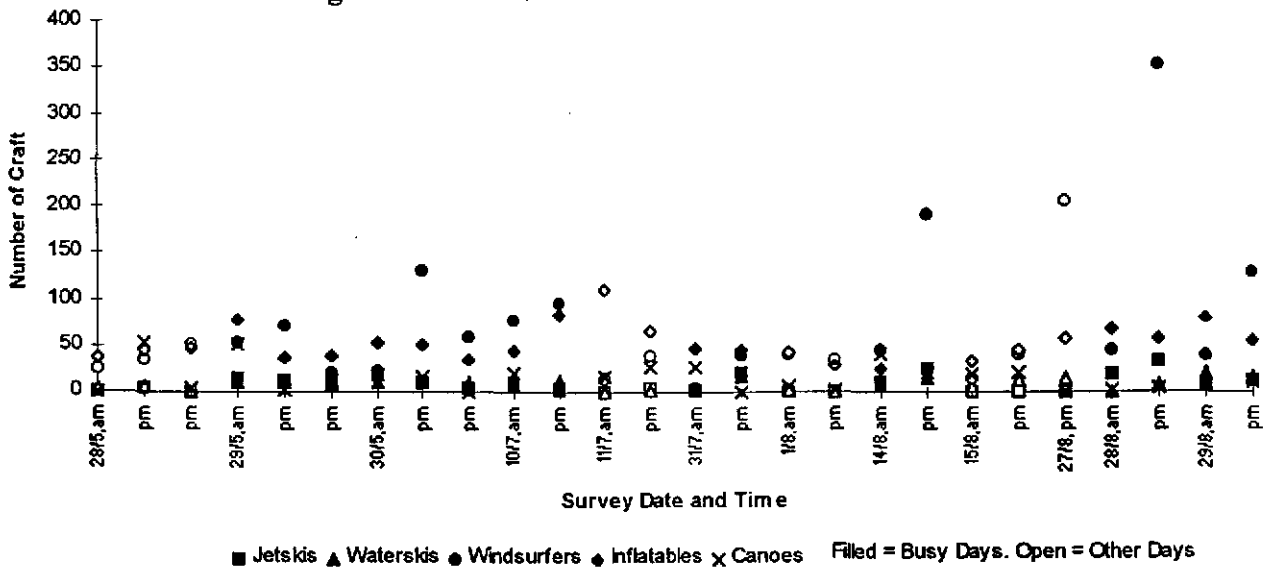
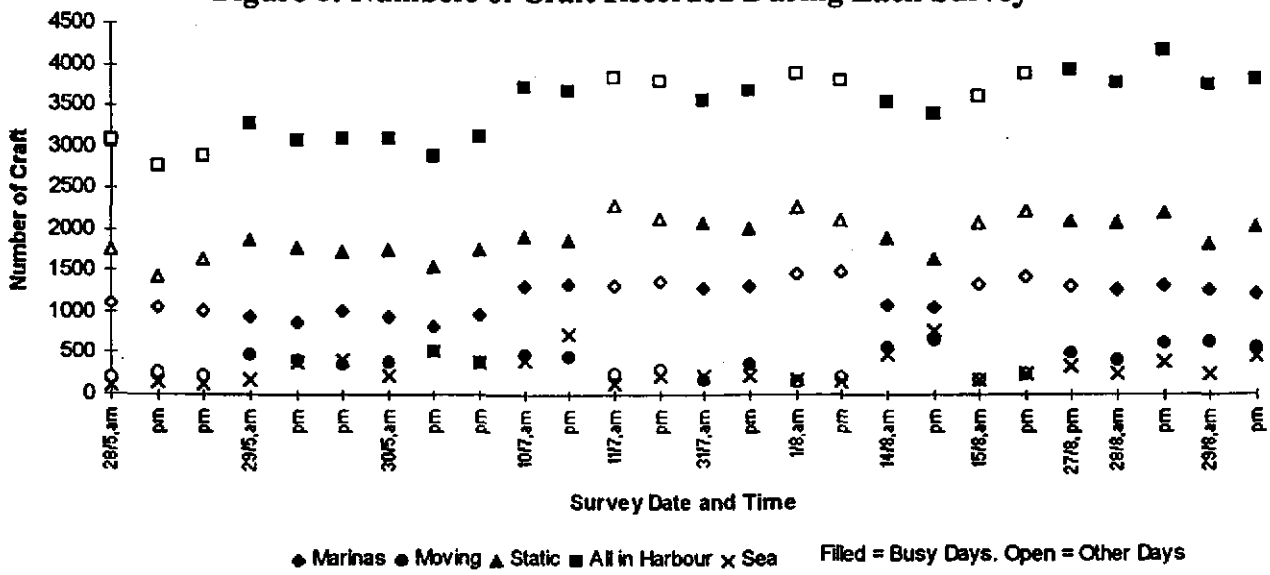


Figure 6: Numbers of Craft Recorded During Each Survey



Appendix 6

Poole Harbour – A review of management planning

(unpublished paper)

POOLE HARBOUR - A REVIEW OF MANAGEMENT PLANNING

Ms R. Fairgrieve [1] & Dr P.H. Sterling [2]

1.0 SUMMARY

Poole Harbour is one of the world's largest natural harbours. It is of international importance for wildlife and contains a commercial port as well as being a major base for recreational activity. There is thus considerable potential for conflict between interests and the environment.

Specific Harbour management policies have been formulated since the late 1970s, although they have only more recently been adopted by planning authorities and only control development to the mean low water mark. In 1994 a management plan which covered the recreational activity on the open water was launched for public consultation. Following the granting of new byelaws to the Poole Harbour Commissioners, speed limits now operate throughout the harbour except in specified zones to allow particular motorised water sports to continue. The outcome of the consultation process and evaluation of the trial zoning are unfortunately unavailable for inclusion in this presentation, but are awaited with keen interest.

There has been a notably high degree of joint working and consultation since the late 1970s between the regulatory bodies and interest groups involved in the Harbour. Management groups have thus far involved mainly regulatory bodies, though user and commercial interests are likely to become more involved in the management process as the need to regulate the use of the Harbour increases. Perhaps the greatest challenge is to understand how to effect the sustainable management of the Harbour. As yet we do not fully understand the impact of activities on one another and the environment, and neither do we know if we can sensibly define the capacity of the Harbour to absorb change in activity without detriment to its existing interests.

2.0 THE CURRENT SITUATION

Management of the coast is very much in vogue, with conservation bodies such as WWF [1], RSPB [2], English Nature [3], local government in Dorset [4] and also central Government [5,6] all producing information and guidelines on how coastal issues should be tackled. For example: paragraph 4.17 of the PPG states: "For estuaries local authorities and other agencies and interest groups may co-operate to prepare estuary management plans".

At the local level in Poole Harbour we are running at least in tandem, if not ahead of such advice. In 1988 a Management Group of officers from the County, relevant District and Borough Councils, Poole Harbour Commissioners, English Nature (then NCC) and other statutory organisations produced the Poole Harbour Management Policies, which were amended in 1991 [7]. As well as providing an overall strategy for Poole Harbour, the Policies provided guidance for the planning and management of the Harbour's margins and a set of policies for adoption within the statutory Local Plans.

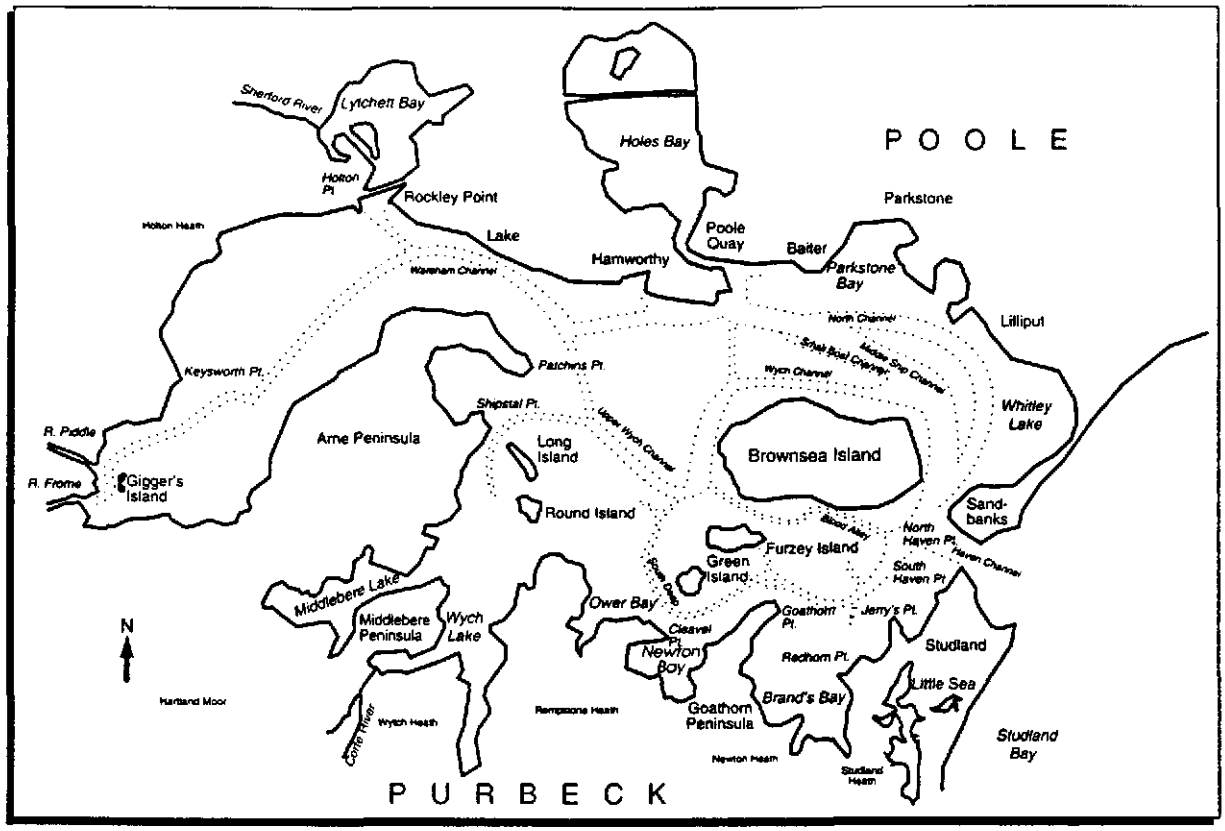
It was recognised that this first step should be followed up by a comprehensive plan for the water area and this year the Poole Harbour Aquatic Management Plan (consultation draft) was launched [8]. This document provides the rationale behind the need for certain recreational activities to be zoned within the Harbour, not only to protect other users, but to limit disturbance to wildlife.

Thus today in Poole Harbour there are local plan policies governing shoreline development, and byelaws to regulate water happens on the open water monitored by PHC. Whilst this is no guarantee of sustainable activity in the Harbour, it is certainly a start in the right direction and demonstrates what can be achieved through joint working of organisations.

3.0 THE VALUE OF THE HARBOUR

Map 1 shows the principle places in and around Poole Harbour. As well as providing a large and beautiful natural resource for exploitation by humans and wildlife, the Harbour sits in a magnificent landscape below the Purbeck hills and adjoining the lowland heathland.This section provides the briefest of resume of that value; further details can be found in the Aquatic Management Plan [8].

Map 1 Poole Harbour



(Source: OS Landranger 195, Admiralty Chart 2611)

3.1 Geology and hydrological setting

Poole Harbour forms part of the Hampshire Basin and consists of Bagshot Bed sands, gravels and clays overlying chalk. The beach material these have given rise to include muds, sands, shingle and boulders. The raised islands including Brownsea are what remains of former high ground isolated as sea level rose and broke through the Basin.

In terms of hydrology, four main rivers flow into the Harbour, though their total freshwater input is small. They carry little sediment the majority of which is derived and deposited from tidal currents. For complicated reasons the tidal regime is unique in the Harbour. There is a double high tide which means that water covers the sands and muds for several hours longer each tide than it would do under a single tide regime. The combination of substrate and water regime have led to the development of substantial areas of mudflats, saltmarsh and reedbed.

3.2 Wildlife

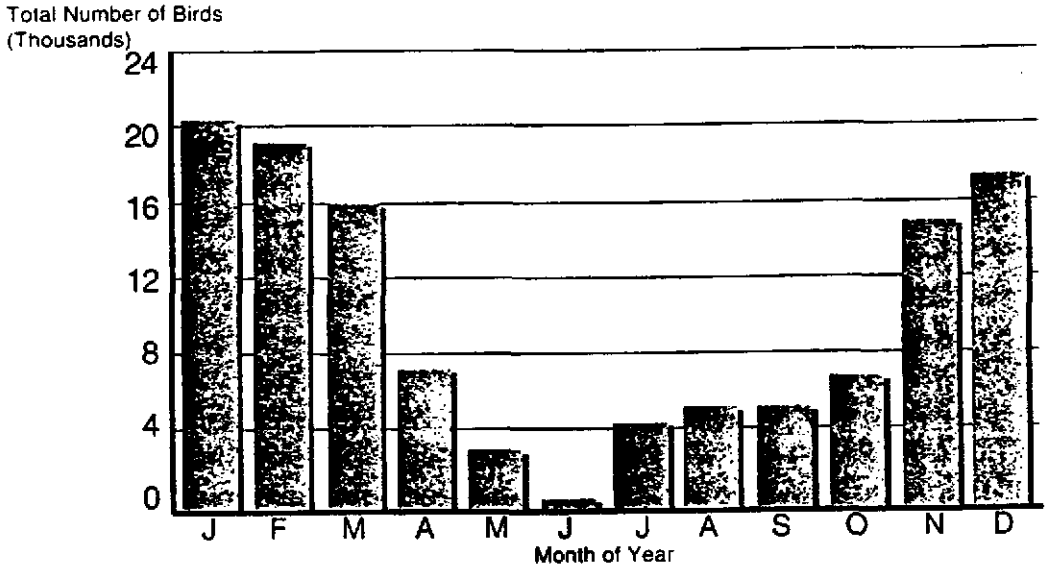
The most important habitat for wildlife in the Harbour is the intertidal mudflats which cover some 80% of the area (total water area is 3800ha at high water springs). They are critical to providing a feeding area for waterfowl, especially wading birds and wildfowl during the autumn, winter and spring (see Figure 1).

The site supports internationally important numbers of waterfowl (regularly over 20,000), wintering black-tailed godwit (1.9% of the east Atlantic flyway population) and wintering shelduck (1% of the north-west European population). On a national scale there are important numbers of species including wintering avocet, black- and red-throated diver, black-necked grebe; and breeding black-headed gull, Cetti's warbler and bearded tit. In addition there are high densities of redshank nesting on the saltmarsh at Keysworth; nowhere else in south-west England do any redshank regularly breed on saltmarsh.

The quality of the mudflats, saltmarsh and reedbed habitats are reflected in their designation for nature conservation. The site was first notified as a Site of Special Scientific Interest as early as 1964, and was renotified under the Wildlife & Countryside Act (1981) in 1990. The Harbour is a proposed Special Protection Area for birds under the EC Birds Directive and a proposed Wetland of International Importance under the

Ramsar Convention. Within the Harbour are all or parts of three National Nature Reserves, three Local Nature Reserves and three nature reserves managed by non-governmental organisations.

Figure 1 Poole Harbour Waterfowl : monthly bird populations (1984 - 86)



(Source : RSPB)

3.3 Recreation

A full range of water-based activities are regularly undertaken on the Harbour, including sailing, water skiing, jet skiing, motor boating, windsurfing, canoeing/rowing, sub aqua, bathing, sea angling, shore fishing and wildfowling. Table 1 illustrates the regional importance of the Harbour for several activities.

The oldest and still the most popular activity is sailing. Most sailing is organised through clubs, and together with motor boating, membership is about 8000. 4,000 boats can be accommodated within the Harbour between the nine marinas and boat havens, with up to a further 3,600 in swinging moorings.

Peak periods of activity are between April and September, especially at weekends and during 'Poole Week' and the Harbour is one of the best known sailing centres in the country. The shallow and relatively sheltered waters make it ideal for beginners of most sports, and the site is nationally-important for windsurfing. International cruiser racing events are held just outside the Harbour in Poole Bay.

It is difficult to predict the likely increase in activity, but as an example, windsurfing first arrived in this country in the mid seventies; within 10 years there were at least 100,000 boards in use, and in recent years there has been a steady increase of 15% per year in participants. Sidaway [9] estimates that overall demand for sailing of all types is likely to increase by over 40% by the year 2000.

