Cyfoeth Naturiol Cymru
Natural Resources Wales

The Ecosystem Approach in action: global case studies, good practice and lessons learned

Jessica Woo, Andy Woolmer (Salacia Marine).

Cyfoeth Naturiol Cymru
Natural Resources Wales

Contents

Introduction

There are a number of international, European and UK drivers for implementing an Ecosystem Approach (EA) to management of the marine environment, and recent policies from the Welsh Government, including the Environment Bill for Wales 2013 and the Wales Marine and Fisheries Strategic Action Plan 2013, have the EA principles at their core. Given these commitments, there is significant interest in how an EA could be implemented to management of the Welsh marine environment.

The merits and practicalities of implementing an EA to fisheries and marine management in Wales are currently being explored by the fishing industry, non-governmental organisations and statutory bodies. Salacia Marine was contracted by Natural Resources Wales (NRW) as part of the FishMap Môn Project to undertake a case study review of global examples in which an EA to fisheries and wider marine management – or aspects of it – had been implemented. Following on from this, the review was required to consider how key lessons learned from the case studies might be applied to implementation of EA in the Welsh context.

This report is a collection of case studies from around the world, all of which illustrate the Ecosystem Approach, or elements of it, in action. There are examples of good practice and successful implementation, and others where management fell short in some respect. Some incorporate most or all of the twelve Core Principles, as laid out in the Welsh Government Framework. Others might fail the "test" as a whole, but are a good example of a few of these principles. Table 1 is an overview of the case studies in terms of which Principles they include.

Table 1

Welsh Government Ecosystem Approach Core Principles	The Wash	Chesapeake Bay	Apo Island	New Zealand	Great Barrier Reef	Galapagos Marine Reserve
Societal choice	X	X	X		X	X
Localised decisions	X	X	X		X	X
Adjacent effects		X	X		X	
Economic drivers	X	X	X	X	X	X
Ecosystem resilience		X			X	
Environmental limits	X	X		X	X	
Spatial & temporal scale	X	X	X	X	X	X
Long term approach	X	X	X	X	X	X
Managing change	X	X	X	X	X	X
Biological diversity	X	X	X	X	X	
Evidence	X	X		X	X	X
Stakeholder engagement	X	X	X	X	X	X

Each case study starts with a summary page. These in combination can be treated like an executive summary. Here, you will see at a glance the key elements of the study, including which aspects of the Ecosystem Approach are applied, a short abstract, and key lessons. There is also an indication of where it lies on the management continuum referred to in Striking the Balance – from state control to self-governance, with co-management falling in the centre of this. Additionally, there is an indication of which of the Implementation Phases described in Marine EcoSol's report[1] are demonstrated by the case study.

At the end of each case study is a reading list which includes anything directly referenced in the study in addition to sources of information for further reading.

Lastly, after the case studies have been presented, there is a concluding section which draws all the common threads together, explores how ecosystem services are addressed, and the implications of the lessons with reference to Wales.

[1] As described in Bloomfield, H; Stamp, T & Goudge, H (2014) A process for implementing an Ecosystem Approach to Fisheries Management in Wales: a literature review. Report by Marine EcoSol for NRW.

The Wash & North Norfolk Coast European Marine Site

Summary

This case study is an example of an adaptive co-management approach to marine management in a highly designated MPA which is a sustainable use site. There are mechanisms for stakeholder engagement, and management is also supported by scientific evidence. The management setup takes advantage of existing partnerships and promotes new ones, both coordinating on a strategic level and working directly at grassroots level. Local, regional and national elements to management are incorporated.

Aspects of Ecosystem Approach in this case study (Welsh Government Core Principles)

- Societal choice
- Localised decisions
- Economic drivers
- Environmental limits
- Spatial and temporal scale
- Long term approach
- Managing change
- Biological diversity
- Evidence
- Stakeholder engagement

Where on Striking the Balance spectrum

Implementation phases demonstrated

1. Understand context and issues
2. Objective setting
3. Explore management options & develop plan
4. Implement preferred management
5. Monitor
6. Evaluate & adapt

Why it works

- Ownership and partnership – combines individual and collective responsibility
- Partners' input has the appropriate "scope" – in terms of expertise, capability and interest; different groups consist of the right people for the right job
- Good communication between all partners, and "higher" and "grassroots" levels facilitated by the EMS scheme
- Agreement of higher level objectives and "vision" for a sustainable use site, implemented at a local level
- Constantly adapts to changing requirements and flexible enough to respond when things aren't working

Introduction

The Wash and North Norfolk Coast European Marine Site (WNNCEMS) is on the East coast of England, and runs from Gibraltar Point in Lincolnshire to Blakeney Point, Norfolk. In addition to being a SSSI and Ramsar wetland of international importance, the site is part of the Natura 2000 network of Marine Protected Areas, and includes a Special Area of Conservation and three Special Protection Areas, designated under the EU Habitats and Birds Directives.

These designations reflect the importance of the estuary in terms of the habitats it contains and the species it supports. In particular, The Wash is an important stopping-off point for winter migrant birds as well as supporting healthy resident populations. Among the habitat features are areas of subtidal biogenic reef (*Sabellaria spinulosa*), intertidal sand and mud flats, saltmarsh, and seagrass.

Figure 1 - The location and site boundary of the Wash & North Norfolk Coast EMS

The group of sites is managed collectively under the Wash and North Norfolk Coast European Marine Site (EMS) management scheme. The site boundary for the EMS is shown outlined in Figure 1.

European Marine Sites are “sustainable use” sites. This means that despite high level of legal protection, activities aren’t prohibited but instead strictly managed in a way that should not detriment the features of the site. There are in fact a wide range of activities that take place within the site.

Fishing

Commercial cockle and mussel fisheries – both wild capture and aquaculture – occur in the intertidal sand and mudflats of the Wash and the harbours of the North Norfolk coast. Seasonally, there are trawl fisheries for brown and pink shrimp, and crab and lobster potters target the deeper parts of The Wash. These fisheries are collectively worth millions of pounds to the local economy. Around 90 boats fish within the EMS, mostly based in King’s Lynn, Boston, Brancaster and Wells-next-the-Sea.

Tourism and recreation

The North Norfolk coast is a popular area with millions[2] of visitors each year taking advantage of the amenities of the area. The relatively undeveloped landscape and coastal environment are a big part of the attraction of the region. The visiting bird species are also a big draw to birdwatchers who visit the RSPB reserves at Frampton Marsh, Snettisham and Titchwell. Seal trips to the Inner Wash (from Hunstanton) and Blakeney Point (from Morston and Blakeney) are popular. Sporting activities include recreational sea angling, sailing, kite-boarding and golf. Many dog walkers use the coastal areas regularly.

Ports and shipping

There are commercial ports on the Witham, Welland, Nene and Great Ouse. The largest ports at King's Lynn and Boston each handle in excess of £1m cargo a year. Recently, Wells-next-the-Sea has become an important base for support vessels for the nearby offshore windfarms with an outer harbour being built to provide a wider tidal access window.

Other uses

Locally, a variety of other activities take place, from engineering projects such as maintenance dredging, sea defences and offshore renewables, to military practice grounds in the south and western Wash, to farming just beyond the sea walls in Norfolk and Lincolnshire. Traditional "longshore" activities include bait digging, samphire picking and wildfowling, and many of these are exercised as rights in common by the local community. There is some industrial use of the rivers that discharge into The Wash.

What they do

The ecological, economic and socio-cultural importance of the site is reflected in the number of organisations who are involved in managing it. These organisations form a partnership through the EMS Management Scheme.