Table 1 Regional Recreational Significance of Poole Harbour

Activity	No Clubs in Poole Harbour	% South East Dorset, Chesil-Christchurch	% South Coast Dorset Westwards
Angling	10	43	20
Sub-aqua	3	75	14
Water Skiing	1	50	14
Wildfowling	1	33	11
Windsurfing	2	50	20

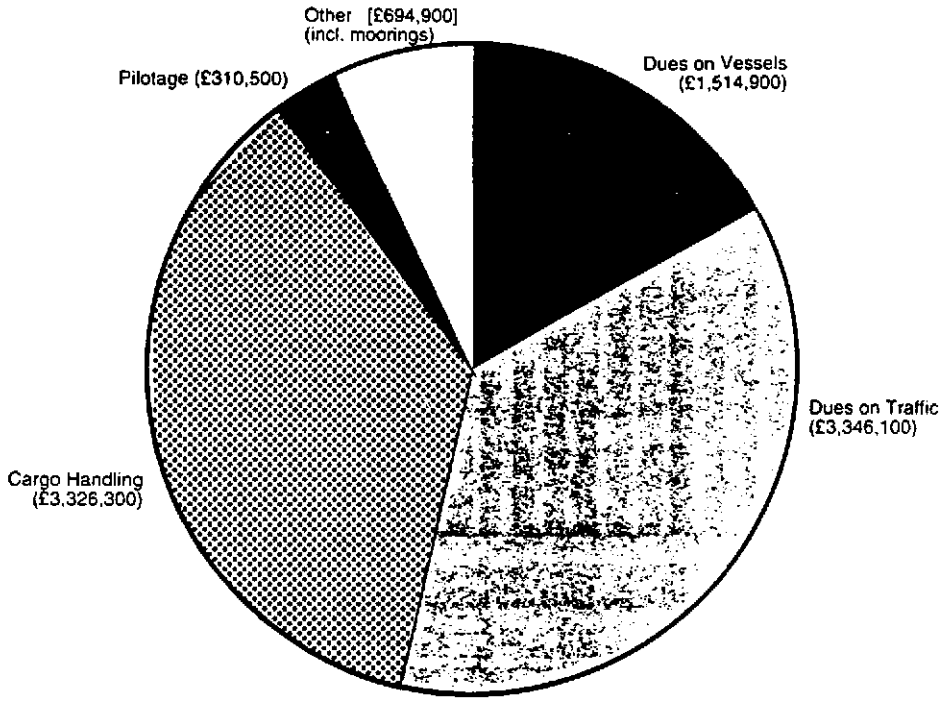
(Source: South Western Council for Sport and Recreation, 1990)

3.4 Commercial

The Port makes a valued contribution to the this country's sea freight and ferry operations as well as to the local economy. It handles two types of trade, conventional tonnage and roll-on/roll-off (ro/ro). Figures for 1990 show that Poole handled about one quarter of the total cargo traffic handled through West Country ports and one fifth of the ro/ro traffic handled by all South Coast ports excepting those in Kent. The main cargoes are imported steel and other bulk commodities and the facilities at the Port are enhance by the freight rail head. The ferry terminal is operated by the Harbour Commissioners and handles passenger and freight services. The reported turnover for PHC in 1991/92 was over £9M; figure 2 shows the sources of this revenue.

In addition to the Port activities there are several sizeable boat builders and repairers, pleasure boat operators and the military all working in the Harbour. There are both fin and shell fisheries within the Harbour, the former exploiting mullet, bass, flounder, sole, eel and plaice, whilst the latter concentrate on oysters, clams, cockles and mussels.

Figure 2 Sources of revenue of Poole Harbour Commissioners



Source: Poole Harbour Commissioners, 1992)

[ ] = Revenue to the Poole Harbour Commissioners

4.0 THE NEED FOR MANAGEMENT PLANS

Management policies relating to the development of the shoreline around Poole Harbour were first produced to try to clarify and relate the policies of the various statutory authorities operating within Poole Harbour. Pressures on land uses around the Harbour meant that then, as now, there was an ever-present need to coordinate the activities between the statutory bodies.

The need for an aquatic management plan for the Harbour stems from the need to protect its ecological value whilst allowing the existing use of the water area by those interested in commerce, recreation and amenity. In itself this justification may be sufficient, but with anticipated growth, in particular in the recreational sector, it appears essential to have the mechanisms in place to examine and monitor how any change may affect the different interests.

The driving forces behind the Policies and Plan are thus different; in the former the need to speak with a common voice, whilst in the latter the need to work out practicable compromises which promote wise and balanced use of the Harbour.

5.0 THE HISTORY OF MANAGEMENT PLANNING IN THE HARBOUR

The first joint working arrangement was developed in 1976 between the three local authorities (Dorset County, Poole Borough and Purbeck District) and the Harbour Commissioners. Known as the Management or Steering Group it produced policies for the Harbour, first published in 1979. A decision was taken not to produce a separate "local plan" for Poole Harbour which might have caused problems to constituent authorities in carrying out their statutory functions, but to produce a set of policies for adoption.

In the event only the Harbour Commissioners adopted the policies. In 1980 a period of controversy began over a Port expansion scheme by the Harbour Commissioners and discussions were started over proposed land reclamation works in Holes Bay for a County Council road scheme. There was also disagreement over land ownership in Holes Bay. The result was that the County and District Councils failed to endorse the plan over just a few policies. The remainder of the plan was uncontroversial, however, and over ensuing years those policies were adopted within relevant Local Plans.

It was not until 1986 that it was decided to review the earliest management policies. Land use pressures remained, but there were a number of new issues to take on board, notably the major extension of the ro/ro terminal, reclamation of Holes Bay for the new road, and the development of oil exploration on Furzey Island and the southern shores of the Harbour. There was also the proposal to replace Poole Bridge with its implications for wildlife and boat users in Holes Bay. The Nature Conservancy Council's power to protect the Harbour had changed dramatically with the introduction of the Wildlife & Countryside Act 1981 and there was new information its wildlife value gathered as part of the SSSI re-survey work. It was at this stage that NCC, Southern Sea Fisheries District Committee, Wessex Water Authority (and the Countyrside Commission by correspondence only) were invited to join the Management Group. The new policies were issued as a Draft Consultative Document in September 1987 and comments were sought from a wide range of groups with interests in the Harbour; the final document was published in September 1988.

A further revision of the Management Policies was considered necessary in the light of new development, the growth in recreational use of the Harbour and changing environmental legislation (the introduction of Environmental Assessment Regulations and the EC Birds Directive which gave international recognition to the wildlife quality of Poole Harbour). These were issued in March 1991 and have not been updated since.

Whilst overall the Management Policies dealt with shoreline development, there were policies in the document which aimed to control what happened on the open water, for example: Policy G6 ".... swinging moorings in open water should be progressively removed or relocated as they become vacant..." and Policy G7 "Specialist craft and water sports will be encouraged to confine their activities within appropriate waters of the Harbour. The establishment of Clubs or Associations should be encouraged with the aim of achieving some regulation over these activities". However, policies did not deal in detail with the management of the water area.

The Management Group were repeatedly encouraged by the RSPB from 1989 to consider their concern that recreational use in the open water could conflict with the internationally-important wildlife of the Harbour. RSPB urged that an estuary management plan should be produced and that the concept of zoning should be actively promoted.

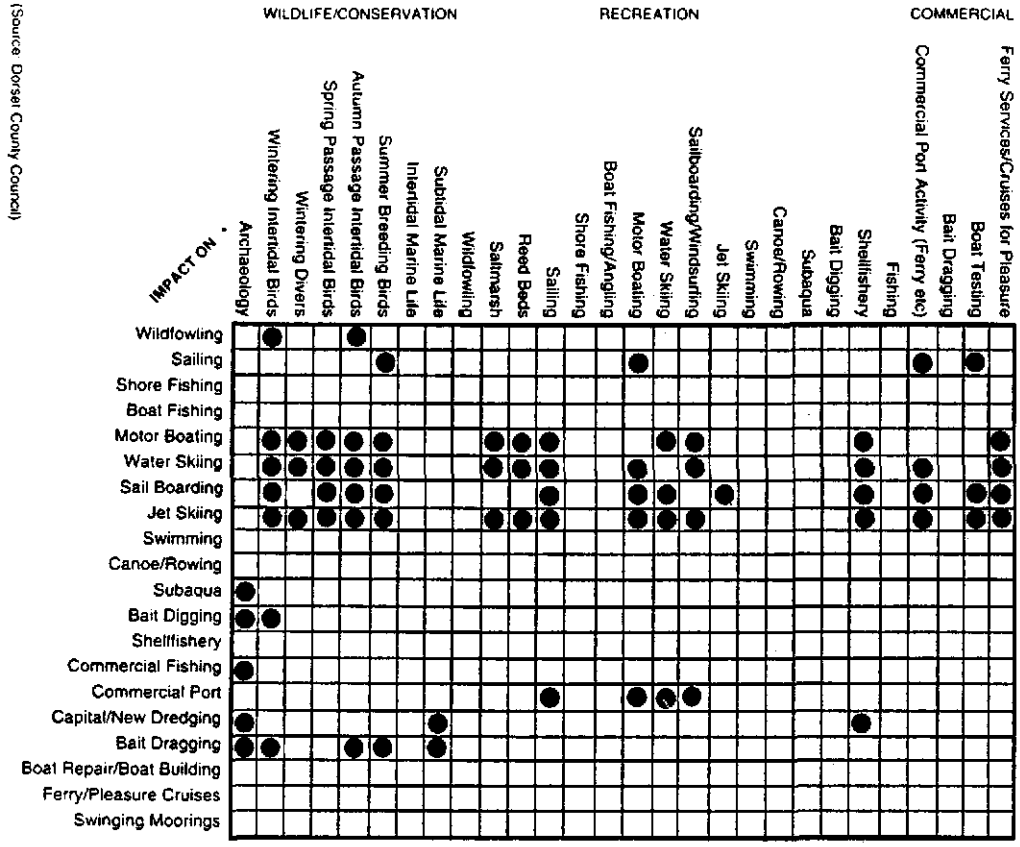
In 1991 a subcommittee of the main Management Group was formed to take forward the production of a management plan for the water area. The "Core Group", as it was known, contained officers from the Harbour Commissioners, County Council, English Nature, and the RSPB, who were invited to join given their experience of estuary management planning elsewhere.

The brief for the Core Group was to assess what activities go on in the Harbour, at what level and where; whether these were likely to change over time; whether activities conflicted with each other of the environment; what existing mechanisms there were to safeguard and regulate interests and what additional powers were needed. Amongst other investigations, a questionnaire was sent to all sports and leisure groups and commercial operations in the Harbour. It identified the existing and possible conflicts in the future between groups and where there were impacts on the Harbour's environment.

Summary results are shown in Table 2, highlighting those conflicts which are currently being considered in the management plan. Two major areas of conflict are between the Harbour's wildlife and motorised water sports,

and between the latter and the quieter recreational pursuits such as swimming and canoeing. In order to ascertain where the greatest problems were two scores were allocated to each cell of the matrix; the severity of impact (from low to total preclusion of affected interest) and significance in policy terms (from no importance to international importance).

Table 2 Present conflicts of significance



The first draft of the management plan was produced by consultants, brought in to speed up the process and funded by English Nature. This draft needed some considerable reworking by the Core Group since it was felt to be too much of a straight description of the Harbour, rather than an exposition of management options. The principle recommendations of the plan were for the zoning of waterskiing, jet skiing, windsurfing and sub-aqua, as shown in Map 2.

The main constraints to the implementation of the plan were financial, manpower and the lack of powers to enforce the zones put forward. However, in October 1993, new byelaws were granted to the Harbour Commissioners, the most significant of which was the imposition of a 10 knot speed limit throughout the Harbour, except in ecologically-sensitive areas where either an enforceable or an advisory 6 knot speed limit is applied. The speed limits mean that for any water or jet skiing to take place legally, there must be de-restricted areas or zones for them.

The financial constraints were lifted, at least for 1994, by successful applications for funding to launch the aquatic management plan from a number of sources including Europe (the Atlantis Project), English Nature (Estuaries Initiative), the local authorities and the British Marine Industries Federation. A total of £70,000 was raised allowing the employment of a full-time project officer for nine months to oversee a project which had the following aims:

1. A study of the interaction of recreation and wildlife. Whilst a proliferation of surveys is not always helpful, the Core Group agreed on the need to collect direct evidence that wildlife was actually being disturbed on the Harbour. Thus far there was only anecdotal evidence of disturbance. There was a good deal of thought that it seemed likely, especially in the early summer when breeding birds were present, and recreational use was

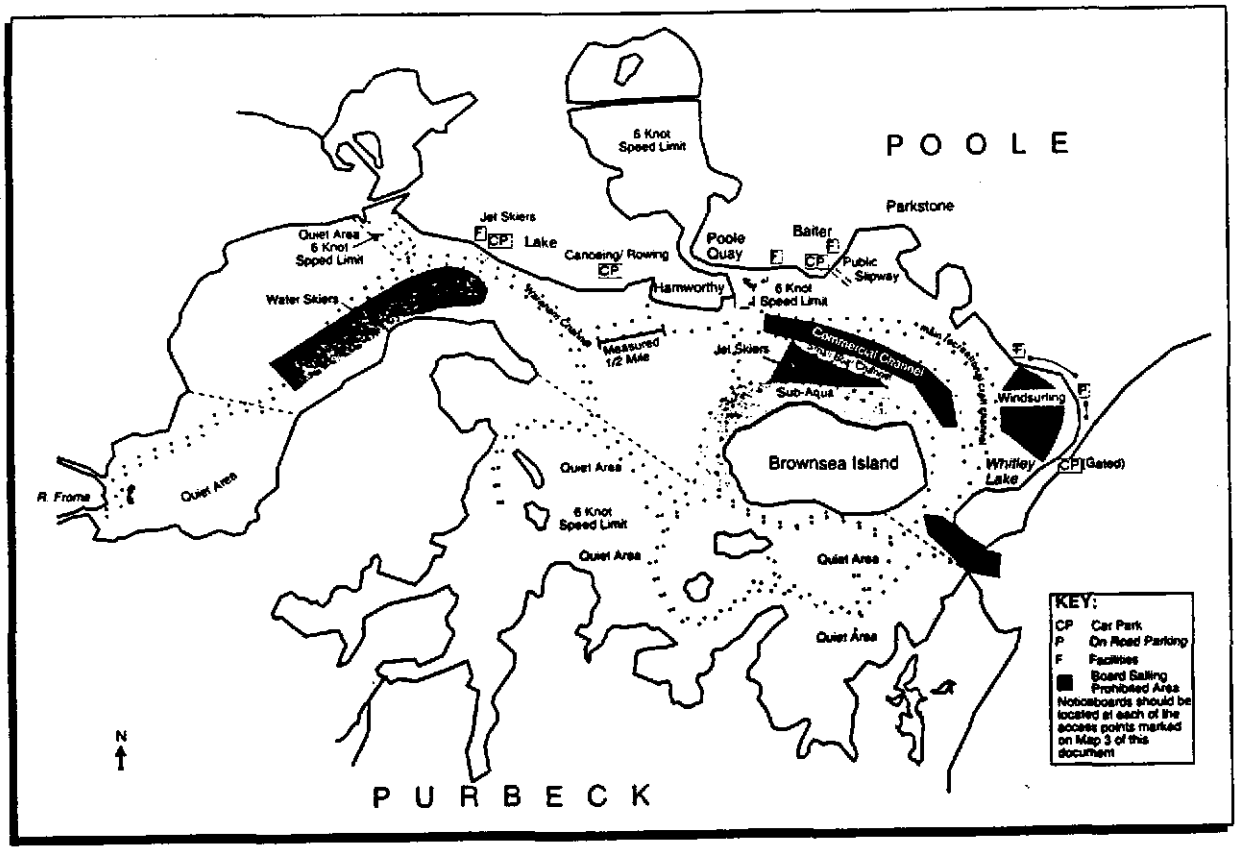
beginning to pick up after the winter lull. The contract is currently being undertaken by RSPB and the results are yet to be reported.

2. A recreational activity study. A crucial question for the Harbour Commissioners is how many craft can the water area support without detriment to safety, enjoyment and the environment? To date there has been no comprehensive survey of how many craft use the Harbour. The current activity study is being approached from the air and the ground. The aerial work is being undertaken by consultants who have developed techniques for counting livestock from light aircraft flying over the desert plains of Africa. Direct counts are made of the different types of craft by observers sitting in the aircraft, rather than by using aerial photography which is considerably more expensive.

By combining aerial survey data with evidence from ground-based questionnaires asking users about what they have been doing and if it was safe and enjoyable, we hope to make a first step towards understanding how many craft the Harbour can support.

3. The launch of the management plan. Given the popularity of the Harbour, the Core group considered it crucial to produce a plan and associated publicity which would reach as wide an audience as possible. The plan was launched on the 8th July 1994, with considerable local media coverage, and an eight week consultation period followed. In addition to the detailed plan sent to organised groups, a colour flyer advertising the zoning plan and byelaws was produced for distribution to individual users, with advertisements posted throughout the area.

Map 2 Proposed aquatic zoning plan and proposed facilities



(Source: RSPB, 1991; Southern Sea Fisheries Committee, 1990)

6.0 THE LESSONS LEARNED

Identifying what lessons have been learned throughout the management planning process in Poole Harbour has not been at all easy. The process began in 1976 and since that period there have been many personnel changes and it has been impossible to cull much of an overview from archived files. More recently, the launch of the aquatic plan, granting of byelaws and survey work certainly mark a major step forward for planning the water

space in Poole Harbour, though since the work is only a few months old, it is too early yet to draw any conclusions about their effectiveness. There are, however, some general points which can be drawn out.

Representation on the working groups
Although there has been a long history of joint working in Poole, it is fair to say that from time to time this has been an uneasy alliance. In the past there has been hostility towards nature conservation, in favour of commercial and fisheries interests, and this has not been helped by the outnumbering of conservation organisations on the Management Group (only NCC). Producing joint statements which accommodate all views has not been easy. In the Core Group perhaps a better balance has been struck with English Nature, RSPB and the County Council's Ecologist represented.

It is logical that any management plan should be formulated with input from all those likely to be affected to foster cooperation. Whether all organisations should be formally represented in working groups, or only consulted once a plan has been drafted, is a difficult question. It has been a pragmatic decision to keep numbers small in Poole. Recreational interests, for instance, have not been directly represented on either management group; it remains to be seen whether this has been an omission.

Working in a local government framework
The Management and Core Groups operate within a local government set up. Issues of significance must be reported to the relevant committee of elected local Members to ensure democratic accountability is maintained. As was seen during the production of the first round of policies for the Harbour in 1979, although officers could agree on a way forward, certain policies were unacceptable in the political climate.

Management Policies and Plans must be enforceable
It is important that policies are adopted into statutory Local Plans so that they are widely known, seen in the context of the whole and, importantly, they are respected. However, the same arrangement is not possible for the aquatic plan since local authorities have no jurisdiction below low water mark. Relying solely on good will, common sense and self-policing arrangements to make the aquatic management plan work is unlikely to work in the short term. It certainly appears critical at the moment that the Harbour Commissioners have been granted the powers to enforce the byelaws, though they are as yet unable to make the necessary investment in personnel and patrol vessels to apprehend those seen as breaking the rules.

Plans should be backed up by a wide-ranging campaign to educate users. Publicity leaflets, posters, displays and exhibitions are essential for increasing awareness and getting the message across; it is relatively easy to communicate with organised clubs, but reaching the mind of an errant jet skier out for a burn-up on the sea is a different matter.

Financing plans
Little progress would have been made on the aquatic management plan without grant-aid. None of the represented organisations have been able to offer full-time personnel; this does not reflect a lack of commitment, but rather that officers have many other roles and physically cannot devote the time. Money has been raised relatively easily in Poole in 1994, almost certainly because it is one of the first zoning plans to be tested. Once the novelty has worn off here and elsewhere no doubt it will not be so easy.

The role of local authorities
The role the County Council in Poole Harbour has been important throughout the management planning process, acting as the co-ordinator bringing together relevant organisations, gaining political approval, fund raising, and providing the specialist and back-up services to enable the plans developed, printed and launched. Other representative organisations have not been in a position to offer this breadth of support, mainly because their remit is narrower (e.g. main role of the Harbour Commissioners it is to run the commercial port, whilst that of English Nature is to protect the interests of wildlife). However, with the re-organisation of local government in Dorset and elsewhere on the near horizon and the probable fragmentation of resources into smaller units, we can only hope that new authorities will in the future be able to provide the same depth of support.

7.0 THE FUTURE MANAGEMENT OF THE HARBOUR

Without prejudging the results of this year's studies, it has been our experience that there is little disagreement over the idea of an Aquatic Management Plan for Poole Harbour. Broadly speaking user groups have backed the 'common sense' approach of separating non-compatible watersports and the concept of zoning is accepted as a valid management technique.

The consultation exercise has not been without criticism; the plan is accused of being 'high-flying nonsense' and was 'obviously written by someone with no knowledge of Poole Harbour whatsoever'. Criticisms are divided into three categories: firstly, things are fine in the Harbour and change is unnecessary; second, the Plan is seen as interfering with traditional rights to navigate freely and that the degree of control is too great; and third, that users feel that 'experts' are managing them out of the Harbour.

There is clearly a long way to go in Poole Harbour; it will take considerable time and effort to try and convert users of the Harbour to the concept of zoning and away from their unfettered freedom in the past. In addition, there is little point in trying to achieve the implementation in a single year. The Harbour Patrol launches have commented how quiet the water area has been this summer; is this the result of a successful zoning plan or the end product of a prolonged recession that has hit the recreation market? If the predicted growth in watersports does come to fruition, it may be several years before the Management Plan's effectiveness is fully tested.

Future management in Poole Harbour must encompass regular review and updating of the Policies and Aquatic Plan to see that both continue to be relevant in the face of changing commercial and recreational pressures. It also timely, with the implementation of the Habitats Directive in the UK, to consider how nature conservation in the Harbour can be taken beyond the reactive, protective phase we are currently in and into one which looks at opportunities for positive management and enhancement of the interest. There is a clear need for an ecological management plan for habitats within and surrounding the Harbour in the near future.

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ADDRESSES FOR CORRESPONDENCE

1. Poole Harbour Commissioners, Engineers Office, 20 New Quay Road, Poole, Dorset BH15 4AF
2. Planning Department, Dorset County Council, Colliton Annexe, County Hall, Dorchester, Dorset DT1 1XJ

PART 2

A Review and Analysis of the Methodology used in the Formulation of Coastal Zoning Schemes in the UK.

Julie Bale

September 1996

CHAPTER 1 - INTRODUCTION

1.1 THE CONCEPT OF ZONING

The concept of spatial zoning is intuitive to human reason as a method to promote resource protection and efficient use. This includes the building of walls and fences around property, lanes on motorways and administrative boundaries. Zoning, however is not restricted to a terrestrial activity. Zoning is used to define both aircraft and shipping lanes. With the development of Coastal Zone Management (CZM), zoning schemes are being used extensively to provide spatial separation between different activities, in particular the different aspects of marine recreation, to enable them to coexist. This presents new challenges to zoning, as the scheme must transcend both the aquatic and terrestrial environments (Millard, 1995).

1.2 AIMS AND OBJECTIVES

A well designed zoning scheme should take account of the whole range of user requirements to the extent that minimal enforcement of the plan is required. Zoning schemes, already existing in the coastal zone, within the UK, are generally found in wider coastal zone management plans.

Forsyth (1995) carried out some research into the Poole Harbour Aquatic Management Plan (PHAMP), which includes the zoning of recreational activities in the harbour. He states that, 'through analysis of the decision making process which resulted in the adoption of a recreational zoning plan, it is clear that no consistent methodology was practised throughout'. Forsyth (1995) goes on to say that the decision to adopt a zoning scheme was not the result of a comparison of management options and, further, the methodology used in the design of individual zones is not transparent.

With the increasing use of the zoning as a technique contributing to coastal zone management, it is a concern that zoning schemes, in general, have no clear methodology to follow during production. This dissertation is to investigate the methodology behind zoning schemes, with the aim of either proving or disproving the following hypothesis:

"There is in robust framework for the incorporation of a zoning methodology in Coastal Management Plans in the United Kingdom"

In order to achieve the proposed aim it is necessary to set out specific objectives. Fig. 1.1 details the objectives for this dissertation.

Fig. 1.1 ***Objectives***

- To produce a literature review which will take into account Coastal Zone Management as a wider concept, focusing on the meaning of zoning and zoning techniques.

- To identify and select a number of Coastal management Plans from which to work.

- To acquire the selected Coastal Management Plans from the appropriate authorities or agencies.

- To catalogue the Coastal Management Plans, with respect to their appropriateness for the task.

- To review the issues involved in the formulation of the zoning schemes, detailed in the wider Coastal Management Plans, leading to a classification of the zoning schemes.

- To analyse the techniques used to determine the zoning system, focusing on the methodology used in terms of history, inertia and politics. This will include and analysis of the zoning process as a whole, and a classification of the methodologies used.

- To prove the hypothesis correct or incorrect.

1.3 THE STRUCTURE OF THE DISSERTATION

The dissertation starts with a review of the literature relevant to zoning in the coastal zone. This is followed by a methodology which sets out how the research for the dissertation was approached. A separate chapter for the identification and selection of the appropriate Coastal Management Plans is provided, as some of the issues are complex. There are two main chapters to the dissertation. Firstly, there is consideration of the general issues which affect the formulation of a zoning scheme. Secondly, there is a more detailed analysis of zoning methodologies. The dissertation ends with a summary of the main findings, and lists some recommendations for the future.

CHAPTER 2 - LITERATURE REVIEW

2.1 COASTAL ZONE MANAGEMENT (CZM)

2.11 CZM IN THE UK

Coastal Zone Management (CZM), although not a new concept in the United Kingdom, is still in its infancy with many parts of the UK putting together their first structured CZM plans today. A report by the House of Commons Environment Committee states that:

> 'Coastal protection, planning and management in the United Kingdom suffers from centuries of unco-ordinated decisions and actions at both the national and local levels ... There are inadequacies in legislation, anomalies in the planning system, a lack of central guidance, and overlapping and conflicting policies and responsibilities (and in some cases lack of action) amongst a host of bodies, with poor co-ordination between them. Much of this has arisen partly because of the pattern of ownership of the coastal zone and partly because the boundaries separating the administrative authorities are not drawn with regard to the presence of natural coastal processes and the possible consequences on one part of the coastline by interference with another.'

Clearly, the slow development of CZM can be attributed to failings at a number of institutional levels, e.g. at both central and local governments, and also in a number of fields. The same report further points out that the administrative responsibilities should match the coastal dynamics, and not vice versa. Now that this principle has been accepted the UK can plan and protect coastal resources in an integrated and co-ordinated manner, and the definition of coastal zone management (Coastal Zone Management, 1996) can be fulfilled:

> 'Coastal zone management is the process which brings together all those involved in the development, management and use of the coast within a framework which facilitates the integration of their interests and responsibilities to achieve common objectives.'

As a response to the need for integrated and co-ordinated coastal management, coastal management plans, estuary management plans (amongst others) are being developed around the UK.

2.12 DEFINING THE 'COASTAL ZONE'

There is no universally accepted definition of the coastal zone and no limits to the extent of this zone. Perhaps the most widely accepted definition in the UK is that suggested by the Countryside Commission and now included in PPG20 (1992):

> 'The coastal zone extends seaward and landward of the coastline. Its limits are determined by the geographical extent of coastal natural processes and human activities related to the coast.'

Howarth (1992) acknowledges that this definition might be criticised for its circularity. He notes, however, that it places proper emphasis upon the integrity of ecosystems and land use which is distinctive to coastal areas and so constitutes a considerable improvement upon the range of stipulative definitions of administrative boundaries which pervade existing legislation.

Clearly the coastal zone needs to be seen as an area incorporating maritime land and inshore waters as well as the inter tidal area and the sea and all those activities carried out within. The CZM Best Practice document (NPP, 1996) acknowledges that there is no precise definition but suggests that the coastal zone includes:

- the adjacent land, including both developed and undeveloped areas;
- estuaries, tidal inlets; and the inter-tidal littoral; and
- the inshore marine zone.

Many of the activities on land produce an impact on the sea. For example, sewage outlets infecting bathing waters. Understanding such couplings between land and sea is fundamental to the management of coastal resources within a CZM framework.

2.13 Issues in the Coastal Zone

A range of economic and social activities require coastal locations. (PPG20, 1992). The ideal world would see all of these activities working together in harmony. However, reality shows us that this isn't possible, especially in the coastal zone where so many different activities come together. Conflicts between activities are inevitable, e.g. as cited earlier the quality of bathing waters are often affected by sewage outlets. In Langstone Harbour (Langstone Harbour Conservancy, 1996) there was conflict between jet skis and wildlife. The noise and wash from the jet skis disturbed the breeding birds.

Another major issue is that there is no single statutory framework for all the actions involved in CZM (Coastal Zone Management, 1996). Much literature has been produced on this subject. For example, Edwards (1994) presented a paper on managing coastal recreation in environmentally sensitive areas. He looks at the voluntary management approach, concluding that there is a need for legislative support to the voluntary zoning plans used to manage activities in the coastal zone.

2.2 Zoning

2.21 Zoning as a Technique

Zoning is a technique that can be used to reduce resource use conflicts. The concept of zoning is not a new one, spatial zoning is intuitive to human reason as a method to promote resource protection and efficient use. This includes the building of walls and

fences around property, lanes on motor ways, administrative boundaries and to define aircraft and shipping lanes (Millard, 1995). With regards to CZM, 'zoning' is very much the "buzz word" of the moment and zoning is being used extensively to provide spatial separation between different activities, particularly marine recreation, to allow them to coexist.

2.22 DEFINING 'ZONING'

Zoning with regard to the coastal zone, i.e. spanning the terrestrial and marine environment, has no universally accepted definition. Goodhead and Johnson (1996) define zoning as:

> 'A technique which either, by its nature or through its selection and design, constrains water-based leisure activities.'

Although this doesn't regard the terrestrial environment it is nevertheless a good definition as it contains the important point, 'zoning is essentially a technique which constrains activities.' Goodhead and Johnson (1996) also suggest that zoning, as a management technique, is used to reduce the likelihood of conflict between different water-based activities, social side-effects on land, or damage to environmentally sensitive areas.

To illustrate a different approach to constraining activities we can consider zoning in the formulation of biosphere reserves, some of which are located in estuaries, e.g. Taw-Torridge Estuary. A biosphere reserve, first promoted by UNESCO in 1974, contains four zones:

- Core Zone: interference should be minimal in this zone, to serve as a baseline for the biological region and in which research, educational and training activities should be carefully controlled and must be non-manipulative.
- Buffer Zone: managed for research, education and training, where manipulative methods and techniques are permitted and traditional sustainable use activities can be permitted in a controlled manner.
- Restoration Zone: managed to study and reclaim lands and natural resources, where heavy natural or human-caused alterations have passed ecological thresholds, where biological processes have been interrupted, or where species have become locally extinct.
- Stable Cultural Zone: managed to protect and study existing cultures and land use practices that are in harmony with the environment.

(Nature Conservancy Council, 1991).

Rather than "zoning off" particular activities, this approach uses zoning to categorise different land uses. The Nature Conservancy Council (1991) further suggests that a zoning approach may offer considerable benefits for its integration of complex

patterns of sustainable land-use such as are widespread and necessary on British Estuaries.

Another common approach is to use zoning to establish a separation between industry and residential developments. In this context zoning can be defined as being:

> 'The operation of introducing physical distance and boundaries, called buffers, between incompatible activities such that both can exist simultaneously'
>
> (Millard, 1995).

This involves two stages. Firstly, the separation of the activities and secondly, the use of boundaries around the buffers. Such techniques were originally developed to overcome such industrial nuisances such as visual intrusion, noise and odour, as well as the risk of major hazards. Millard (1995) further points out that such zoning can be very effective and can allow even the most conflicting activities to coexist, provided the buffers are sufficiently large.

Goodhead and Johnson (1996) suggest that, concerning coastal recreation, zoning restricts **where** a leisure activity can take place and **when** it can take place. A good design should reflect the spatial and temporal distribution of the activity and its preferences in terms of access and environmental conditions and the level of usage; the degree of restriction should be relative to design.

Goodhead and Johnson (1996) suggest that controlling activities by time zoning is considered the most effective way of reducing conflict between watersports, but in terms of making use of water space area activity management is more effective. This allows many sports to take place at the same time. However, it does not take into account changing seasons and day-to-day weather conditions (Goodhead and Johnson, 1996). This dissertation is examining zoning used for activity management. Goodhead and Johnson (1996) provide a good definition of zoning to be used throughout this dissertation.

2.3 Issues Surrounding Zoning Schemes

In the UK, Coastal Management Plans are voluntary plans. The content is often influenced by statutory development plans which are prepared by local authorities. Goodhead and Johnson (1996) have commented that a no 'best solution' administrative framework has emerged. A separate statutory body has been formed in Chichester Harbour which is efficient and effective in management plans. However, the formation of a new statutory body for each management plan area would be costly and unrealistic (Goodhead and Johnson, 1996).

By default, zoning schemes are also voluntary in nature and the lack of legislation can cause problems when it comes to enforcing the scheme. MacDonald (1994) stresses the importance of using bye-laws in management plans. However, Goodhead and Johnson (1996) note those bye-laws are limited in terms of their control, e.g. speed limits can be imposed but activities such as jet skiing cannot be banned from a

particular area. Bye-laws also need to be enforced which raises cost implications, e.g. the employment of wardens.

To be an effective tool in CZM zoning needs to be able to be applied to the land, sea and the inter-tidal seabed. The planning system in the UK, which is responsible for building operations down to the LWM, does not have any powers over the sea and inter-tidal seabed (with the exception of the Island Councils of Orkney and Shetland). Despite this limitation planning within the coastal zone is a widely recognised concept and PPG20 (1992) recognises the role of planning (para. 1.2):

> It is the role of the planning system to reconcile development requirements.....
> .... acknowledging the special character of the coast.'

The House of Commons Environment Committee recommended that the 12 nautical mile limit for territorial waters should become the new limit for the operation of planning control (para. 52). Until such a solution is found, zoning schemes dealing with water-based recreation will have no legislative backing.

The Coastal Zone Management, Towards Best Practice (1996) paper stresses the importance of the integration of organisations for plan implementation. It is suggested in this paper that all coastal interests should work together in a spirit of trust, recognising that their individual and corporate aims are best served by developing a wider, strategic approach.

2.4 EXISTING COASTAL ZONING SCHEMES

Zoning schemes, where in operation, are generally included in wider CZM plans. Perhaps the most common example used to illustrate a zoning scheme is that of the Poole Harbour Aquatic Management Plan, in Poole Harbour, Dorset. The Poole Harbour task force considered that a zoning scheme for water-based recreation was considered the most appropriate way of mitigating conflict, by spatially segregating incompatible activities (see Map 2.1).