As illustrated in Figure 2, there are a range of partners including:

- Statutory authorities – these organisations have legal responsibilities within the EMS and comprise local and national government (KLWNBC, NNDC, NE, MMO) autonomous bodies such as Eastern IFCA, the drainage boards and harbour & port authorities, and government executive agencies such as the Ministry of Defence, Crown Estate and Environment Agency. Most of these partners contribute funding and sit on the project's management board.
- Non-statutory partners (NGOs – RSPB, Wildlife Trusts, National Trust)
- Local organisations (fishermen's associations, wildfowlers, RYA, Parish Councils)
- Individuals (including common rights holders)

[2] In 2010, North Norfolk District Council figures show over 6 million visitors to the area, with spending valued at over £397 million pounds (Tourism South East, 2010).

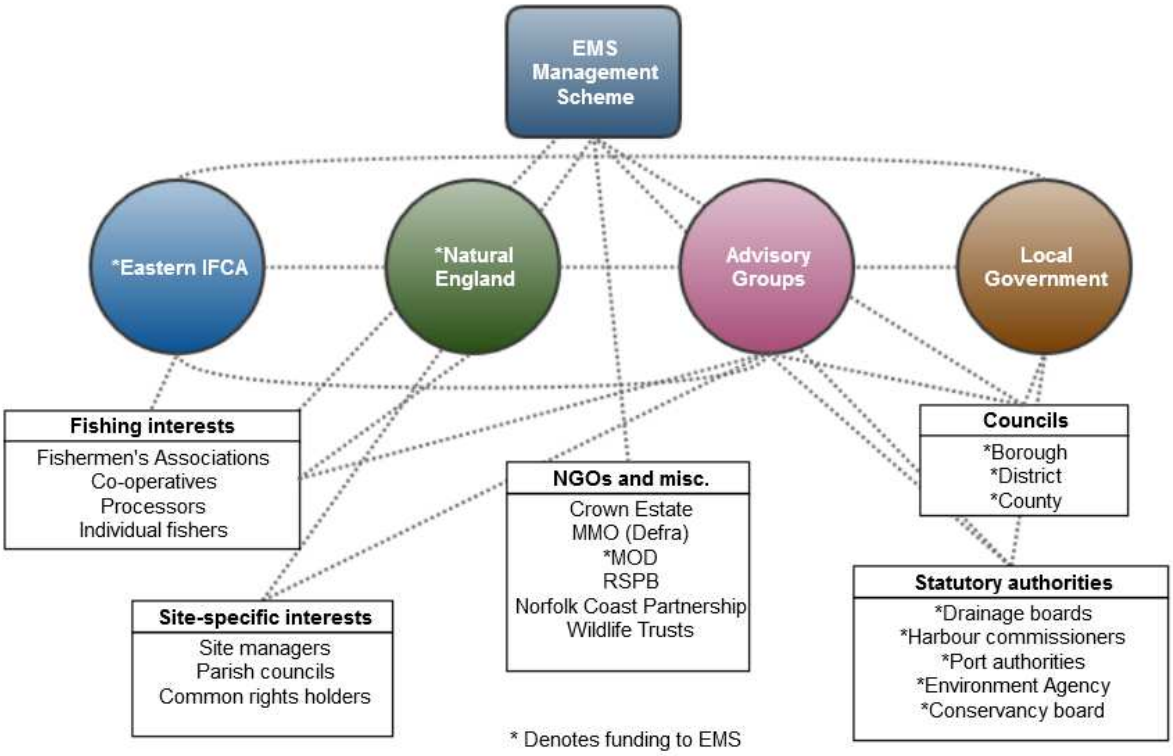


Figure 2 - Organisational chart showing key EMS partnerships and groups

The EMS Scheme coordinates the activities of key organisations and groups with the purpose of making sure the conservation objectives of the site are being addressed. In addition to taking advantage of pre-existing partnerships, new ones are created. This model has the effect of helping those involved to avoid duplicating effort, improving communication and creating efficiencies.

In addition to this high-level strategy work, the EMS Project Manager works directly with the community and local officers of relevant authorities and NGOs through Advisory Groups. The makeup of each Advisory Group is quite different, reflecting the key issues within the site in that area – for example, agriculture and wildfowling in Lincolnshire, and common rights issues and the longshore economy on the Norfolk Coast.

The larger partner organisations also do their own engagement at a community level. The IFCA, for example, has a duty to collaborate on management of the fisheries, and the IFCA committee has representatives from a cross-section of interest groups.

Figure 3 (below) shows the process of managing fisheries in the Wash and North Norfolk Coast. Commercial fisheries are the responsibility of the IFCA, but they don't work in isolation – the MMO, Natural England and many other partners (organisations and individuals) have direct input to the IFCA at committee level. The IFCA directly consults the fishing industry about management, too – and they communicate with local stakeholders outside the industry through the Advisory Groups.

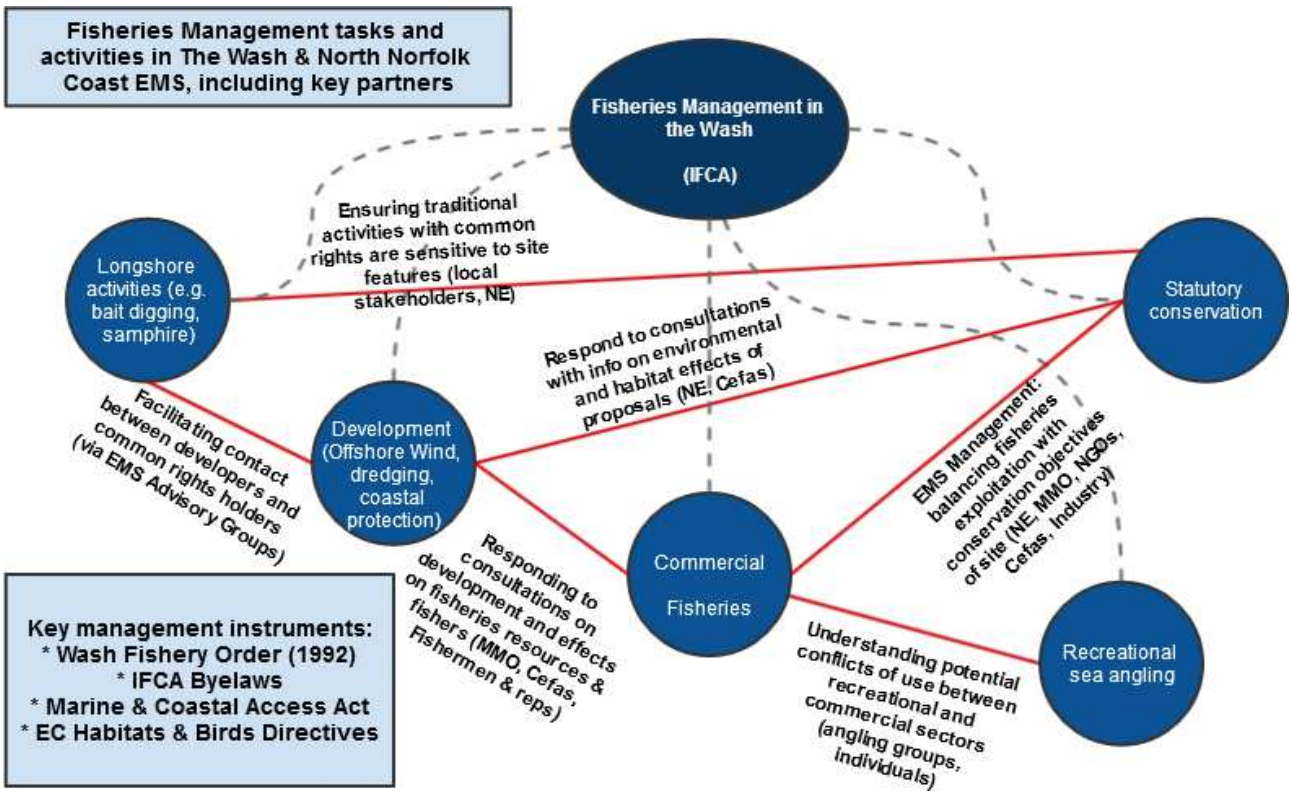


Figure 3 - Key Fisheries management activities, partnerships and legal instruments in the Wash & North Norfolk Coast EMS

Because of the breadth of interests being taken into account and represented by consultees and partners within fisheries management matters, a more holistic approach that takes other activities into account is effectively "hard wired" into this approach. This is what makes it effective, and is the reason why co-management is an integral part of the Ecosystem Approach.