The location of the zones was based largely on existing concentrations of use (see chapter 6). Edwards (1994) has reviewed the zoning plan and he suggests that experience in Poole Harbour implies that the voluntary approach to managing coastal recreation will be insufficient to ensure the success of the proposed zoning plan. He also suggests that the need for legislative support is becoming more pressing if our most valuable estuaries are to be sustained. It is certain that the success or failure of the Poole Harbour Aquatic Management Plan will have significant implications for other such plans of its type in the future.

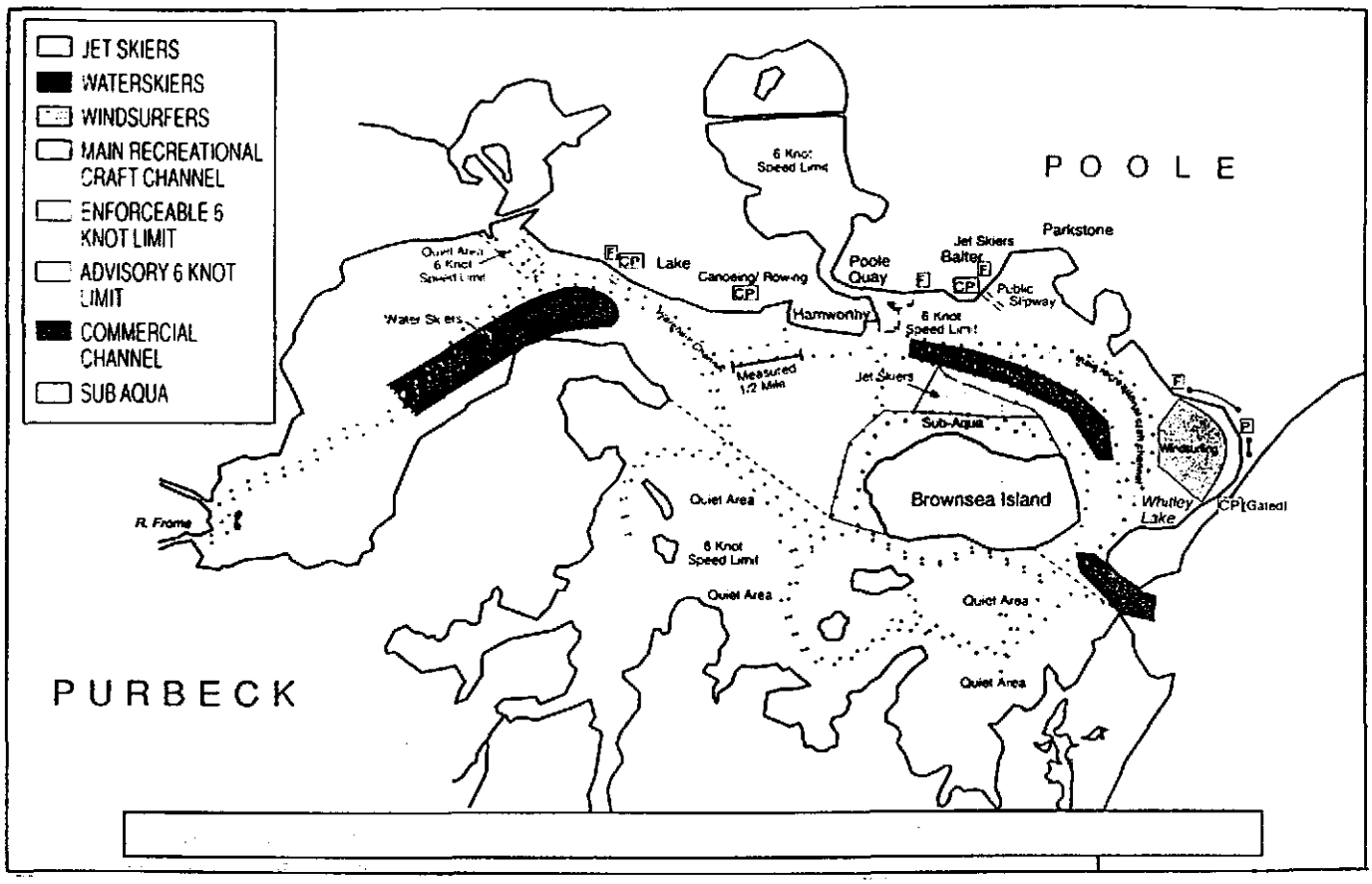


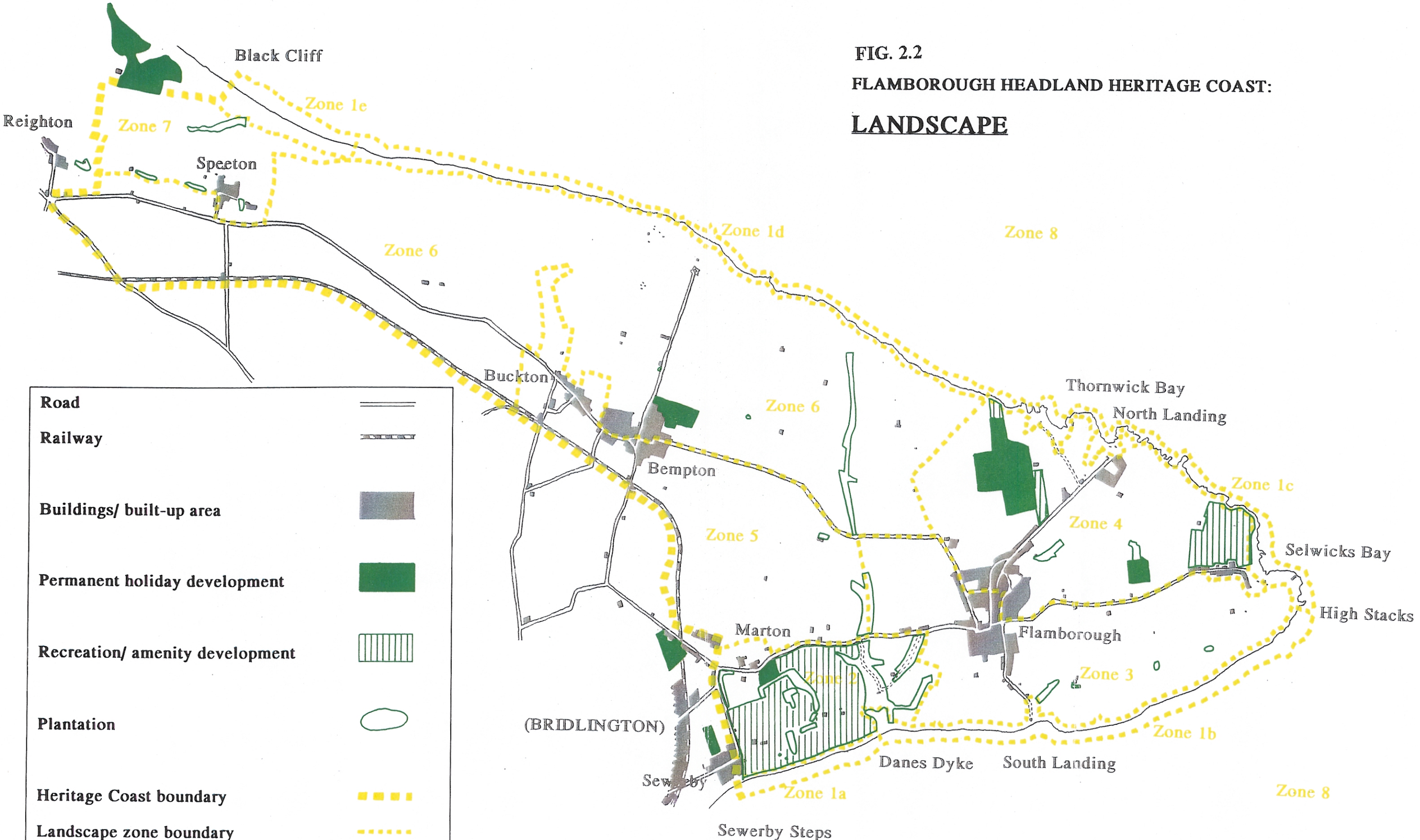
Fig. 2.1 Poole Harbour Recreational Zoning Plan (adapted from Goodhead & Johnson, 1996, Original source: Dorset County Council)

Some areas have deliberately not chosen a zoning scheme to manage water-based recreation, e.g. Chichester Harbour who consider that zones for water-based recreation get too full (Pers. Comm. Philip Couchman, 1996). Although many of these areas enforce speed limits to exclude high powered watercraft, which in itself is an attempt at zoning. Chichester Harbour does have geographical entities, e.g. salt marsh, access, water-based recreation, which to them is more of an administrative convenience (Pers. comm. Philip Couchman, 1996). Geographical entities such as salt marsh are more descriptive in nature and resemble the Heritage Coast approach to zoning.

FIG. 2.2

FLAMBOROUGH HEADLAND HERITAGE COAST:

LANDSCAPE



For example, Flamborough Headland Heritage Coast Plan includes a landscape zoning scheme. The heritage coast is divided into eight zones based upon general characteristics and features (see map 2.2).

Zone 1: *the coastline (this is the only almost entirely natural one of the terrestrial zones).*
Zone 2: Sewerby and Danes Dyke Estates.
Zone 3: South Headland.
Zone 4: North East Flamborough.
Zone 5: Bempton Valley.
Zone 6: High Wolds.
Zone 7: Speeton.
Zone 8: Marine Zone.

The zones are decided by assessing the following characteristics:

- High chalk cliffs;
- Boulder clay slopes above chalk;
- Small, steep-sided ravines;
- Wave-cut beach platform;
- Geological features; and
- Wildlife features

(Flamborough Headland Heritage Coast Management Plan, 1995).

2.5 DISSCUSSION

This chapter has shown that there are very few references, specific to zoning, to be found. Many of the references are concerned with terrestrial zoning. Although this is useful, i.e. it might be a technique which can be transferred to the aquatic environment, it does not provide details of the specific techniques for the aquatic zone. However, zoning schemes do exist in the UK, which suggests that some methodology must have been used. Therefore, by the use of questionnaires, this dissertation is seeking to elicit these methodologies.

A request for information on coastal zoning plan methodologies was put out on 'COASTNET' (worldwide electroninc mailing list for Coastal Zone Management). Eight replies were received, four of which requested a copy of the report when completed. The other four responses were followed up but, although they gave examples of zoning schemes in the United States, in particular the Oregan Estuary, they did not give any details of the methodologies used to arrive at the zoning plans.

CHAPTER 3 - METHODOLOGY

3.1 INTRODUCTION

Reading carried out for the literature review has shed some doubt on the effectiveness of the use of zoning, as a tool to avoid conflict, in the coastal zone. With Edwards (1994) casting doubt over the success of the Poole Harbour Aquatic zoning plan. As stated in chapter 1 this dissertation will look at the actual formulation of zoning schemes, i.e. the issues and the techniques involved in the development of the scheme (see chapter 1 - objectives). This leads us to the overall aim of this dissertation, which is to prove this hypothesis:

> "There is no robust framework for the incorporation of a zoning methodology in Coastal Management Plans in the United Kingdom".

This chapter will explain how the research was carried out in order to prove this hypothesis correct or incorrect (see fig 3.1).

3.2 SELECTION, ACQUISITION AND ANALYSIS OF THE PLANS

Zoning schemes, existing in the coastal zone, are documented in some coastal management plans. These coastal management plans take a number of forms:

- ☐ Development Plans
- ☐ Marine SAC management Plans
- ☐ Heritage Coast Management Plans
- ☐ Local Environment Agency Management Plans
- ☐ Harbour Authority Management Plans
- ☐ Shoreline Management Plans
- ☐ Estuary Management Plans

It was decided that the following types of plans were suitable for the purpose of this dissertation: Estuary and Harbour Management Plans, and Heritage Coast Management Plans (see chapter 4 for further explanation).

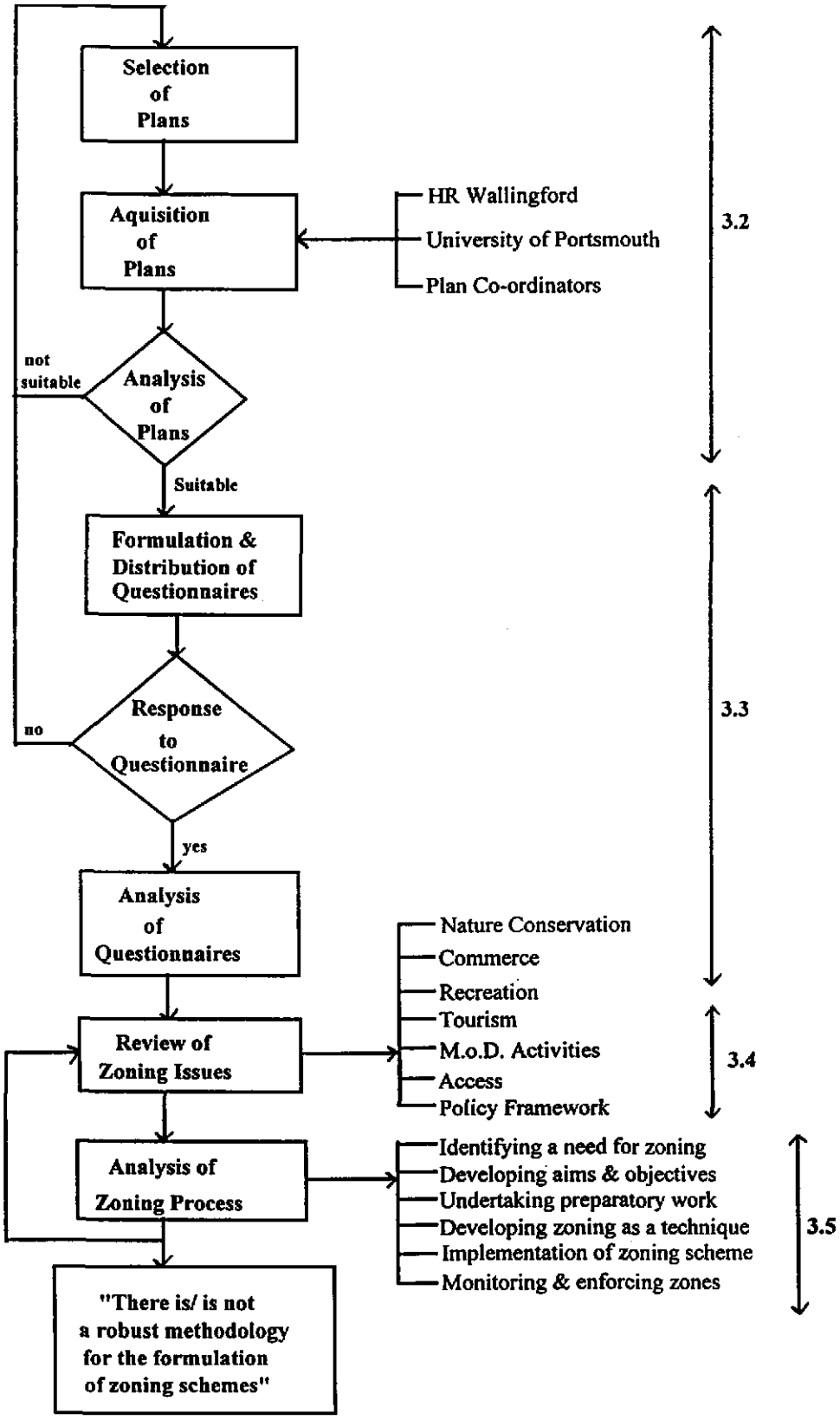


Fig. 3.1 The methodology used to carry out a review and analysis of zoning schemes.

Given the time constraints it was decided that 12 coastal management plans, of these types, would be sufficient for analysis (see chapter 4). These plans were selected using the following criteria:

- ☐ Availability of the plans
- ☐ The cost of the plans
- ☐ The stage of the plans
- ☐ Inclusion of a zoning scheme
- ☐ Number of plans selected
- ☐ Geographical location of plan
- ☐ Issues.

The types of coast, size of the management area, and the plan producer were not considered important criteria in the decision process as the dissertation is interested in the issues involved in the formulation of the zoning schemes.

The coastal management plans were obtained from a combination of the plan co-ordinators, the University of Portsmouth, and HR Wallingford Ltd, over a period of one month (See Appendix A). These plans were then catalogued with regards to the inclusion or exclusion of a zoning scheme. The Chichester Harbour Management Plan was found not to have a zoning scheme. After consultation with Philip Couchman (Chichester Harbour Conservancy, 1996) it was decided that the plan should be included in the analysis as some valid points have been made over choosing alternative schemes to zoning.

3.3 QUESTIONNAIRE METHODOLOGY

Questionnaires were designed to target the plan co-ordinators, initially. The questionnaire had two purposes. The first was to identify any issues not immediately obvious from the management plans themselves. The second was to ask questions to understand the techniques used when formulating the zoning schemes contributing to the management plans. One questionnaire was used to target all of the chosen management areas. Appendix B shows the questionnaire used. The questions were carefully chosen in order to extract the necessary information. Figure 3.2 explains information that each of the questions seeked to eleicit.

Fig 3.2 Questionnaire Methodology.