Successes

Over time, a strong working relationship between IFCA Officers, local Natural England Officers and the fishing industry has developed. This has improved compliance – reducing risk to the site features, and allowing a less hands-on approach to enforcement. The IFCA and NE have agreed on management policies for cockle and mussel stocks which reference bird populations and food requirements; these streamline the Regulation 33 "Appropriate Assessment" process meaning fisheries can be opened more quickly and with less staff time – but also, if stocks won't support a big fishery (as has happened in some recent years) it's clear why and industry are able to accept it.

Similar benefits have been seen in areas outside fisheries management. The Advisory Group setup allows localised issues and concerns to be tackled with the relevant people "on the ground", as well as allowing members to contribute to tackling the wider issues affecting the site as a whole. Because the topics discussed are of interest to the local community, there is good attendance of the meetings and they are often a better way for Natural England and IFCA Officers to get feedback on consultations because the Advisory Groups are better attended and less "formal" than those organisations' own drop-ins and roadshows. It's people talking to people, rather than a organisations consulting

stakeholders, and the organisations get more meaningful feedback as those they're consulting are more likely to engage. This has helped recently, as there have been a lot of different consultations about changes to marine planning and many Advisory Group members have suffered from "consultation fatigue". Being able to talk to relevant authorities on a personal level has saved time and confusion.

Ultimately the setup of the Scheme and its partnership focus has achieved its purpose of improving the ecological status of the European Marine Site. Since its establishment, many of the interest features in the EMS have been brought from "unfavourable" or "declining" condition to favourable status.

Bringing the lessons home

Wales has faced a transition over the past few years from the previous framework , where inshore fisheries, those outside the 6nm, inland waters (the EA) and statutory conservation duties (CCW) were managed by separate entities, to a new model where these services have been taken "in house" under Welsh Government and within Natural Resources Wales. This will help ensure management is consistent and, in theory, improve communications between those responsible for different work-streams.

However, it will be important to understand the most appropriate "unit" for management and consultation, depending on the spatial footprint of activity or matrix of activities. The scope may be different, depending on both the needs of the local environment and the stakeholders. It will be necessary to ensure contact is maintained with stakeholders and partners outside Welsh Government and at a local level, as these smaller groups and non-governmental organisations (even individuals) can be key partners with specialist knowledge and the means to get things done. Inviting input and true joint working from a broad section of stakeholders might not be possible at a legislative level, but schemes such as that in operation for the Wash & North Norfolk Coast EMS allow statutory bodies to create meaningful working partnerships with a broad range of organisations and interests. Strong relationships may take time to build, but are a good long term investment and have the potential to create "wins" for all involved.

The Fishmap Môn Project demonstrated that a great deal can be achieved through a partnership approach. Extending this to co-management of marine resources – particularly with the support this concept is currently receiving from the fishing industry – would be a welcome next step.

Reading

Eastern IFCA (2013) Eastern Inshore Fisheries and Conservation Authority (website). Available online at: http://www.eastern-ifca.gov.uk/ *(Provides general information on the IFCA and its duties and functions. Documents are available, including research reports, management plans and meeting minutes.)*

Eastern Sea Fisheries Joint Committee (2008) Fisheries Management Policies. ESFJC, King's Lynn. 22p. Available online at: http://www.washandnorthnorfolkcoastems.co.uk/downloads/PDF/Management-Policies-08.pdf *(This document contains the cockle and mussel management policies agreed between the IFCA's*

predecessor and Natural England for the Regulated Fisheries within the Wash and North Norfolk Coast EMS, as referred to in this case study.)

Tourism South East (2010) Economic Impact of Tourism. North Norfolk District Results. Available online at: https://www.northnorfolk.org/files/Economic_Impact_of_Tourism_-_North_Norfolk_2010_Full.pdf

WNNCEMS (2014) Wash and North Norfolk Coast European Marine Site Management Scheme (website). Available online at: http://www.washandnorthnorfolkcoastems.co.uk/ *(This contains information on the organisation of the Management Scheme, and documents and papers for the Advisory Groups as well as links to Project Partners.)*

Thanks also to Sharron Bosley, Project Manager for the EMS Scheme, for her personal observations.

Chesapeake Bay

Summary

This case study is an example of ecosystem-based management on a large scale, with adaptive management and a collaborative approach at the core. There is a formal structure which coordinates the work of a large number of partner organisations and incorporates stakeholder engagement and scientific expertise at every level of management. This is reflected both within Teams, responsible for specific workstreams, and across the higher-level strategic work that knits everything together. The Bay Program has no regulatory powers itself, but ensures that the appropriate statutory obligations are met on a federal, state and local level, and that they are effective in the context of the ecosystem as a whole (for example, through the overarching Fisheries Ecosystem Plan which provides a basis for implementing the ecosystem approach through Fisheries Management Plans).

Aspects of Ecosystem Approach in this case study (Welsh Government Core Principles)

- Societal choice
- Localised decisions
- Adjacent effects
- Economic drivers
- Ecosystem resilience
- Environmental limits
- Spatial and temporal scale
- Long term approach
- Managing change
- Biological diversity
- Evidence
- Stakeholder engagement

Where on Striking the Balance spectrum

Implementation phases demonstrated

1. Understand context and issues
2. Objective setting
3. Explore management options & develop plan
4. Implement preferred management
5. Monitor
6. Evaluate & adapt

Why it works

- Ownership and partnership – combines individual and collective responsibility
- Partners' input has the appropriate "scope" – in terms of expertise, capability and interest; different groups consist of the right people for the right job
- Good communication between all partners, and "higher" and "grassroots" levels facilitated by the Bay Program

- Agreement of higher level objectives and “vision” for the Bay, implemented by the appropriate partners (federal, state, academic, community etc.)
- Constantly adapts to changing requirements and flexible enough to respond when things aren’t working
- Realistic goals over long- and shorter-term timescales

Introduction

Chesapeake Bay is the largest estuary in the United States, with a huge catchment area which drains over 64,000 square miles of land over seven states: parts of Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia and the whole of the District of Columbia. The administrative element of this is considerable – across the catchment, there is a population of 17 million living in a huge number of towns, cities, counties and townships and consequently 18,000 local governments have responsibilities within the wider Bay ecosystem.

Figure 4 - Chesapeake Bay and its watershed

Perhaps unsurprisingly, given the massive size of the watershed and the population, there are many human uses and pressures which have had an effect on the health of the Bay ecosystem.

Fishing

The Bay itself is home to over 2700 species of plants and animals. This includes over 300 species of finfish and 173 species of shellfish. The fisheries here are highly productive, with just under 227 000 metric tonnes of seafood landed annually – however, landings have been steadily declining. In particular, catches of the dominant commercial species,

Atlantic menhaden (*Brevoortia tyrannus*) and blue crab (*Callinectes sapidus*) have fallen over recent decades, and the number of key species that contribute to commercial fisheries has also been declining. Oysters were once the most significant fishery in the Chesapeake, but the current population is just 1% of what it was pre-1980 due to overharvesting, sedimentation and disease. The decline in oyster reefs, which act as natural filters, has had implications for water quality in the Bay.

Tourism and recreation

The Chesapeake Bay area is a popular tourist destination for those visiting Maryland and Virginia. Outdoor pursuits such as sailing, fishing and other water sports are particularly popular and take advantage of the amenity value of the landscape.

Ports and shipping

There is a large commercial port at Baltimore, Maryland, which handles a large volume of domestic and international cargo, and is an embarkation point for passenger cruise ships. Other ports in the Chesapeake Bay include Port Annapolis (also home to the US Naval Academy) and smaller yacht havens and marinas at Crisfield and Havre de Grace. The waterway continues into the major tributaries, with many of the larger ports on the James River (including Newport News, Norfolk, Portsmouth and Richmond) of particular significance due to shipbuilding, industrial and naval activities.