1. What were the four key issues of conflict identified in your management planning process?

This question was asked in order to identify which issues of conflict were given priority by a particular management area. It might be that the area has a high level of Military of Defence activity, which is given priority over recreation or conservation.

2. How were these conflicts assessed?

The plan co-ordinator is given an option of a number of methods of assessing conflicts from which to choose. The aim is to identify whether a particular method of assessment is prefered or used more widely than others.

3. Why was zoning considered appropriate for your area?

This question was asked to understand the rationale behind selecting a zoning scheme. In particular was zoning used "because everybody else uses it" or were alternatives considered.

4. What are the strategic aims and specified objectives of your zoning scheme?

This question was asked to identify whether the zoning producers have set out exactly what the zoning is to achieve at the outset. Zoning schemes should have their own set of aims and objectives, rather than sharing those of the overall coastal management plan. N.b. the zoning scheme objections should reinforce the objectives of the CZM plan.

5. What criteria were used to determine the desired zone?

A number of criteria are set out for the plan co-ordinators to choose from. Different criteria will be relevant to different management areas, depending upon the issues being tackled.

6. What process did you go through to produce the zoning scheme?

This question was intended to gauge whether a particular process was carried out by the management area when formulating the zoning scheme. However, the plan co-ordinators identified some of the techniques used by them during the zoning process.

7. What literature was consulted in preparing the zoning scheme?

If people have been following a published methodology then it needs to be clear which. This may be a "zoning scheme cookbook" of which we are not aware, or copying the approaches used elsewhere.

8. Who undertook the preparatory work for the zoning scheme?

This question was asked to see whether the institution carrying out the preparatory work was reflected in the methodology used. Different institutions will have different resources with which to tackle the task.

9. Outline the stages, and the time scale of those stages, in the zoning scheme?

The purpose of this question was to identify whether formal stages are used by the plan co-ordinators. It also identifies whether all of the zoning schemes use a similar methodolgy and whether those zoning schemes are rushed.

10. At what stage were the public informed of the zoning scheme?

Public participation is an important factor as it is essential that the users of the zoning scheme are happy with that scheme. Involving the public early on the zoning process can avoid problems after the zoning scheme has been implemented.

11. What were the four most significant objections made to the zoning scheme and how were these dealt with?

This question identifies whether the users of the zoning scheme are happy with it. It might be that the zones are not to everybody's likening, in which case there maybe a problem with the zoning methodology. It is also to check if consistent objections are made across different zoning plans, e.g. is it always the same group that objects?

12. Will the operation of the zoning scheme be monitored, and if so, how?

The zoning scheme may be set up to stop reduction in breeding birds, for example. Therefore the number of breeding birds will be monitored. The objections to this would come from areas such as tourism or jet-skis, whose access into this area would be restricted. Monitoring is not just for enforcement, it is also to ensure that the zoning scheme is doing what it was set out to do.

13. Will the zoning scheme be reviewed, if so, how often?

This question was asked to identify whether any problems which arise with the zoning scheme are picked up on immediately, or whether they have to wait a set period before the zoning scheme is reviewed, and what constitutes a valid review period.

14. Could you describe the approach used in the development/preparation of your management plan?

Again, this question gives the plan co-ordinator a chance to identify whether a formal methodology was used. It might be that a previously implemented zoning scheme influenced the approach taken.

15. Did your approach consider a selection from a range of options for managing the coast, if so, what were those options?

It might be that zoning is not the most appropriate solution to managing a particular area. This question identifies whether management areas consider using other techniques as an alternative to zoning.

The first draft of the questionnaire was sent to representatives at HR Wallingford and the University of Portsmouth. Comments and criticisms from these were taken on board and final drafts of the questionnaires were drawn up (see appendix B).

The final draft was sent to the 12 chosen plan co-ordinators (see references). Any information which could not be obtained from the questionnaire was obtained through a telephone interview with the Plan co-ordinator at a later date. The outcomes of the questionnaires were used to produce a review of the issues and a critical analysis of the techniques used when formulating coastal zoning schemes.

3.4 REVIEWING THE ISSUES

The issues involved in the development of the coastal zoning schemes were reviewed by an examination of the use of zoning, followed by an analysis of the issues involved in defining those zones. The issues were identified as being (See chapter 5):

1. Nature Conservation
2. Commerce
3. Recreation
4. Tourism
5. Commercial Port Development
6. Ministry of Defence Activities
7. Access
8. Policy Framework.

The issues were identified from the coastal management plans, the questionnaires and the telephone interviews.

The review of the issues provides a reminder of the different applications of zones. The question of how zones are defined and integrated, within the zoning scheme, is raised. This will be tackled in the analysis of the zoning process.

3.5 PREPARATION OF ZONING SCHEMES

Once the issues had been reviewed an analysis of the zoning process was carried out. The zoning process, as identified from the questionnaires and telephone interviews, is (see chapter 6):

- ☐ Identifying a need for zoning;
- ☐ Developing aims and objectives;
- ☐ Undertaking preparatory work;
- ☐ Developing zones as a technique;
- ☐ Implementation of the zoning scheme; and
- ☐ Monitoring and enforcing zoning scheme.

Each of the stages was analysed separately, using the example of conflict, between recreation and conservation, to illustrate their importance. An analysis of the process as a whole was carried out to see whether, or not, there was a formal framework for zoning schemes.

3.6 SUMMARY

This chapter has identified the approach used to achieve the aims and objectives specified in chapter 1. Importance was placed on the primary research, i.e. the questionnaires and telephone interviews, as these provided the bulk of the information needed to assess the zoning methodologies. The outcome of this approach shows whether the zoning is logical and the implementation is workable (see chapter 7). Finally the hypothesis is proved either positive or negative.

CHAPTER 4 - IDENTIFICATION OF PLANS

4.1 TYPES OF PLANS

Zoning schemes are part of some wider coastal management plans. In order to identify those management plans containing zoning as a technique the types of coastal management plans need to be identified. Coastal Zone Management Best Practice (1996) identifies the seven most significant types of plans affecting the coast as being:

- Development Plans
- Marine SAC Management Plans
- Heritage Coast Management Plans
- Local Environment Agency Management Plans
- Harbour Authority Management Plans
- Shoreline Management Plans
- Estuary Management Plans.

4.11 TYPES OF PLANS NOT SELECTED

Development Plans are used as a mechanism whereby local planning authorities set out their policies and proposals for the future development of their area. Development Plans were not suitable as they deal with land use rather than land management. The plans are also prepared by local planning authorities which only have jurisdiction down to LWM, with the exception of the Orkney and Shetland Isles. For the purpose of this dissertation plans which take into account the land, sea and the intertidal seabed must be considered.

Marine SAC Management Schemes deal with Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), designated under the Habitats and Birds Directive (Coastal Zone Management Best Practice, 1996). On the whole Marine SAC Management Schemes do not include zoning schemes. An exception is the Lundy Island Marine Nature Reserve which has a wholly aquatic zoning scheme. A copy of a document containing the methodology used to arrive at the zoning scheme could not be obtained and therefore the scheme is not be included in this dissertation.

Local Environment Agency Management Plans deal with the strategic planning of agency functions, covering flood defence, water resources, navigation, conservation, fisheries and pollution (Coastal Zone Management Best Practice, 1996). The plans are approached from a scientific, e.g. the layout of the zones, rather than a management point of view, e.g. operation of the zones. As zoning is a management technique these plans are again unsuitable.

Shoreline Management Plans (SMP) are limited in scope and look at coastal defence management within defined management units. This involves cell boundaries based on coarse sediment processes. SMP's indicate factors such as areas at risk from

flooding and defence options based on land use. The techniques used to determine which areas are at risk result in a spatially bound set of areas or zones, derived at from assessment of oceanographic features and land use. However this dissertation is interested in the use of zoning for activity management and regulation, which has a broader coverage than sea defence only. As such, plans were used that had sustainable resource use and multi-activity management as a central focus.

4.12 Types of Plans Selected

Heritage Coast Management Plans explore issues, derive a co-ordinated plan of action and provide detailed policies at the local level; to secure protection for, and attention to the management needs of these stretches of coastline (Coastal Zone Management Best Practice, 1996).

Estuary and Harbour Management Plans, promoted by English Nature, provide integrated plans for the sustainable use of British Estuaries (Coastal Zone Management Best Practice, 1996). These plans identify all management issues affecting the sustainable use of the water and related land. The wide range of issues in the estuary/harbour leads to conflicting activities which may be avoided by employing zoning schemes.

4.2 Existing Coastal Management Plans

The Directory of Coastal Planning and Management Initiatives (1994) notes that there were 31 Estuary and Harbour Management plans which are multilateral non-statutory plans, varying in scale from Faversham Creek and Adur Valley to the Humber and the Severn. There are 17 Heritage Coast Management Plans which focus on defined or designated areas; usually exhibit strong conservation emphasis; often supported by the Countryside Commission; include both county-wide (North York Moors, Suffolk Coast) and local (Lundy, Seven Sisters Country Park).

4.3 SELECTION CRITERIA

In the first instance twelve Estuary, Harbour or Heritage Coast Management Plans were selected. The selection of these plans depended on the following selection criteria.

1. The availability of the plans.
Many plans are held by the libraries or the Centre for Coastal Zone Management at the University of Portsmouth and HR wallingford Ltd. These plans were given preference over those which needed to be obtained from the plan co-ordinators in an effort to reduce the time required to obtain plans. Some of the plans are out of date and so the most recent version of the plan had to be obtained from the plan co-ordinator.

2. The cost of the plans.
The Heritage Coast Management Plans can be obtained from the plan co-ordinators free of charge, as could some Estuary Management Plans. These were given preference over those with a fee attached, in an attempt to reduce overall costs and the time taken to procure those plans.

3. The stage of the plans.
Final drafts of the plans were given preference over those which had only reached the consultation draft stage. However, after telephone discussion with the plan co-ordinators it was decided that consultation drafts could be used where there is little change between them and the final draft. Updates must be obtained from the plan co-ordinators. In some cases, the final drafts have yet to be completed, but the zoning schemes are already up and running, in which case the consultation draft of the plan is suitable for use.

4. Inclusion of zoning schemes.
Those with a known zoning scheme included were given preference over those without a zoning scheme. However it was considered important to look at those without zoning schemes in order to assess the reasons for the plan producer choosing not to incorporate a zoning system.

5. The number of plans selected.
Given time constraints and the sheer volume of information it was not practical to analyse all the plans in existence. This resulted in a representative sample of 12 plans being chosen from Estuary Management Plans and Heritage Coast Management Plans (see section 4.12).

4.4 CHOSEN PLANS

Table 4.1 gives a brief description of the plans which were chosen and which criteria were satisfied in the selection process.

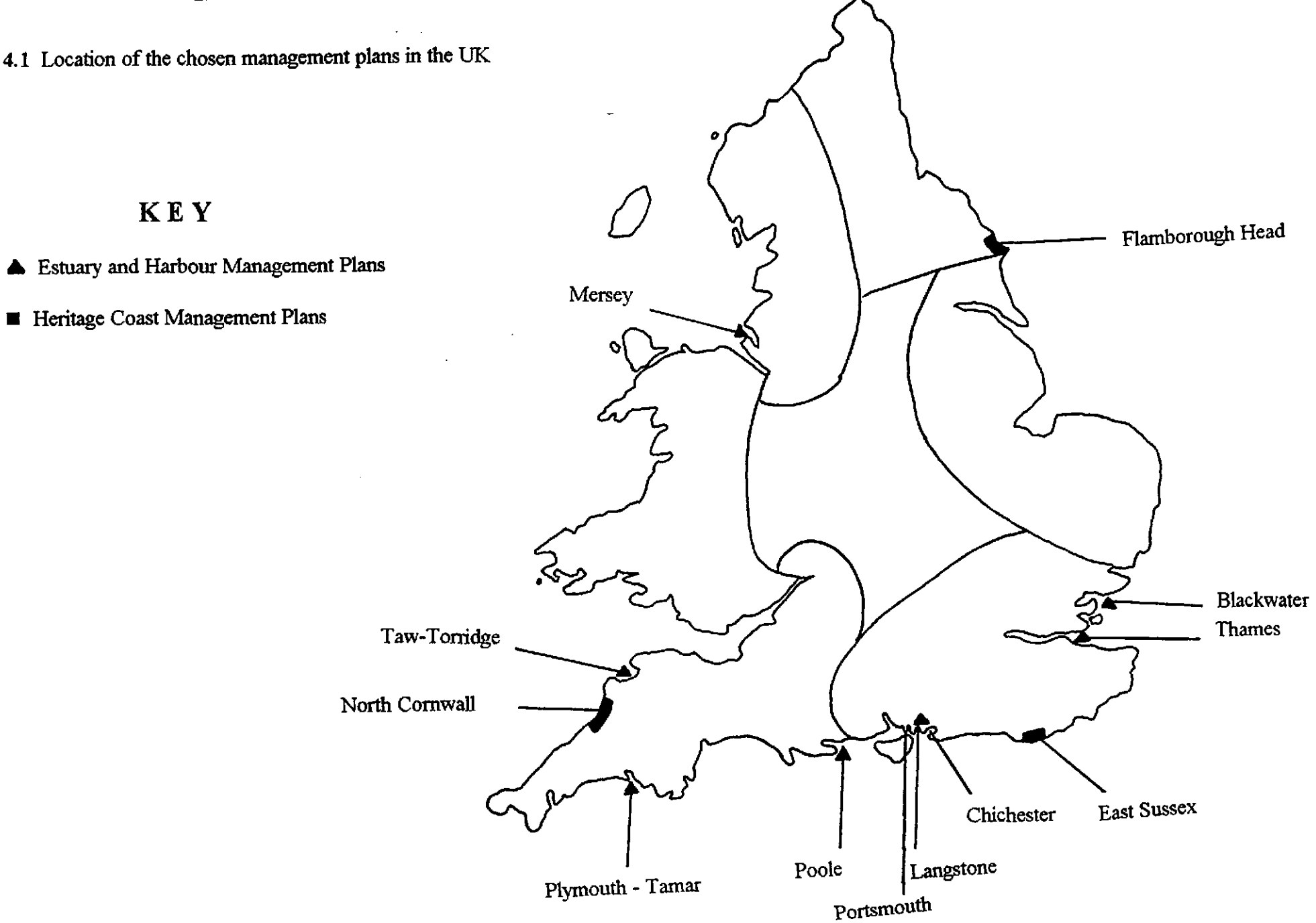
CRITERIA

[Availability] [Cost][Stage][Scheme]

	Centre for CZM	Library	HR Walling-ford	Plan Co-ord inators	Free of Charge	Fee	Consult-ation Draft	Final Draft	Known Zoning Scheme
Poole Harbour Aquatic Management Plan			■		■			■	■
Langstone Harbour Management Plan	■				■		■		■
Portsmouth Harbour Management Plan	■				■			■	
Chichester Harbour Management Plan			■		■			■	
Tamar Estuaries Management Plan				■	■		■		
Thames Estuary Management Plan				■	■		■		■
Mersey Estuary Management Plan				■	■			■	
Taw-Torridge Estuary Management Plan				■	■			■	■
Blackwater Estuary Management Plan	■				■		■		■
Flamborough Headland Heritage Coast Mngt. Plan				■	■			■	■
North Cornwall Heritage Coast Management Plan				■	■			■	■
East Sussex Heritage Coast Management Plan				■	■			■	

Table 4.1 shows the location of these management plan areas in England.

Fig. 4.1 Location of the chosen management plans in the UK



4.5 DISSCUSSION

This chapter has outlined the process of identifying and selecting a number of plans from which to work. These plans form the basis of the information presented in chapters 5 and 6.

CHAPTER 5 - REVIEWING THE ISSUES

5.1 ISSUES ASSOCIATED WITH ZONING SCHEMES

This chapter is concerned with the issues, e.g. nature conservation and recreation, which must be considered when formulating coastal zoning schemes. By analysing the coastal zone management plans a list of issues associated with the coastal zone was formulated. From the coastal zone management plans and the questionnaires it is possible to identify those issues considered important by a particular geographical area when producing the zoning scheme. Before discussing the issues identified it is necessary to briefly discuss the types of zoning schemes implemented by the management areas previously chosen.

5.2 TYPES OF ZONING SCHEMES

By analysing both the coastal zone management plans and the questionnaires three different situations where zoning is considered appropriate have been identified: Water-based recreational zoning scheme; along the Heritage Coast; and at Sites of Special Scientific Interest (SSSI).

Water-Based Recreational Plan	Langstone Harbour, Poole Harbour, Portsmouth Harbour, Thames Estuary, Tamar Estuaries, Taw-Torridge Estuary.
Heritage Coast Management Plan	Flamborough Headland Heritage Coast Management Plan, North Cornwall Heritage Coast Management Plan.
SSSI Consultation Zone	Langstone Harbour, Blackwater Estuary.

Table 5.1 Types of zoning schemes employed by the management areas studied.

5.21 WATER-BASED RECREATIONAL ZONING SCHEME

By far the most widely used application of the zoning schemes is the water-based recreational zoning scheme, e.g. Poole Harbour. Different management areas use the technique of zoning for different types of activities and at different degrees. For example, Langstone Harbour employs a zoning scheme to zone water skiing and jet skiing only, whereas the Blackwater Estuary employs a zoning scheme for all of its recreational activities. The Thames Estuary has even gone so far as to propose a similar scheme for activities on land.

5.22 Heritage Coast Zoning Scheme

The second type of zoning scheme is that employed by the Heritage Coast. The Heritage Coast is divided into characteristic zones where management principles are outlined. These zones, otherwise known as management areas, are formed according to character, degree of remoteness and particular opportunities (North Cornwall Heritage Coast Management Plan (HCMP), 1990).

5.23 Buffer Zoning Scheme

The third type of zoning scheme employed is that of providing a buffer zone around an SSSI, also known as a consultation zone. These zones were established by English Nature under the Town and Country Planning Acts General Development Order 1988, and amendment 1988 (Blackwater Estuary Management Plan (EMP), 1995). The intention of such a zone is to protect species from adverse landward influences such as disturbance, land drainage and misuse of pesticides. This type of zoning scheme is used merely to provide space between areas of scientific interest and otherwise damaging uses and, therefore, will not be discussed in further detail.

5.3 Issues Associated With Recreational Zoning Schemes

Through a combination of management plans and questionnaires it was possible to identify those issues considered important by particular management areas when formulating a recreational coastal zoning plan. These issues were identified as being:

1. Nature Conservation
2. Commerce
3. Recreation
4. Tourism
5. Commercial Port Development
6. Military Of Defence Activities
7. Access
8. Policy Framework
9. Existing Responsibilities.

Conflicts occur where many of these issues meet. For example, recreational pursuits often conflict with nature conservation efforts. Noisy activities, such as jet skis, can upset the breeding sites of many waders, especially in estuaries, e.g. the Brent Geese of Langstone Harbour.

5.31 Nature Conservation

Nature conservation was considered an important issue in nearly all of the management areas (see table 5.2) and was seen as a mechanism to reduce conflict. It is important that the existing nature conservation resource is maintained and passed onto

future generations, where ever possible in a better condition, in terms of quality and extent, than exists today (Thames EMP, 1996). In order to achieve this objective, recreational pressure should be diverted away from the most sensitive wildlife sites. The Blackwater Estuary protects inter- tidal areas (mudflats and saltmarsh) by preventing waterborne users landing by the use of zoning signage and information.

	Nature Conser-vation	Commerce	Recreation	Tourism	Commerc. Port Develop.	Ministry of Defence	Access	Policy Frame-work	Existing Respons-ibities	Commun-ications	Water Quality	Fisheries
Portsmouth Harbour	■	■	■	■	■	■	■					
Poole Harbour	■	■	■		■	■	■	■	■			
Langstone Harbour	■		■				■					
Chichester Harbour												
Blackwater Estuary	■		■				■	■	■	■	■	
Taw-Torridge Estuary	■		■									■
Tamar Estuaries	■	■	■	■			■				■	■
Thames Estuary			■					■			■	■

Table 5.2 The key issues of conflict identified from coastal management plans and questionnaires.

5.32 COMMERCE (INCLUDING COMMERCIAL PORT DEVELOPMENT

Commerce was considered important by both Poole Harbour and Portsmouth Harbour when formulating zoning schemes. Poole Harbour Steering Group recognised the potential conflicts between recreational activities and commercial activities and also between commercial activities and conservation issues. Recreational users have been noted as congesting Poole Harbour's entrance and the shipping channels, thus causing a hazard to commercial ships (Poole Harbour AMP, 1993). Commercial dredging operations destroy benthic invertebrate communities however, the Port channels must be cleared of siltation. Portsmouth Harbour is more concerned with providing a safety zone for the M.o.D. firing range. Major shipping channels are usually defined, e.g. Poole Harbour's commercial ferries. In many harbours there are also smaller lanes for recreational craft in order to steer the craft in and out of the harbour safely, without causing any conflict with the commercial ships.

The actual harbour related activities are rarely considered when forming a zoning scheme. However, these industries would invariably affect water quality, and in turn could affect the placement of a bathing zone for example. Perhaps harbour related industries and water quality should be two issues which should be considered during the production of a zoning scheme.

5.33 RECREATION

All those employing a zoning scheme consider recreation to be a key issue in the formation process (see table 5.2). Zoning of water-based activities, many of which are recreational, has already been identified as the most widely used application (see section 5.21). Recreational pursuits lead to a number of potential conflicts. For example, recreational activities often conflict with wildlife populations, commercial interests, and also with other recreational activities. Perhaps the worst culprits are jet skiers who often interfere with bathers, stray into shipping lanes, and disturb bird populations.

Using zoning as a management tool endeavours to reduce the effect of competing demand between different recreational activities. The Thames Estuary is one of the most congested estuaries in Britain for recreation (Thames Estuary Project, 1996). Fig. 5.1 demonstrates how the Thames Estuary Project Group have approached segregating these activities.

5.34 TOURISM

Tourism is, surprisingly, rarely considered a key issue when formulating coastal zoning schemes. Tourism, i.e. hotels, holiday accommodation and caravan parks, are often zoned in local development plans. Certain areas are designated for tourist developments. A good zoning scheme should take into account the seasonal and time factor in order to avoid unnecessary congestion during the busier months. This would involve time zoning and, although it is thought of as the most effective way of reducing conflict between watersports, is the least effective in terms of making use of water space (Goodhead and Johnson, 1996). An example of where such a technique is used is Military Of Defence gunnery ranges, e.g. safety zones in Portsmouth Harbour.

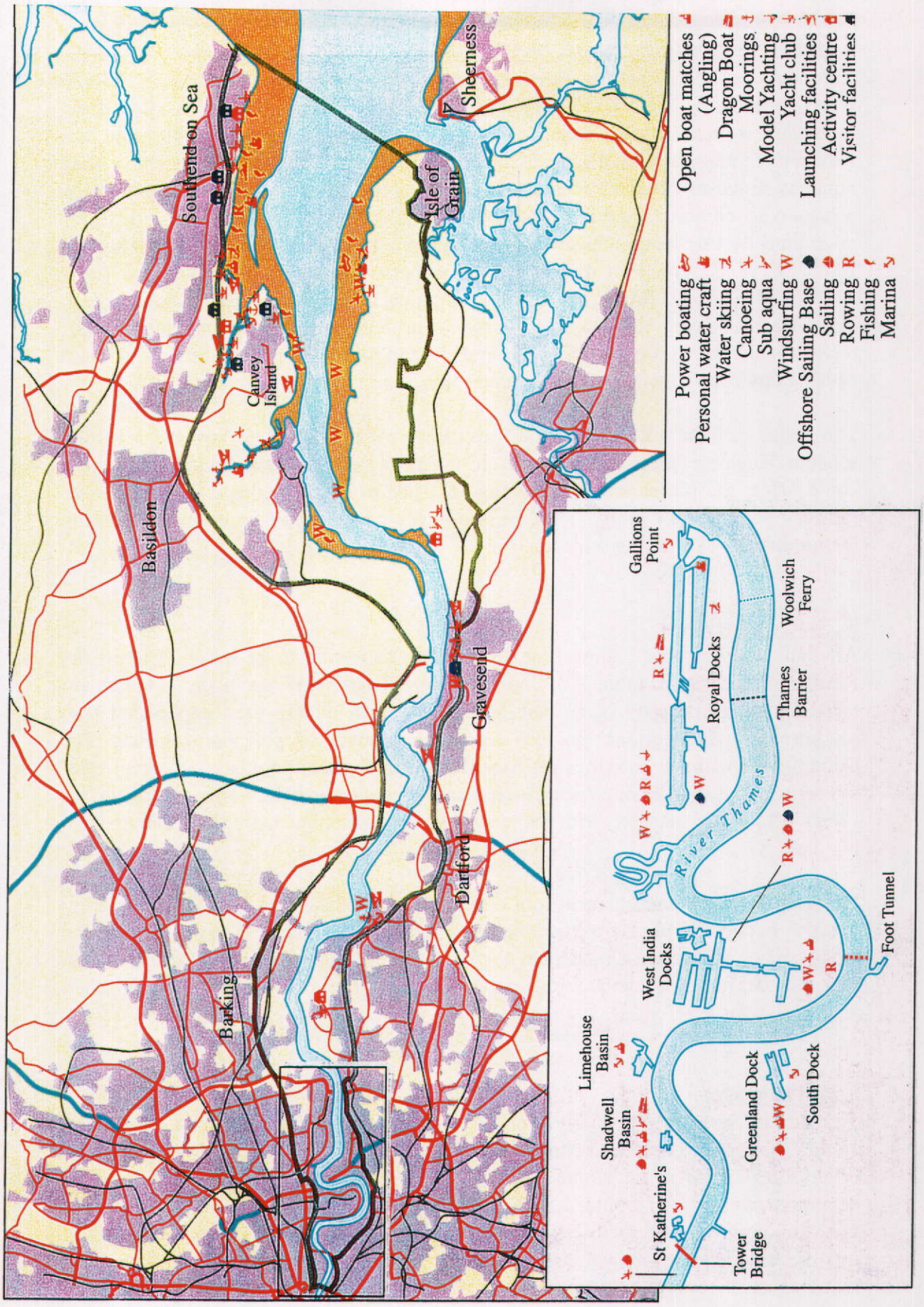


Fig 5.1 The Thames Estuary water-based recreational zoning scheme.

5.35 Ministry of Defence

The Royal Navy is a prominent force in Portsmouth Harbour, using the harbour for exercises and as a general Navy Base. The Ministry of Defence (M.o.D.) also use Poole Harbour regularly for exercises involving the Royal Marines based at Hamworthy. These exercises are potentially dangerous for other water users and thus zoning is an ideal tool with which to segregate the M.o.D.'s activities. In Portsmouth Harbour a zone has been formed for the Royal Navy firing range, with respect to safety (Phil Slamon, 1996). This issue is only important to specific management areas and therefore is obviously not considered by other harbours/estuaries.

5.36 Access

The zoning of a particular activity relies largely upon accessibility to the water. Different activities have different needs, for example sailors need a stable jetty from which to launch, whereas bather can swim directly from a beach. Many management areas consider access carefully when producing zoning plans, as activities can be restricted by restricting the types of users who can use a particular access point. For example, powered craft should not be allowed to access the water near a protected wildlife site, thus disturbing the birds (see section 6.63) .

5.37 Existing Responsibilities

Often the management of a harbour or estuary is spread across a range of bodies and across the low water mark divide (Poole Harbour AMP, 1993). No one authority has all of the appropriate management measures at their command. To prevent divergent and uncoordinated policies there is a need for an integrated management strategy in all management areas. This is imperative to zoning schemes where often there is more than one local authority involved in the decision processes as well as the different agencies concerned with conservation and watersports.

5.4 Issues Associated with Heritage Coast Zoning Schemes

Heritage Coast zoning schemes are formulated with respect to the coastal landscape. The four zones: remote zone; intermediate zone; intensive zone; and established settlements (see fig. 2.2); all have the following issues:

1. Physical Description
2. Ecology
3. Archaeology
4. Ownership
5. Recreation and Access
6. Settlements
7. Existing Use.

(North Cornwall Heritage Coast Management Plan (HCMP), 1990).

5.41 Physical Description

The Flamborough Headland HCMP (1995) note that to a person on the cliff-top path, their experience of the Heritage Coast is a combination of the coastline, the visible inland landscape and what is happening out to sea. Therefore derelict features in some areas detract from the landscape, spoiling an individuals experience. This can be worked to the landscape's advantage as many derelict features have historic and potential landscape value. Developments below LWM (e.g. drilling rigs off Flamborough Head) may also have a significant effect on an individuals experience of the Heritage Coast. Zoning can ensure that such features are not included in a zone known for its outstanding beauty.

5.42 Ecology

Many of the Heritage Coast Management areas have wildlife, habitats and communities that have unique characteristics. However, the Town and Country Planning System provide only a limited means of implementing such conservation issues. In order to manage and improve the area the Heritage Coast has policies and objectives which allow for a more positive approach, at the same time as complimenting the planning system. Water quality, commercial activities and recreational activities may have a significant effect on communities in the marine zone. Zoning can prevent adverse effects on such communities.

5.43 Archaeology

The archaeological resources of a Heritage Coast area are an integral part of what makes such an area special and unique (North Cornwall HCMP, 1990). It is important that sites are protected and managed properly. Thus such areas should be zoned as a remote area as they would be damaged in character if access was facilitated to any extent.

5.44 Ownership

Some areas of the Heritage Coast are owned privately, others by the government, and others by charitable organisations, e.g. National Trust. Different ownership can often lead to unco-ordinated management which results in a poorly managed coastline. The Flamborough Headland HCMP (1995) has noted that privately owned land with public access in some cases has not been managed in a way that is sensitive to the local landscape and environment. A zoning scheme needs integrated management in order to be successful.

5.45 Recreation and Access

The document 'Policies for enjoying the countryside' states for Heritage Coasts that they are highly attractive to large numbers of visitors. Often access and recreational opportunities are based on the existing public rights of way system along the Heritage Coasts. There is little land in public ownership within the Heritage Coast designations, and whilst considering public access to the countryside, the rights and needs of the landowners and farmers must be carefully considered (North Cornwall HCMP, 1990). In some Heritage Coast management areas there are areas within zones designated to recreational pursuits which have good access and facilities.

5.46 Settlements

Development within a Heritage Coast designation should make a positive contribution to its surroundings. The Heritage Coast has a number of policies for the built environment which includes that in prominent and exposed locations where the Heritage Coast has retained and undeveloped character, no new development should be allowed (North Cornwall HCMP, 1990). Such areas which have an undeveloped character should be zoned as remote, undisturbed areas.

5.47 Existing Use

The Heritage Coast zoning scheme involves zoning areas with respect to their existing character and landuse. Areas with large amounts of built environment are zoned as established settlements, areas with large amounts of farming activity are zoned as intensive, and areas of archaeological or wildlife importance are zoned as remote. Certain activities are restricted to specific zones which helps keep the character of a zone (see fig 5.1).

5.5 DISCUSSION

The issues reviewed in this chapter are those which have been addressed, by the management areas studied, when formulating a zoning scheme. Issues from both water-based recreational zoning schemes and Heritage Coast zoning schemes have been reviewed.

Heritage Coast zones are based upon existing land uses and are descriptive in nature. For example, a remote zone might be one of outstanding beauty with very little settlement. Whereas an area with large amounts of built environment is zoned as established settlements (see section 5.4). The zones cover both the terrestrial and the marine environment, although they only have powers down to the LWM.

Water-based recreational zones are based upon the activities which take place within a management area. The issues might be technical in nature, i.e. whether a particular zone can be accessed with ease, or more political, i.e. whether a zone satisfies various existing policies. Very few of the management areas studied took all of the issues reviewed into account (see fig. 5.1). The key areas of conflict, for each of the areas studied, have been identified in table 5.2. The management areas gave priority to different issues depending on the individual needs of that area. For example, Portsmouth Harbour has a lot of military activity and so this area is given a high priority. In contrast, Langstone Harbour is of a quiet nature and has an important wildlife content, particularly migratory birds. The wildlife in this case is given a high priority. Clearly, there needs to be an element of scoping to determine which of the key issues warrant further investigation.

This chapter gives a basic understanding of the issues involved in the formulation of a zoning scheme. Chapter 6 will go further and will discuss and analyse the process of zoning.

CHAPTER 6 - PREPARATION OF ZONING SCHEMES

6.1 INTRODUCTION

Chapter 5 discussed the issues which are considered important by plan co-ordinators, when using zoning as a tool to manage resources/activities effectively within coastal management plans. This chapter will assess the process of producing the zoning elements of plans. Different management areas have approached the zoning process in different ways. Some decisions are governed by the political environment, whereas others are purely technical in nature.

Firstly, the stages involved in producing a zoning scheme will be discussed, followed by an analysis of the zoning process as a whole.

6.2 IDENTIFYING A NEED FOR ZONING

In the first place the plan co-ordinator should identify a need for zoning. Of the management areas studied, all of them, with the exception of the Taw-Torridge Estuary, used surveys to identify conflicts between activities (see Fig. 5.1). Many of these areas back up these surveys with questionnaires and/or published statistics. Anecdotal evidence featured in all of the management areas, when identifying the conflicts (see Fig. 5.1). Complaints from the existing users of the geographical areas identify the major conflicts of activity. It was in this way, for example, that the conflict between speed boats and wind surfers in the Thames Estuary were identified (Thames Estuary Project, 1996).

Once it has been identified that conflicts exist it is necessary to actually identify the individual conflicts which can occur. This can be done by using matrices. Many of the areas have side stepped the identification of the perceived conflicts, and therefore might find that, during the implementation stage, important issues have been overlooked thus reducing the effectiveness of the management plan and the contributing zoning scheme.

Fig. 6.1 A matrix showing a summary of the questionnaire and subsequent interviews.