Other pressures

Given the scale of the catchment area, many of the pressures relate not to local or specific activities, but to the cumulative effect of the large human population within the watershed of the Chesapeake. Farming and agriculture accounts for one quarter of the land use within the watershed, and is the largest source of nutrient and sediment pollution into the Bay. Additional input of nitrates, phosphates, sediment and other chemical pollutants comes from atmospheric deposition, storm water runoff and wastewater from urban and industrial sources within the catchment.

In addition to water quality issues, habitat degradation and modification has had an effect on ecosystem structure and function, affecting native flora and fauna as well as the amenity value of the landscape.

What they do

The Chesapeake Bay Program was established in 1983 as a regional partnership involving state and federal government as well as NGOs (environmental and others) and academic organisations and community representatives. The initial agreement was a statement of intent, which was further strengthened in 1987 by the (at the time, novel) setting of specific targets and deadlines by which they were to be achieved. *Chesapeake 2000* added a more comprehensive higher level vision and strategy along with 102 goals, and at this time the headwater states (Delaware, New York and lately West Virginia) signed up to the partnership. In 2009, the Program introduced additional short-term biennial milestones, with the aim of accelerating progress.

The Chesapeake Bay Program partners include:

- Federal agencies such as the Environmental Protection Agency (EPA), National Ocean and Atmospheric Administration (NOAA), US Department of Agriculture, Department of Education, Department of Defence (19 total)
- State agencies and programs (nearly 40, across the six States and the District of Columbia), for example: the States of Maryland, Virginia and Pennsylvania; the Chesapeake Bay Commission, a legislative assembly from these three States; specialist state departments such as the Pennsylvania Bureau of State Parks. Academic institutions, including Universities, colleges and research institutes (25)
- Non-governmental organisations, including those concerned with conservation, education and environmental stewardship (over 30)
- Local governments (around 1800), represented on the Local Government Advisory Committee
- Citizen advisory groups

Funding for the Program comes principally from federal and state sources, and includes direct funding and in-kind support such as staff, technical expertise and office space.
Figure 5 shows the structure of the Bay Program management including the Goal Implementation Teams (GITs).

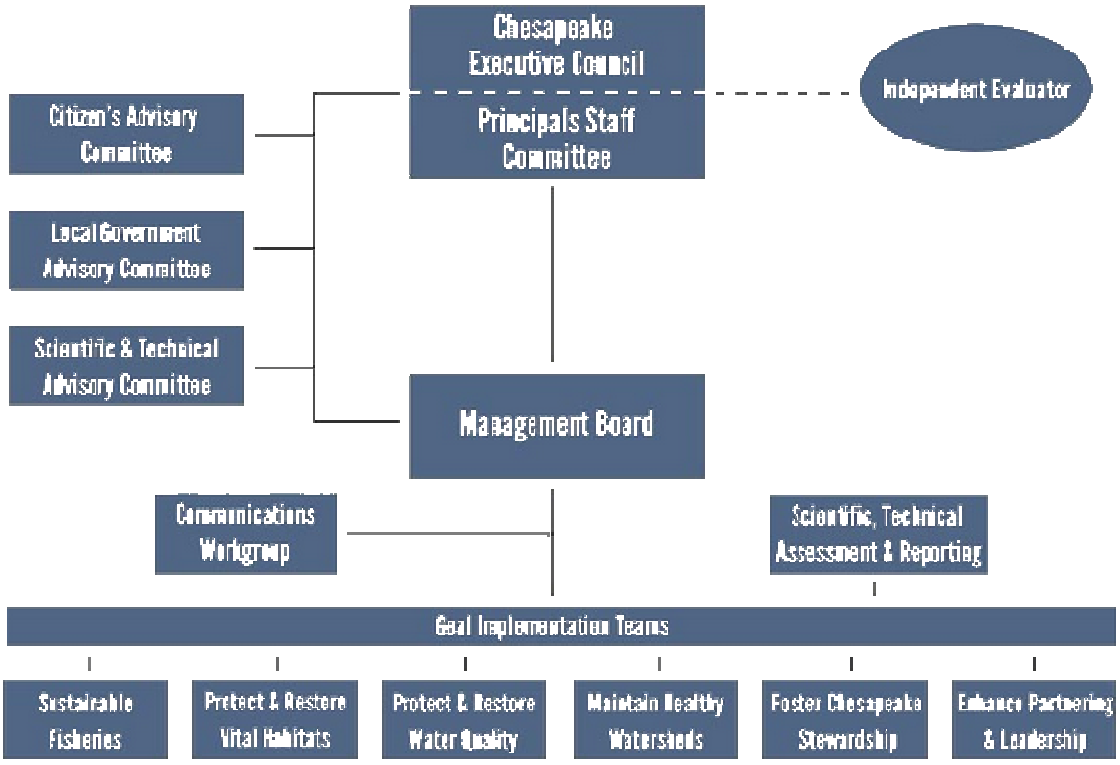


Figure 5 - Organisational chart showing the structure of the Chesapeake Bay Program (Chesapeake Bay Program, 2013a)

The GITs each have responsibility for an area of management, such as fisheries or water quality, and are made up of representatives from relevant partnership organisations, as

well as stakeholders not necessarily represented in a statutory capacity – such as community groups, or individual fishermen (watermen). Essentially, each Team brings the right people together to get things done.

As well as being a way of coordinating management across different key areas, it is of direct benefit to the partner organisations, which are able to avoid duplicating effort which helps conserve their resources. It also allows for establishing good working relationships outside the specific remit of the Bay Program, and partners share skills and expertise. Advice is fed in from scientists, government and from the community not just at GIT level, but also on the more "higher level" strategic side via the advisory committees. These committees input into the overall management through the Board, which coordinates the work of the separate teams to make sure everyone is on the same page, within the wider context of the ecosystem.

Adaptive management

The Bay Program uses an adaptive management process in its approach, which is illustrated in Figure 6. This applies to the work of each GIT and to the work of the Bay Program as a whole; the key goals are identified and assessed, specific targets to address any gaps are set and worked into the management strategies, and progress is assessed with changes made to monitoring, goals, and management as necessary.

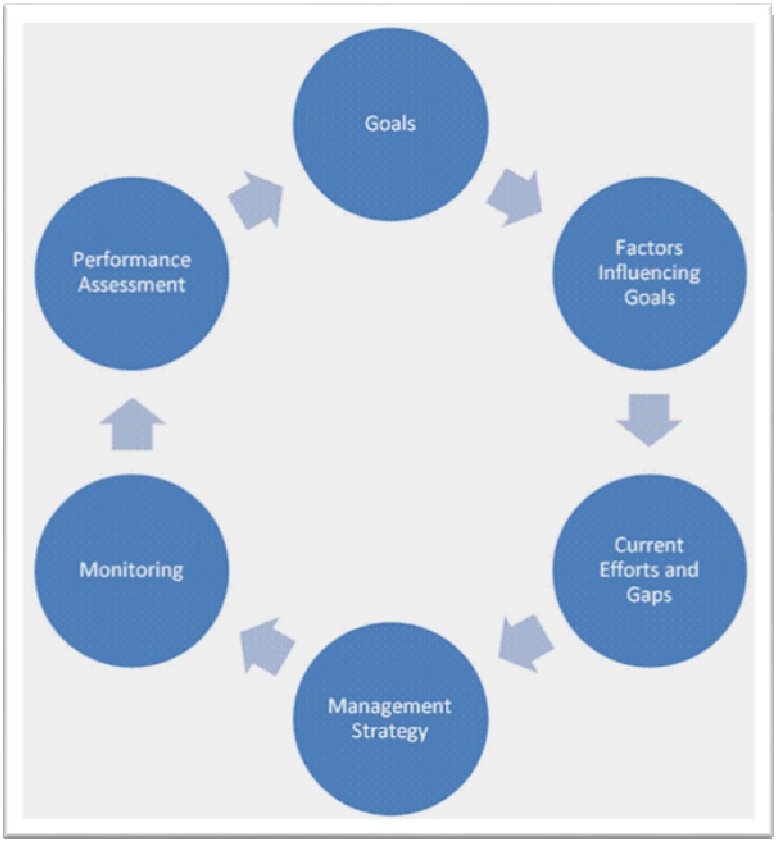


Figure 6 - Adaptive Management (Chesapeake Bay Program, 2013b)

This iterative approach gives partners the agency to act, rather than be paralysed trying to anticipate every possible issue, as management is flexible enough to adjust quickly and to recognise and correct failures. For example, when the Program identified a need to accelerate the rate of progress, the whole approach: management strategies, goals, monitoring and performance assessment was amended to include additional, shorter-term goals so that progress was more closely monitored and goals broken, where necessary, into smaller milestones.