Key:

1 - Portsmouth Harbour
2 - Blackwater Estuary
3 - Thames Estuary
4 - Tamar Estuaries
5 - Taw-Torridge Estuary
6 - Poole Harbour
7 - Langstone Harbour
8 - Chichester Harbour
9 - North Cornwall Heritage Coast
10 - Flamborough Head Heritage Coast

Zoning scheme is proposed
Chichester Harbour - No existing zoning scheme
Heritage Coast Management Plans

	1	2	3	4	5	6	7	8	9	
Assessing the conflicts:										
Surveys	●	●	●	●		●	●		○	○
Questionnaires		●		●	●	●	●			
Published Statistics	●					●	●		○	○
Anecdotal Evidence	●	●	●	●	●	●	●		○	○
Other	●	●		●		●				
Aims and objectives										
Safety			●	●			●			
Enjoyment of other uses		●	●				●		○	○
Sustainability of activity(s)			●			●			○	○
Avoidance of conflict		●			●	●	●			
Voluntary agreements		●								
Reduce wildlife disturbance					●	●	●		○	○
Adopt "integrated" approach	●					●				
Criteria determining zones										
Physical characteristics	●		●			●			○	○
Nature & level of human activity	●		●		●	●	●		○	○
Availability of facilities/access	●		●		●	●	●			
Interactions between recreation	●		●	●	●	●	●		○	○
Past & future trends			●		●					
Safety implications	●			●	●	●				
By-products of activities						●			○	○
Other									○	○
Zoning processes:										
Fig. tables	●					●				
Consultation & public meeting	●	●	●	●	●	●			○	○
Bye-laws			●			●	●			
Legislation									○	○
Literature Review										
Other coastal managment plans		●			●					
Local plans	●	●			●	●			○	○
Club rules		●				●	●			
Proposed strategy (consultants)	●				●		●		○	○
National policy guidance	●								○	○

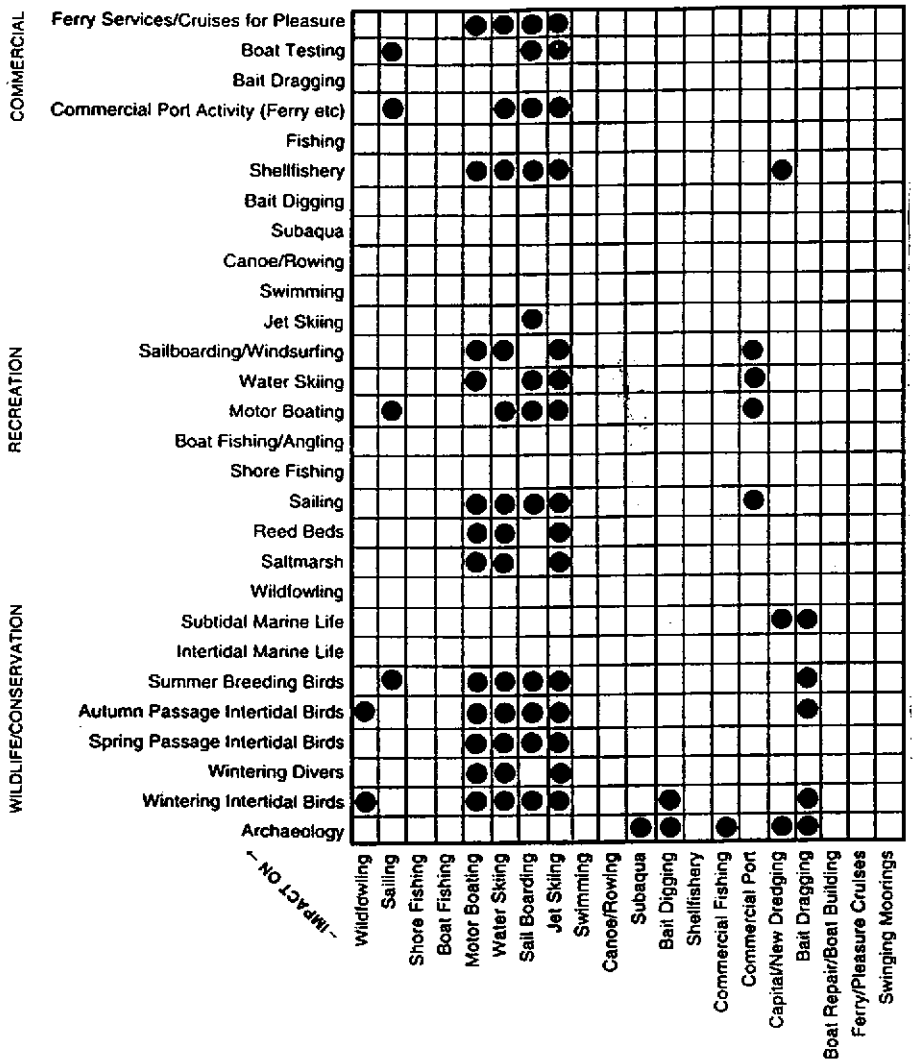
	1	2	3	4	5	6	7	8	9
Preparatory work undertaken by:									
University					●				
Local authority	●	●	●	●	●	●		○	○
External consultants	●			●	●	●			
Other			●					○	○
Stages in development:									
Initial review of information	●			●					
Public consultation of issues	●			●					
Preparation of consultation draft	●			●					
Review (comments/responses)	●			●					
Preparation of final draft	●			●					
Public participation									
Consultation stage	●		●	●	●	●		○	○
Public seminar	●							○	○
Leaflets	●				●	●		○	○
Objections to scheme									
None	●						●	○	○
Positioning of certain activities					●				
Monitoring/enforcement of zones									
None									
Voluntary wardens	●	●					●	○	○
Coastal rangers		●						○	○
M.O.D. Police	●			●					
Complaints by users				●	●	●	●		
Police						●			
Is zoning scheme successful?									
Yes			●	●	●	●			
Yes, but needs improvement		●					●	○	○
No									
Criteria proving success of scheme									
Availability of rangers			●					○	○
Reduced conflicts					●		●	○	○
Poilce reports				●		●			
Complaints to the council				●		●			
Reviewing the zoning scheme									
Continually	●	●							
4 - 6 years					●	●			
1 - 3 years			●					○	○
None				●					
Were a number of options considered?									
Yes	●			●	●				
No		●	●			●	●	○	○

6.21 MATRICES

Before the appropriate technique can be applied to a management area, the perceived conflicts must be identified. Poole Harbour and Portsmouth Harbour have used matrices to do this. The framework for such a matrix is adapted from a standard

Leopold Fig., where each activity is evaluated against every other interest and activity in turn to assess the magnitude and significance of the conflict for each interaction (Poole Harbour Aquatic Management Plan (PHAMP), 1994). Fig 6.2 illustrates the use of a matrix table in Poole harbour. In this case two 'scores' were allocated to each cell of the matrix to reflect these two factors: magnitude (for severity) of impact was rated from 'very low' to 'total preclusion of affected interest', and the significance of the affected interest in policy terms was rated from 'of no importance' to 'of international importance'.

Fig. 6.2 Present conflicts of significance (adapted from the PHAMP, 1994, original source from Dorset County Council).



- Matrix cells with high scores for both magnitude and significance (at least moderate impact and at least regionally important).

A similar process was used by *Phil Salmon* (Portsmouth City Council, 1996) for the Portsmouth Harbour Management Plan (Draft, 1996). The matrices show the key issues which require consideration by the management plan.

6.3 Developing Aims and Objectives

A set of aims and objectives provide a focus from which to work. It is not surprising, then, that all of the management plans have identified at least one aim, some several, from which to work (see Fig. 5.1). Ideally the aims and objectives should be concise showing that areas have used zoning as a technique to reduce conflict. Portsmouth harbour aims to, 'adopt an integrated approach to the management and use of the coastal zone, embracing both land and water,' (Phil Salmon, 1996). This is an aim more suitable to the Harbour Management Plan as a whole. In relation to zoning, a more specific objective would be to reduce conflict between two specific activities. For example, one of the objectives of the Taw-Torridge Estuary (Andy Ben, 1996) is, 'to reduce disturbance to wildlife'. This is carried out by including a jet ski zone away from the important wildlife areas, thus preventing the noise and wash from disturbing the breeding birds (see section 6.63). The Thames Estuary has the following objectives:

- ☐ To ensure the sustainability of the activity
- ☐ To enhance the enjoyment of users
- ☐ To ensure the safety of users.

These objectives are more specific, and therefore more suited to the concept of zoning, i.e. to reduce conflict between activities.

From the questionnaires and the management plans it is not clear that the management areas have formulated a set of aims and objectives specifically for the zoning of activities. If the aims and objectives are not well thought out it will be reflected at a later stage, particularly during implementation.

6.4 Preparatory Work

As part of the preparatory process a literature review should be undertaken. It has been shown in the work done for the literature review, for this dissertation, that there is very little information available on zoning as a technique, particularly with respect to water-based recreation. The newer plans can make use of existing zoning schemes, e.g. PHAMP (1994). Portsmouth Harbour (Phil Salmon, 1996) has identified the following as literature consulted in preparing the zoning scheme:

- ☐ National policy guidance
- ☐ Local authority policy documents

- ☐ Independent consultant reports
  (used to identify issues and gain information).

Phil Salmon (1996) has commented that none of the sources are specific to the concept of zoning since an integrated approach is being sought. The Blackwater Estuary (1996) has gone further and included the club rules in the literature review. These are important as they show how the existing club users operate within the estuary. It could be that some zones are naturally in place (see section 6.61). The lack of relevant material for a literature review would suggest that much of the preparation material for zoning must come from primary sources, e.g. qiestionnaires and interviews.

6.5 ZONING AS A TECHNIQUE

The Poole Harbour Steering Group (1994) suggested that the exercise of forming a matrix table recognised geographical and temporal separation between potential conflicts. As identified by Goodhead and Johnson (1996), 'a good zoning design should reflect the spatial, temporal and seasonal distribution of the activity and its preferences in terms of access and environmental conditions and the level of usage; the degree of restriction being relative to design'.

The core purpose is to separate conflicting activities within a management area. For example, in Langstone Harbour (Capt. P. Hansen, 1996), zoning is used in the harbour to provide an area for water skiing and to license jet skiers to launch at the harbour entrance. In other areas, for example in the Blackwater Estuary (Management Plan, 1995) and Poole Harbour (Steering Group, 1994), zoning is used for all water-based activities.

6.51 PERCEIVED CONFLICTS

As already discovered in chapter 5, the Heritage Coast Zones are based on descriptive material and the existing uses of the land. Water-based zones are decided upon using a more technical and political decision-making process. A number of conflicts can be identified between water-based activities. The most common conflicts of significance, identified by the questionnaires (see Fig. 5.1), are:

- ☐ Conservation and recreational activity
- ☐ Interactions between watersports
- ☐ Recreational activities and commercial activities
- ☐ Commercial activities and conservation issues.

The example of conflict between water-based recreational activities and bird populations will be used to illustrate the preparation of a zoning scheme. This example is common to most of the management areas studied, including Portsmouth,

Langstone and Poole Harbour, and the Blackwater, Thames and Tamar Estuaries. Powered craft, and in some cases wind surfers, disturb wildfowl breeding patterns in the summer and can disturb migratory birds feeding patterns in the winter.

6.6 PREPARATION OF THE ZONES

In order to prevent water craft from conflicting with the birds, the activities need to be separated, i.e. zoned. Certain types of activity can be limited to particular areas or zones, or be totally prohibited from set zones. Goodhead and Johnson (1996) have suggested that many activities choose a location for specific reasons, e.g. with the expectation of waves or surf. In many locations, however, conditions will be suitable for several watersports. A number of factors are considered when formulating these zones, namely:

- ☐ Consultation
- ☐ Physical characteristics
- ☐ Access
- ☐ Future Trends.

6.61 THROUGH CONSULTATION

Eight of the management areas identified consultation as an important part of the zoning process (see Fig. 5.1). Through consultation the nature and level of human activity can be implied. As Andy Ben (Taw-Torridge Estuary, 1996) suggested, consultation between the plan producers, the sports council and the existing users of the water space can build up a consensus as to how the water-space is used and by how many.

Poole Harbour carried out four separate studies during the consultation period:

- ☐ Breeding Bird Survey (RSPB, 1994)
  To assess the disturbance to wildlife.
- ☐ Consultation Exercise Report (Fairgrieve, 1995)
  To assess public perception of the plan.
- ☐ Recreational Activity Questionnaire Survey (Fairgrieve, 1994)
  To provide human evidence of human activity.

(Forsyth, 1995)

These studies gave the Poole Harbour Steering Group an idea as to: how the zoning scheme would be received by the public; and how the existing recreational activities interact with each other and other activities. The Taw-Torridge Estuary also carried out extensive public consultation (Andy Ben, 1996) and the Blackwater Estuary

carried out breeding bird surveys (Blackwater Estuary Management Plan, 1995), which suggests that these are widely accepted techniques.

When choosing where to place a particular zone, the existing users must be considered. For example in the Taw-Torridge Estuary some segregation was in place already (Andy Ben, 1996). In this case it was considered that the formulation of an already accepted principle was the way forward. Poole Harbour (PHAMP, 1994) also had traditional zones where certain activities took place, e.g. water skiing has traditionally taken place in the Wareham Channel. This was taken into account when positioning zones and the speed limit has been lifted in this area so that water skiing can continue to take place there.

6.62 Physical Characteristics

Physical characteristics were identified, by Portsmouth Harbour, Poole Harbour and the Blackwater Estuary, as being an important criterion in the zoning process (see Fig. 5.1). For example, Goodhead and Johnson (1996) have identified the following physical characteristics for sailing in a particular area:

- Depth of water (variations in depth owing to tide, water management, and climatic conditions);
- Shape and size of water area;
- Water characteristics;
- Wind characteristics (it is generally easiest to launch a dinghy from a windward shore).

They further suggest that where the design of a zone does not cater for these requirements, congestion, an enhanced risk of accidents and depreciation in the quality of and opportunity for recreation can occur.

This would suggest that physical characteristics are important in the development of an individual zone. It is surprising, therefore, that more management areas do not place more importance on them. Forsyth (1995) has criticised the PHAMP for not assessing the physical characteristics as to whether they are fundamental or merely desirable. For example, canoeists require shallow, calm water in order to carry out their activity in safety. Powered pleasure craft, on the other hand, desire calm water but do not necessarily require it.

6.63 Access

Access is considered an important issue, by many of the management areas, when producing an individual zone (see Fig. 5.1). Poole Harbour Aquatic Management Plan (1994) identifies the following as important criteria for access when deciding upon a zone:

- ☐ Proximity to zone;
- ☐ Suitability of facilities;
- ☐ Landside access,

(Forsyth, 1995).

Section 5.36 has looked at the importance of facilities and landside access in the zoning process. The Thames Estuary (Thames Estuary Project, 1996) placed the access points for jet skiers too far away from the zoned area for jet skiers. This resulted in conflict with other permitted users, e.g. powerboats and water skiers, whilst the jet skiers were travelling to and from their zone. The zone was also placed too far away from the zoned recreational area to patrol.

Langstone Harbour Board (Capt. P. Hansen, 1996) has designated access points for jet ski's at the harbour entrance, so that they can go straight out to sea and then return similarly. This is to prevent the craft from causing disturbance in the harbour itself, a particular relief for the wildfowl. The Langstone Harbour Board (Langstone Harbour Management Plan, 1995) notes that the noise and wash generated by such craft makes them the dominant user of any part of the harbour they enter.

6.64 FUTURE TRENDS

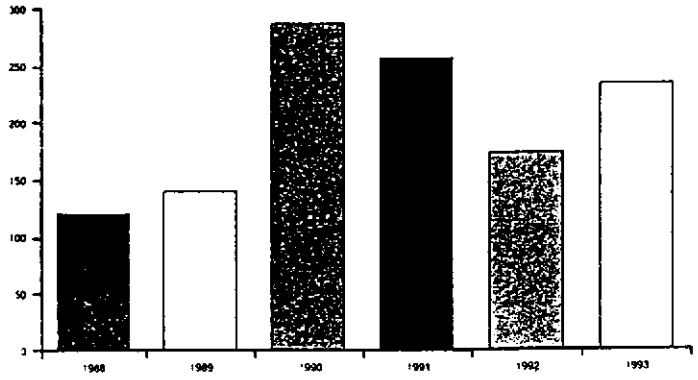
Poole Harbour and the Thames Estuary are the only management areas which consider trends in recreational activity as important (see Fig. 5.1), in the development of a zone. The Thames Estuary Management Plan (1996) recognises that the growth in outdoor recreation participation is expected to continue with increasing awareness of the benefits of healthier lifestyles. As noted in the PHAMP (1994) such anticipated trends in recreational activities have the potential to increase pressure on the wildlife. The Thames Estuary Management Plan (1996) has identified the following factors as those influencing future development:

- ☐ Demographic change: there is an increase in the number of people over 50 likely to stimulate increased participation in sailing and motor boating.
- ☐ Economic prosperity: if a turn in the economy is achieved, there may be a resurgence of interest.
- ☐ Leisure time: the growth in personal leisure time has encouraged sports participation.

The Poole Harbour Steering Group (PHAMP, 1994) considered that a reliable indicator of the strength of the waterborne leisure market may be found in the analysis of sales equipment through chandleries (see fig. 6.3). 'Equipment' refers to the electronics, masts, spares, engines, boat car products, clothing and footwear.

A balance between accommodating increased water-based activity, whilst reducing the conflict between those activities, must be achieved. Zones need to be designed with respect to the envisaged increase in waterborne activity.

Fig. 6.3 Equipment Retail Turnover 1988 - 1993 (Chandlery Turnover Estimates(millions))
(Adapted from PHAMP, 1994).