Fisheries Ecosystem Plan

Another key feature among the many good examples within the Chesapeake Bay Program is the approach taken to consider ecosystem services by setting ecosystem-level

objectives for fisheries. This is something which is intrinsic to an ecosystem approach to management, but which is not always directly tackled. When deciding to formally adopt a multi-species management approach for *Chesapeake 2000*, a Technical Advisory Panel was set up to produce a Fisheries Ecosystem Plan (FEP) for Chesapeake Bay, following the recommendations of a National Marine Fisheries Service report on implementing ecosystem principles within fisheries management[3]. The resulting FEP[4] provides an ecosystem context for Fisheries Management Plans (FMPs). It considers the ecosystem structure and function of Chesapeake Bay in terms of:

- Ecosystem boundaries and management units
- Food web interactions
- Habitats

All of these are not simply described, but also discussed in terms of how an understanding of each feature might be applied in a practical context (for example, how food web dynamics can be incorporated into FMPs, and how they might be considered when approaching multi-species management).

The FEP also describes the ecosystem in terms of human interaction – past, present and how it might develop in the future. For example, patterns in harvesting, human history and present socio-economics, and management structures are all discussed; additionally, monitoring is considered both in terms of higher level considerations (such as reference points and indicators) and in practical terms, such as the logistics of surveys and data needs. Implementation of the FEP and incorporating ecosystem principles within revised FMPs is also considered.

The FEP for Chesapeake Bay acts as a site-specific “bible” for managers, containing key contextual information and advice for implementing an ecosystem approach to fisheries management. In addition to following national principles, such as those in the NMFS guidance, in preparing the FEP the authors also looked to international standards, such as the Code of Conduct for Responsible Fisheries (FAO).

[3] NMFS (1999)
[4] Chesapeake Bay Fisheries Ecosystem Advisory Panel NOAA Chesapeake Bay Office) (2006)

Successes

The Chesapeake Bay Program is seen in the US as an example of best practice in the ecosystem approach. There is a long way to go before the Bay ecosystem is restored to an acceptable condition, but progress is being made and many goals are well on track to being met – for example targets for reducing pollution load of nitrogen, phosphorus and sediment, and the restoration of fish passage in the estuary (see Figures 7 and 8).

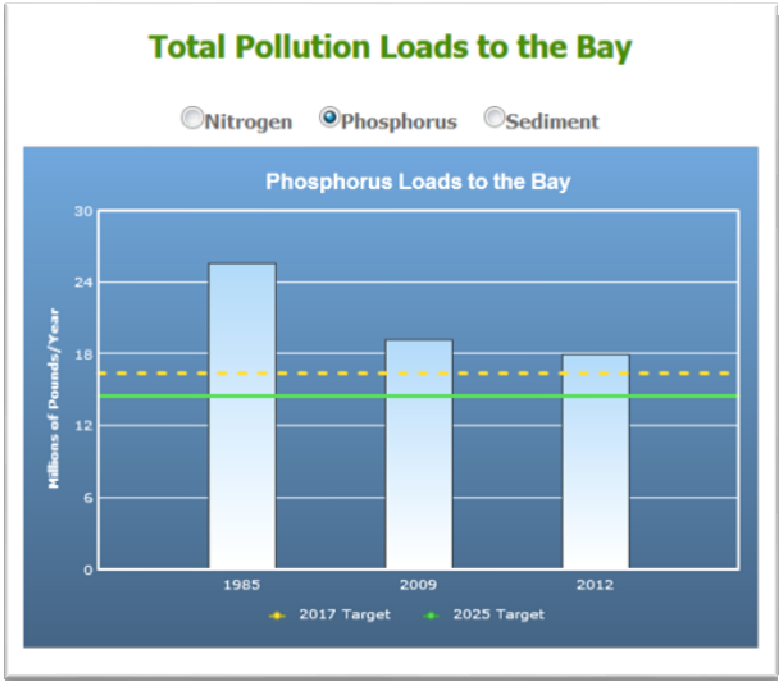


Figure 7 - Trends in phosphorus levels within Chesapeake Bay (ChesapeakeStat, 2013)

Figure 8 - Restoration of fish passage in Chesapeake Bay (ChesapeakeStat, 2013)

The sheer size of the area and the complexities that come with that weight of administration could be crippling, even before looking to the size of the task in hand – restoring a large multiple-use site to good condition. Adaptive management allows progress to be made by breaking things down to manageable chunks and starting to whittle away, tackling each thing in what seems the most sensible way given current information. Where things aren't working, they can be changed – failures may occur, but there's a mechanism to make sure they are learned from and management is flexible enough to do so quickly. The setup of the Bay Program organises all the partners in an effective and efficient way, so everyone (hopefully!) is contributing where they're needed.

Bringing the lessons home

Similar to the Wash example, Chesapeake Bay illustrates a means by which the work many different partners can be brought together, to mutual benefit, under a scheme which acts as a hub for communication, expertise, consultation and facilitation. Wales is in many respects a simpler prospect for management than the United States, with fewer layers of governance, fewer organisations and stakeholders and, arguably, fewer local environmental issues as complex as those within the Bay. This should be to the advantage of those wishing to implement a new approach incorporating ecosystem principles.

One option for developing such an approach might be to develop guidance at an ecosystem level, as exemplified by the Chesapeake FEPs. Such documents capture the structure, function, socio-economics and management options at an appropriate scale; rather than be purely strategic, they should contain meaningful practical information that can be applied to deliver the results needed – whatever they may be at a local level. A FEP may also serve to identify the knowledge gaps to be addressed in the adaptive management process. FEPs might bridge the gap between the higher level approach described in the Welsh Government Framework and individual or multi-species FMPs, and should also look to international standards such as the FAO for best practice.

Reading

Chesapeake Bay Fisheries Ecosystem Advisory Panel (National Oceanic and Atmospheric Administration Chesapeake Bay Office) (2006). Fisheries ecosystem planning for Chesapeake Bay. *American Fisheries Society, Trends in Fisheries Science and Management* 3, Bethesda, Maryland. Available online at: http://chesapeakebay.noaa.gov/images/stories/pdf/FEP_FINAL.pdf

Chesapeake Bay Program (2013a) How We're Organized - Chesapeake Bay Program (webpage). Available online at: http://www.chesapeakebay.net/about/organized

Chesapeake Bay Program (2013b) Adaptive Management - Chesapeake Bay Program (webpage). Available online at: http://www.chesapeakebay.net/about/how/management

ChesapeakeStat (2013) Overview: Water Quality, Chesapeake Bay. Webpage which generates graphical content from current statistics on water quality. Available online at: http://stat.chesapeakebay.net/?q=node/130

Houde, E (2006) A Fisheries Ecosystem Plan for Chesapeake Bay. Pp 1-12 in: Chesapeake Bay Fisheries Ecosystem Advisory Panel (National Oceanic and Atmospheric Administration Chesapeake Bay Office). 2006. Fisheries ecosystem planning for Chesapeake Bay. American Fisheries Society, Trends in Fisheries Science and Management 3, Bethesda, Maryland.