6.7 IMPLEMENTATION, MONITORING AND ENFORCEMENT

Success or failure of a zone during the implementation stage reflects on the methodology used to achieve that zone. The policy framework is essential when producing coastal zoning schemes. Plans should co-ordinate, support and inform the existing planning and management structures, including statutory development plans, coastal defence plans, mechanisms for pollution control, regulation of sea fisheries and controls over development beyond low water mark (Blackwater EMP, 1996). In turn zoning schemes must satisfy the policy decisions made in the wider coastal zone management plan, so as to achieve consistency throughout the framework (see chapter 5).

Monitoring of the zoning scheme gives an indication as to whether the overall zoning scheme is a success or not. All of the management areas have a mechanism for monitoring and enforcing the zoning scheme (see Fig. 5.1). The Tamar Estuaries monitor the zones by taking into consideration complaints from users, and will enforce the zones with the help of the M.o.D. police (Andy Ben, 1996). The Blackwater Estuary zoning scheme will be monitored and enforced by voluntary wardens and coastal rangers (Maldon District Council, 1996). The Taw-Torridge Estuary provides a different method and the zones are monitored through users reporting back to the project officer. The zones are self-enforced by users, and are supported by an information system, e.g. leaflets and panels (Andy Ben, 1996).

Safety is identified as important issue in the PHAMP (Forsyth, 1995). Some activities are not zoned at all. In the Thames Estuary (Thames Estuary Project, 1996) wardens are useful to patrol and advise on alternative sites for such activities. Rangers and the M.o.D. police are also useful to control the direction and numbers of a specified area. In some cases it might be necessary to positively exclude conflicting users. For example Langstone Harbour has excluded jet ski's from the harbour itself by enforcing a by-law to reduce speed. Such bylaws, when policed, give a statutory aspect to an otherwise voluntary scheme.

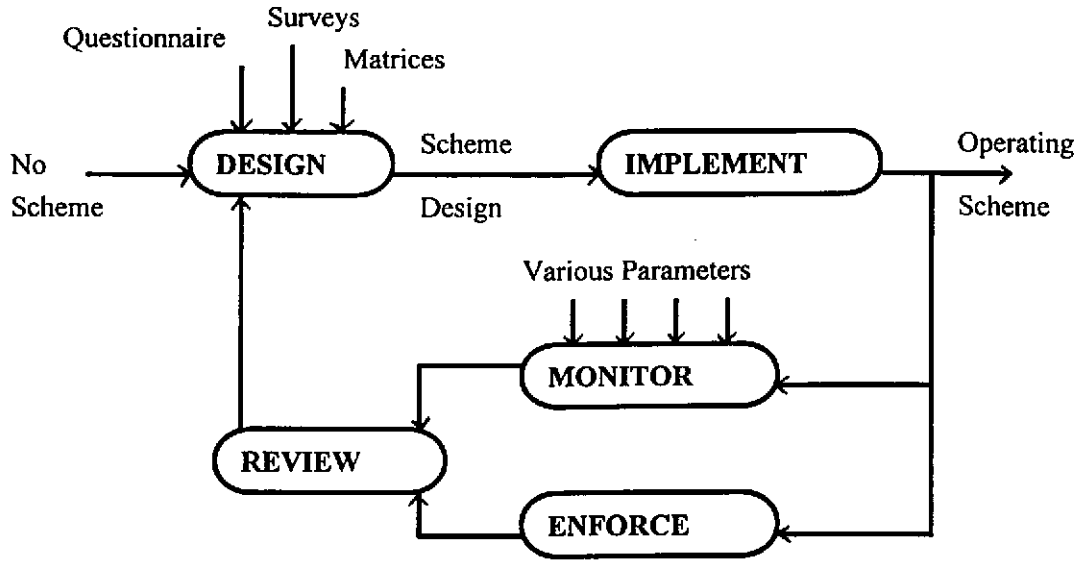
Of the management area studied, none claimed to have an unsuccessful zoning scheme (see Fig. 5.1). The Taw-Torridge zoning scheme satisfied their objective or reducing conflict. However, Andy Ben(1996) considered the scheme as a trial for further improvement. The Tamar Estuaries (Plymouth City Council, 1996) considered the zoning scheme to be pretty good, although they found that improved information at access points has proved successful. The Thames Estuary considered only some of their zones successful. As already mentioned (see section 6.64), the jet skiing access points were placed too far away from zoned areas.

6.8 DISCUSSION

This chapter has identified a number of stages/elements which hold some importance when producing a zoning scheme. These stages/elements are:

- ☐ Identifying a need for zoning;
- ☐ Developing aims and objectives;
- ☐ Undertaking preparatory work;
- ☐ Developing zoning as a technique;
- ☐ Implementation of the zoning scheme; and
- ☐ Monitoring and enforcing the zoning scheme.

Fig. 6.4 Stages/Elements in Producing a Zoning Scheme.



Even though many of the plan co-ordinators have gone through these stages during the zoning process, they couldn't identify any formal stages in the questionnaire (see Fig. 5.1). Portsmouth Harbour (Phil Salmon, 1996) and the Taw-Torridge Estuary (Andy Ben, 1996) have outlined the stages in the formation of a zoning scheme as being:

- ☐ An initial review of information;
- ☐ Public consultation of issues to be addressed;
- ☐ Preparation of the consultation draft of the plan;
- ☐ Review of the comments and responses;
- ☐ Preparation of the final draft; and
- ☐ Implementation.

However, these are the stages involved in producing the management plan as a whole, rather than the contributing zoning process. Also of importance is that a time scale couldn't be put to any of the stages, with the exception of the Taw-Torridge Estuary. This would suggest that the schemes studied have no formal framework and that they are somewhat rushed. This leads to inefficient zoning where some of the important issues are overlooked.

The fact that each of the management areas considered their zoning scheme either wholly, or in part successful, would suggest that the basic aims and objectives of that zoning scheme were met. However, in amny cases the aims and objectives were not clearly defined in which case it would be difficult to assess whether or not the zoning scheme was a success.

A similar, if weak, frameworks followed by all of the management areas studied. What seems to be lacking is a set of formal stages, i.e. a framework, which can be followed by all management areas who want to use zoning as a tool to reduce conflict.

CHAPTER 7 - CONCLUSIONS

7.1 RESULTS

1. Through reviewing the issues involved in formulating a zoning scheme, as a contributing part of a coastal management plan, it is clear that two very different approaches to zoning, in the coastal zone, have been followed. The Heritage Coast zones are based upon descriptive criteria, whereas the water-based recreational zones are based upon technical criteria relating to the activities taking place within that area.

2. It is essential that the key issues within a management area must be identified. There needs to be an element of scoping to determine which of these key issues warrants further investigation.

3. Through analysis of the water-based recreational zoning process it is clear that the zoning schemes studied have no formal framework from which to work. This results in stages of the zoning process being overlooked, thus resulting in the implementation of some ineffective zones, within the overall zoning scheme.

4. The management areas studied all claimed to have a wholly, or partly successful zoning scheme. Many needed further improvements in order to ensure the effectiveness of the zones. However, many of the management areas failed to identify specific aims and objectives and so it is difficult to assess whether they are, in fact, successful.

5. It emerged, from the questionnaire results, that in circumstances where stages of the zoning process were overlooked, that the monitoring and enforcement of those zones had to be increased to compensate. For example, in the Thames Estuary the jet ski zone was placed too far away from the recreational area. As a result wardens had to compensate by travelling further to patrol, i.e. more work was created for them (Thames Estuary Project, 1996). A lack of monitoring means that it is difficult to say whether a zone is successful and subsequently whether improvement in the design methodology is required (see section 6).

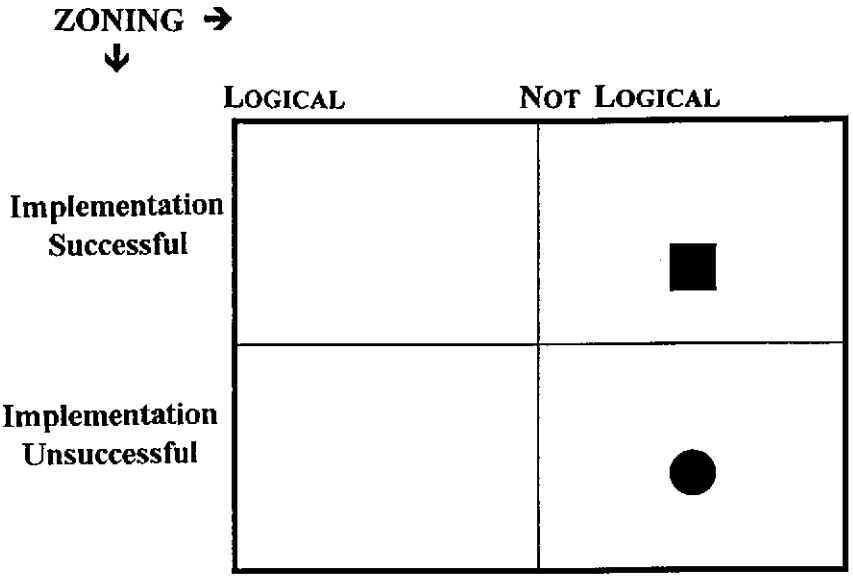
6. All of the water-based recreational zoning schemes followed a similar methodology (see fig. 7.1).

Fig. 7.1 ***Stages in the Methodology***

- Identifying a need for zoning;
- Developing aims and objectives:
- Undertaking preparatory work;
- Developing zoning as a technique;
- Implementation of the zoning scheme; and
- Monitoring and enforcing the zoning scheme.
- Review

It is evident that the zoning methodology is non-robust because monitoring and comparison to objectives is not carried out. Each of the stages, identified in fig. 7.1 should have been identified before the zoning process began. Many of the plans fall into the category of having a reasonable effective zoning scheme even though they failed to use a logical approach (see fig. 7.2). Others, for example, the Thames Estuary, need improvement and they fall into the category of being ineffective and illogical (see fig. 7.2).

Fig. 7.2 Some zoning schemes can be effective even when the methodology is not logical.



■ Those with a successful zoning scheme.
● Those with a zoning scheme which needs improvement.

7.2 DISCUSSION

In many cases several management options were considered before the zoning technique was chosen. Phil Salmon (Portsmouth City Council, 1996) declared that zoning was not considered to be the most effective means of resolving land-use problems in Portsmouth Harbour. He suggests that an integrated approach to planning in Portsmouth has encouraged convergence, rather than segregation, of different interests.

Philip Couchman (Pers. Comm., 1996) of Chichester Harbour states that the zoning approach wasn't taken for a number of reasons. Firstly, it was considered that zones get too full. Instead they have geographical entities that are more of an administrative

convenience, e.g. salt-marsh entity, access entity. Philip Couchman (1996) also states that Chichester Harbour Conservancy understands the logic behind zoning, but as yet they haven't seen the merit.

Goodhead and Johnson (1996) have gone as far as to say that the technique of segregating activities by area may actually be dangerous in terms of compromising safety, as recreational activity may be pushed into an area less suited to that activity.

7.3 FUTURE RESEARCH

Zoning has become a recognised technique as a tool for the reduction of conflict between water-based activities. Further research into transferring land-based zoning techniques to the coastal zone would be beneficial.

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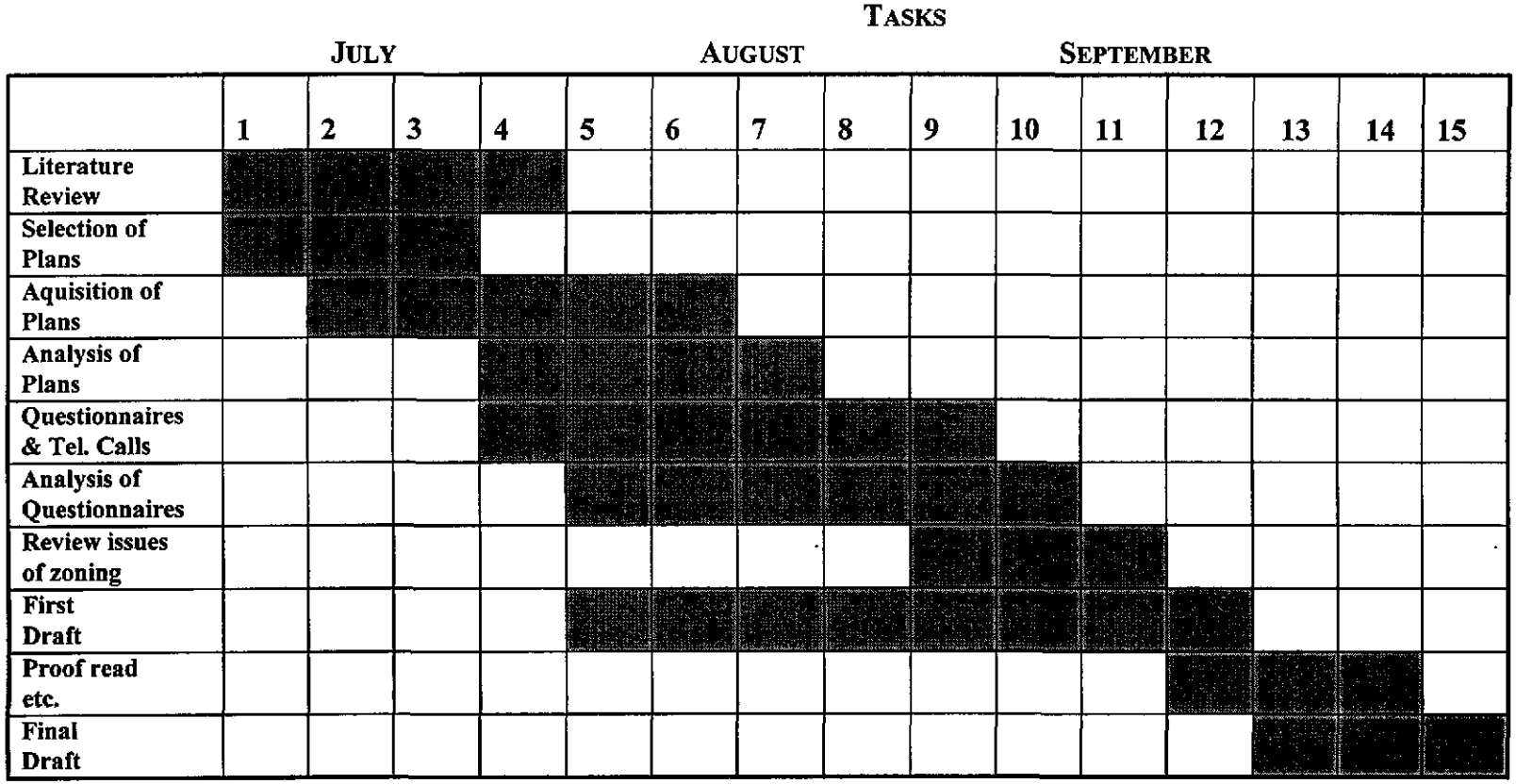
Appendices

APPENDIX A - PROGRAMME



Tel. Calls & Int's. = Telephone calls.
Proof read etc. = Proof read, diagrams, further drafts, etc.

APPENDIX B - QUESTIONNAIRE

1. **What were the four key issues of conflict identified in your management planning process?**

_____
_____
_____
_____
_____

2. **How were these conflicts assessed?**
   - **a. Surveys**
   - **b. Questionnaires**
   - **c. Published Statistics**
   - **d. Anecdotal Evidence, e.g. yacht owners complaining about jet skiis**
   - **e. Other (please specify)** _____

3. **Why was zoning considered appropriate for your area?**

_____
_____
_____
_____
_____

4. **What are the strategic aims and specified objectives of your zoning scheme?**

_____
_____
_____
_____
_____
_____

5. **What criteria were used to determine the desired zone?**
   - **a. Physical characteristics, e.g. landuse type**
   - **b. Nature and level of human activity**
   - **c. Availability of facilities and access**
   - **d. Interactions between recreation, commerce and residence**
   - **e. Past and future trends in recreational and commercial activities**
   - **f. Safety implications of navigation**
   - **g. By-products of activities, e.g. water pollution**
   - **h. Other (please specify)** _____

6. What process did you go through to produce the zoning scheme?

7. What literature was consulted in preparing the zoning scheme?

8. Who undertook the preparatory work for the zoning scheme?

a. University (please specify) _____

b. Local authority

c. External Consultants (please specify) _____

d. Other (please specify) _____

9. Outline the stages, and the time scale of those stages, in the zoning scheme?

10. At what stage were the public informed of the zoning scheme?

11. What were the four most significant objections made to the zoning scheme and how were these dealt with?

12. Will the operation of the zoning scheme be monitored/enforced, and if so, how?

i. **If monitored, is the zoning scheme considered successful?**

ii. **What criteria proved the success of the zoning scheme?**

13. **Will the zoning scheme be reviewed, if so, how often?**

14. **Could you describe the approach used in the development/preparation of your management plan?**

15. **Did your approach consider selection from a range of options for managing the coast, if so, what were those options?**

16. **As I am particularly interested in the technical aspects of producing zoning schemes, I would be grateful if you would provide any other comments you feel would be helpful or if you would send the copies of technical/preparatory material used in developing your scheme.**