NMFS (1999) Ecosystem-based fishery management: a Report to Congress by the Ecosystems Principles Advisory Panel, 54p. U.S Dep Commer, NOAA, NMFS, Silver Spring, Maryland. Available online at http://www.nmfs.noaa.gov/sfa/EPAPrpt.pdf

World Port Source (2013) Chesapeake Bay Waterway – port listing and information. Available online at: http://www.worldportsource.com/waterways/systems/Chesapeake_Bay_Waterway_1.php

Apo Island, the Philippines

Summary

Apo Island is an example of how much power local communities have in the success of marine management. Choosing to engage with scientists to help reverse the decline in the local fisheries, and having seen the benefits of their earliest protection efforts, Apo Island residents committed to and have continued to support marine protection around the island. This commitment and sense of ownership has been important to the success of the reserve, due to the practicalities of enforcing legislation within a multi-island nation such as the Philippines.

A change of governance moving from community management to a centralised, national regime under the NIPAS has had a mixed response. Issues surrounding the membership and power balance within the Protected Area Management Board, and relating to resourcing of management operations due to slow processing of tourist taxes have accompanied a growing sense of disenfranchisement among the community. This may threaten to undermine previous successes, and is a lesson in the need for balance between higher-level oversight and community ownership.

Aspects of Ecosystem Approach in this case study (Welsh Government Core Principles)

- Societal choice
- Localised decisions
- Adjacent effects
- Economic drivers
- Spatial and temporal scale
- Long term approach
- Managing change
- Biological diversity
- Stakeholder engagement

Where on Striking the Balance spectrum

Implementation phases demonstrated

1. Understand context and issues
4. Implement preferred management
6. Evaluate & adapt

Why it works

- A strong sense of ownership on behalf of the local community (although the new, more centralised NIPAS system may be creating some disenfranchisement as local control has passed to the national government)

- Clear positive benefits (more productive fisheries, strong ecotourism) direct to those who might have been seen to “lose out” are a persuasive argument for continued support
- Access to fishing grounds restricted to local islanders
- Well established and based on a solid education program from the local University

Introduction

Apo Island is small volcanic island of approximately 12 hectares in the Sulu Sea, the Philippines. It is within the Negros Oriental province, and comes under the municipal jurisdiction of Dauin. The small population of just under 1000 inhabitants depends heavily on the services of the island's reef ecosystem. The fringing reef that surrounds Apo has a high biodiversity value, with 73% cover of soft and hard corals supporting a wide range of marine life.

Figure 9 - The location of Apo Island (REF: Wikipedia Commons)

Today, there are several hundred MPAs in the Philippines, but Apo Island was one of the first, and has been established since the early 80s, although the nature and extent of management has changed and developed over the intervening decades. The story of this process forms a good narrative, as one of the longest-running examples of community based marine management.

Fishing

Fishing is the principal source of employment on the island, with over half of the residents (nearly all the men of working age) directly or indirectly employed by the fishing industry. Traditionally, fishing had been at a sustainable level, with each fisher taking enough each day to provide for his family and some extra catch to be sold, with the money used to buy other essentials, and to be put in savings (often for children's education). The principle type of fishing vessel is the canoe, propelled either by hand paddle or (more recently) by small outboard motors. Traditional fishing gear comprises methods, including hook and line, gillnets, and fish traps.

As population levels increased on the island, so did the competition for fish, and a number of modern methods were introduced in the 60s and 70s. These gave the fishermen using them a competitive advantage, catching greater numbers of fish with relative ease compared to traditional methods, and so became widespread. They include the use of dynamite, muro-ami[5], cyanide, and small mesh nets, and were destructive both through the physical damage they caused to the reefs, and to the fish population biomass – they were highly efficient – and size structure, with smaller fish being caught in increasing numbers.

The decline in fish stocks resulting from these practices served only to increase fishing effort, to compensate for the decrease in catches. Although these new, destructive methods were illegal, enforcement (the responsibility of national agencies including the

[5] A Japanese method which involves scaring fish out of the reef and into nets by hitting the coral with rocks

coastguard and police) given the size of the country and its geography – an expanse of islands - was next to impossible. By the end of the 70s, Apo's fisheries were in a very poor state.

Tourism and recreation

The amenity value of the island's reefs has made it a popular tourist destination. Visitors come to take advantage of the rich marine environment by snorkelling or diving on the reef. A service industry has grown around this, adding much-needed diversity to the local economy and creating employment opportunities. There are two hotels on the island, with homestays also available for backpackers on a budget; dive boats provide access to reefs, and dive rangers act as guides. As well as the money spent by visitors on accommodation, recreation and souvenirs, a tourist tax – originally voluntary, but compulsory after changes to management – is collected. This has usually been invested in the infrastructure on Apo, either funding community projects such as schools, or latterly financing the management operations of the Protect Area Management Board.

This growth in ecotourism on Apo has followed the recovery of the reefs brought about by management. It has been so successful that over time, the numbers of visitors have threatened to have a cumulative negative impact on the ecology of the reef and fishing activities. As with fisheries, management has needed to address this.

Other uses

Unlike the other case study examples, the diminutive size of Apo Island and concentration of its resources means that there are no significant sources of income outside fishing and tourism. Shipping and navigation is predominantly for transit purposes, or for the movement of goods on and off the island. Some of those engaged in fishing have diversified and provide boat services to make up extra income, and there is some limited farming. However, many of working age leave the island for employment on the mainland, often sending money back to support their families on Apo. There is a high proportion of children of school age or younger.

What they do

By the late seventies, there was a clear need for change as the island's fisheries were in a state of collapse. This meant that the advice of scientists from Silliman University, who initiated an environmental education initiative for local residents, was not dismissed. By the time Dr Alcala and his colleagues arrived on Apo in 1979, the first marine sanctuary in the region on nearby uninhabited Sumilion Island had been under protection for five years and the scientists were able to take residents to see the results, which had been positive. Over the next few years the Apo islanders became more aware of the link between human activity and the health of the reefs, and the impact of this, in turn, on their fisheries.

By 1982, there was enough community support that a marine sanctuary, in the form of a no-take zone, was established. Three years later, the rest of the community got on board and the protection was formalised under the Local Government Code, with community groups on Apo (known as Barangays) partnering with the municipal authorities in Dauin to

create a management zone around the island. In addition to the no-take sanctuary area, fishermen agreed to ban all destructive fishing practices around the whole island. Management was undertaken by a locally-run Marine Management Committee, with enforcement by local volunteers (the marine guard, or Bantay Dagat) – although due to the universal support local fishermen had for the management, most of the patrols became targeted at fishermen from other islands.

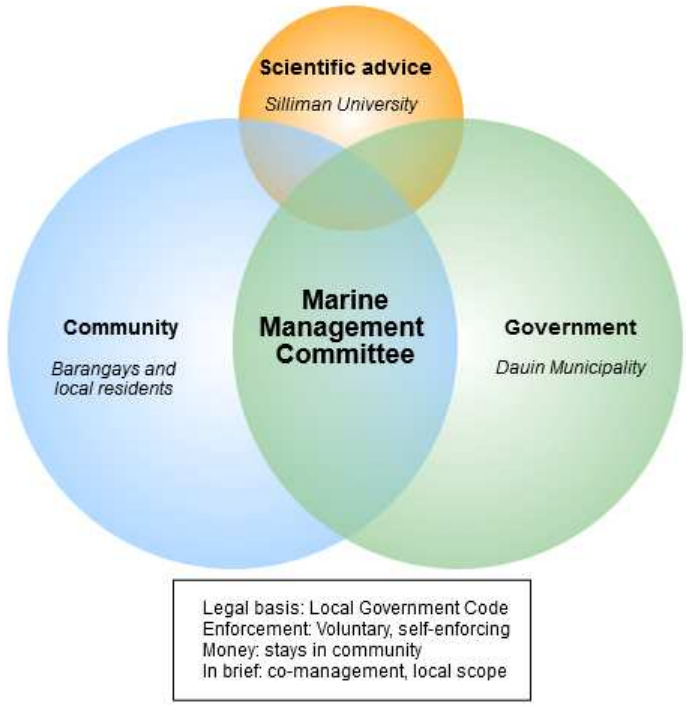


Figure 10 - Local co-management (pre-NIPAS)

This community-driven model – with management implemented locally, supported by municipal government, backed by local government legislation and with support and expertise from the University of Silliman – was in place until the late nineties. Although elements such the formal codifying of protection came part way through, and management measures developed over this period, the first twenty years of marine management on Apo Island followed a "bottom up" approach which was successful enough that it became the model for hundreds of other MPAs in the Philippines.

In 1992, the National Integrated Protected Areas Act (NIPAS) was passed by the Philippines Congress. This was a different framework for MPAs that was more centralised, looking at integrating marine management over a larger scale. Although the community-based model had been working on Apo, the Island was brought under national protection, being designated under NIPAS in 1994, with control handed over from the local Barangays to the newly formed Protected Area Management Board (PAMB) in 1998.

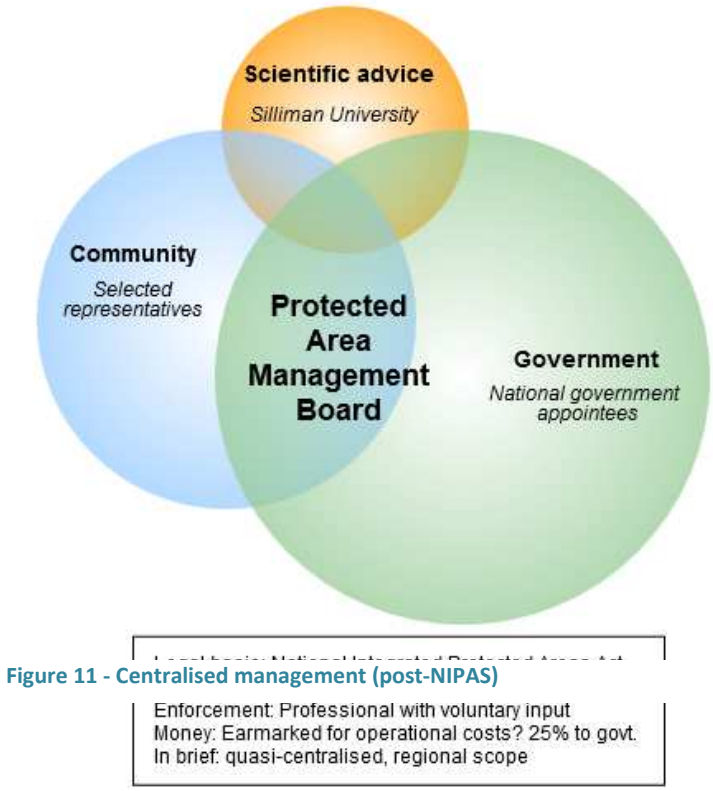


Figure 11 - Centralised management (post-NIPAS)

One of the reasons given for the change in regime was to avoid a repeat of what had happened with Apo's predecessor, Sumilion Island, where a sudden electoral change introduced a new local government opposed to MPAs. The new

administration did not support the Sumilion no-take reserve, with the eventual result of fish stocks collapsing after years of work rebuilding & maintaining them. Management under the national scheme would avoid the potential for a failure in local political support to jeopardise ecological protection. Additionally, there was an argument for looking at the wider ecological picture. Apo does not exist in isolation - its surrounding seas and their management are linked; however, funding for marine protection is concentrated around sources of ecotourism taxes. By taking a proportion (25%) of the Apo reserve's levy income, it becomes possible to use it to help consolidate protection for the wider region.

Management under NIPAS is centralised. This means that rather than control residing with the Barangays (and, by extension, the local community), the PAMB comprises government appointees (mainly from federal agencies) and the site is administered by a manager based locally. The reserve employs staff and rangers from within the local community, and there is some community representation on the board by appointees from the Barangays. However, there has also been criticism of the new setup from those within the community who feel excluded where they had previously contributed. Certainly, participation of local stakeholders is limited and involvement is in a consultative capacity, compared to the hands-on nature of the previous regime.

Figures 10 and 11 illustrate the different management structures pre- and post-NIPAS, showing the relative balance of power for the main actors in each instance.

Successes

Apo is a success story. NGOs such as Greenpeace have described it as a "model for community managed reserves". Importantly, fishermen have seen increased catches outside the No Take part of the reserve. Fish stocks inside the sanctuary have increased – some species as much as eightfold – and there has been a demonstrable spill-over effect with CPUE up by over 50% for fishermen working within 200m of the sanctuary. Further, the move away from destructive fishing practices elsewhere has improved the ecosystem health and its amenity value. This has made the Island an attractive tourist destination which has been another "win" for the local economy. Surveys of local fishermen in the early nineties showed 100% support for the reserve, and half reported that their families had seen economic benefits from tourism, too. Many islanders are employed as PAMB operations staff in activities supporting the management of the reserve, and there are opportunities in tourism and hospitality.

So the success of the reserve has promoted economic diversification as well as improved catch rates; this has consolidated support for the scheme. The Barangay's use of income from the reserve to support the education of local children has led to many studying to university level. Better general education has led to the adoption of family planning, helping to address some of the issues (including ecological ones) relating to population pressure on Apo.

However, there have also been challenges. The change from local to national governance under NIPAS constituted a big swing away from community management. Although there

is provision for local representation on the PAMB, there has been vocal criticism of the way this works in practice. There may be unequal status on the PAMB with national officials reported as not taking local expertise and wishes into consideration. There is now a tourist tax (where previously there was a voluntary donation), and although this has in principle increased revenue, the 75% of proceeds that should return to fund operations has not always been readily forthcoming, which, in addition to creating suspicion, has caused real operational cash flow issues.

These may be behind the reported under-enforcement of diver and snorkeler daily limits within the sanctuary, which has led to increased antagonism between tourists and fishermen. There is also a question over what the money levied from tourists can or should be used for on the island. Under the previous regime, the Barangays saved the proceeds from donations until a need was identified, and many community facilities were funded this way. There has been debate over whether such projects, which are requested and expected by the islanders, can be provided for under NIPAS or whether monies collected are solely to be used for operational costs of the MPA.

There appears to be a need for better transparency in how the money is processed, how quickly it gets back to the island and is made available, and how it can be used. The PAMB should address the issues of apparent disenfranchisement before they undermine the local support that has been, and will be, so crucial to the continued success of Apo Island's marine reserve. Essentially, the issue is a poor relationship management, with no direct line of input for the majority of islanders, and possibly poor communication between national government, the Apo Islanders and the PAMB (as well as within the PAMB itself). Where previously there was an understanding of how things worked, there seems to be less certainty – and where there have been advantages under NIPAS (such as the provision of funds – the 25% - to help integrate Apo management with that of the wider ecosystem), these might be better communicated.

Bringing the lessons home

Wales does not have a long history of community-organised management as on Apo – although there is definitely a strong sense of stewardship on the behalf of inshore fishermen, evidenced by the initiation of work in support of co-management, such as Striking the Balance.

The best lesson to learn from the Apo example is that establishing and maintaining good relationships is a really key aspect of success. There existed (and still does) a good relationship between Apo and the scientists at Silliman due to extensive groundwork put in at the start of the process.

Similarly, at a recent conference organised to mark the end of the Welsh FishMap Môn project, one of the strongest messages was the positive reaction to the approach taken by the Project team: namely, to engage directly with stakeholders in an open and transparent manner. This demonstrates that there is an appetite for greater collaboration, which suggests that establishing new partnerships and building links between national agencies

(such as NRW and Welsh Government) and local stakeholder will be entirely possible, with some commitment from all interested parties.

Reading

Greenpeace (2006) The community-managed marine reserve of Apo Island (information leaflet) Available online at: http://www.greenpeace.org/seasia/ph/Global/seasia/report/2006/8/the-community-managed-marine-r.pdf 4pp. Amsterdam, the Netherlands.

Marten, G (2005) Environmental Tipping Points: A New Paradigm for Restoring Ecological Security. Journal of Policy Studies (Japan) 20, pp75-87. Available online at: http://www.ecotippingpoints.org/resources/download-pdf/publication-journal-of-policy-studies.pdf

Marten, G (2005) Marine Sanctuary: Restoring a Coral-Reef Fishery (Apo Island, Philippines). The EcoTipping Points Project (Website). Available online at: http://www.ecotippingpoints.org/our-stories/indepth/philippines-apo-marine-sanctuary-coral-reef-fishery.html#Ingredients Accessed: December 2013. *(This web page links to a number of resources relating to the Apo Island case, including educational materials, videos and photographs and is an accessible source for those interested in learning more.)*

Hind, EJ; Hipiona, MC; Gray, TS (2010) From community-based to centralised national management – A wrong turning for the governance of the marine protected area in Apo Island, Philippines? *Marine Policy* (34) pp 54-62. *(This is a good recent reference documenting community attitudes to the reserve and how they have changed as governance has evolved.)*

Thanks also to Dr Edd Hind for his personal insight on the study (*Pers. comm*).

New Zealand

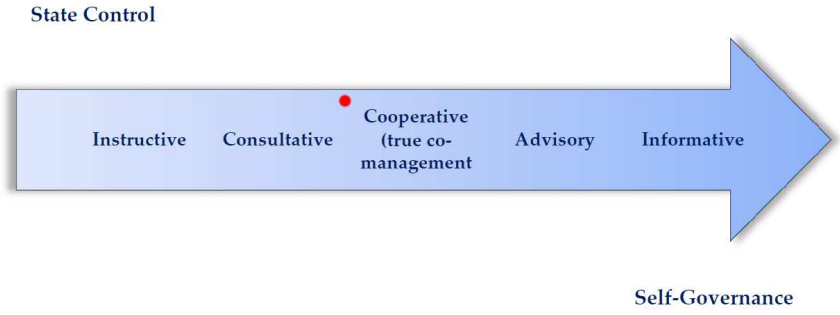
Summary

New Zealand has an international reputation for fisheries management, with an established quota system. However, this infrastructure is in the process of realigning from a sectoral approach and one which has focussed on single-species management towards a more integrated management system. In a similar vein to other studies, this has involved setting high level strategy for sustainable exploitation of the environment within ecological limits that realises not only economic but also social and cultural value within ecosystem services. This strategy is actioned through management objectives within National Fisheries Plans, within which key fisheries and their bycatch receive their own specific goals. Progress is monitored and goals adjusted over time using the best available evidence (a feature of adaptive management) and the opportunity for stakeholder involvement is built in. There is good transparency, with fisheries statistics and consultations all publicly available. However, while some aspects of ecosystem based management are apparent in the New Zealand example, there is not currently a fully integrated approach, and ecological understanding (both in terms of ecosystem services and pressures on them) is noticeably less developed than management of activities.

Aspects of Ecosystem Approach in this case study (Welsh Government Core Principles)

- Economic drivers
- Environmental limits
- Spatial and temporal scale
- Long term approach
- Managing change
- Biological diversity
- Evidence
- Stakeholder engagement

Where on Striking the Balance spectrum



Implementation phases demonstrated

1. Understand context and issues
2. Objective setting
3. Explore management options & develop plan
4. Implement preferred management
5. Monitor
6. Evaluate & adapt

Why it works

- Strong partnership collaborative approach in some sectors – for example, the MOU between industry (the Deepwater Group) and government
- Clear high level “vision” within policy which is successively grounded and framed in a practical way through national fisheries plans, and fishery-specific goals
- Good scientific infrastructure in place
- Transparency of information
- Moves away from sectoral approach (although arguably this has not been achieved yet)

Introduction

New Zealand is an island nation in the South Pacific. North and South Island are the largest, and home to the majority of the population, but there are many smaller islands and their spread results in New Zealand having one of the largest EEZs in the world. The marine environment of New Zealand is highly biodiverse. There are over 17,000 species recorded so far – including a high proportion unique and endemic to New Zealand. Thousands of the species recorded are yet to be described, and it is thought that the number thus far recorded is outnumbered by those yet to be discovered.

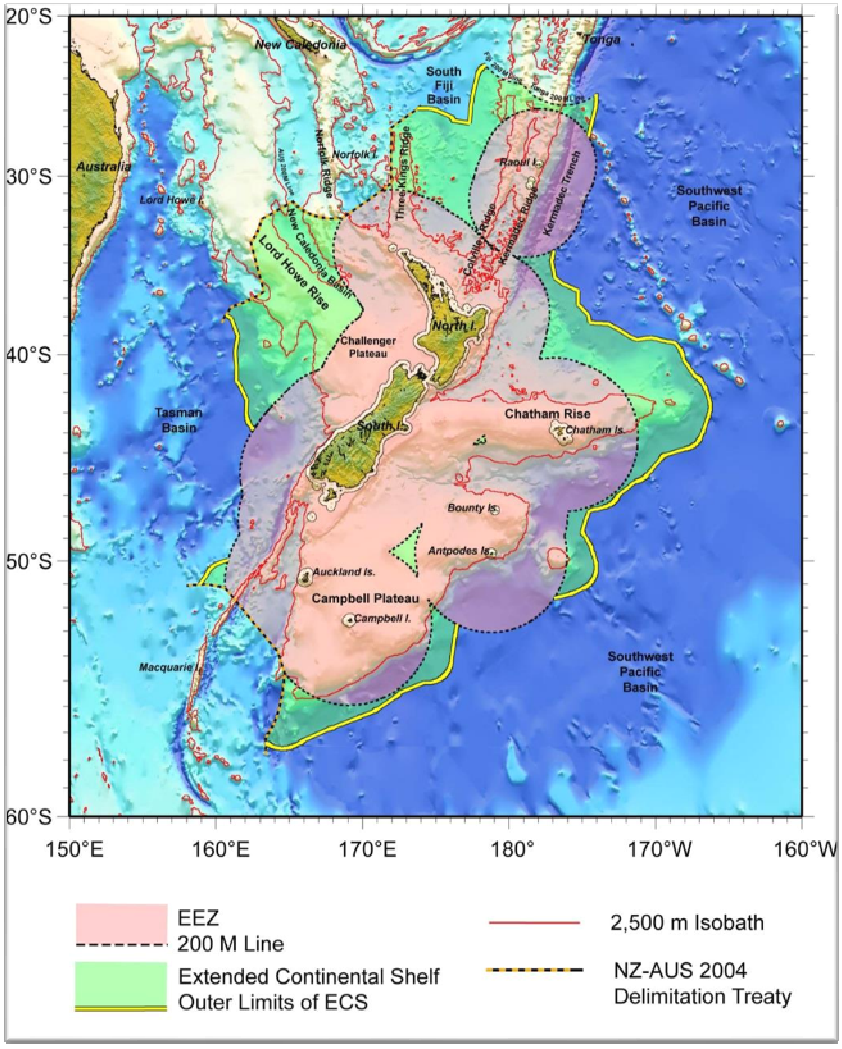


Figure 72 – New Zealand EEZ and continental shelf (LINZ, 2013).

The large extent of the EEZ provides opportunities for extractive activities targeting the biological and mineral resources of the ecosystem; its large size presents challenges for management, and the social history of the island must also be addressed within marine and environmental policy.

Fishing

Commercial fisheries in New Zealand harvest over 500,000 tonnes a year, worth between NZD 1.2 and 1.5 billion. Most of the value comes from exporting the catch worldwide, with key export species including squid, hoki, rock lobster and orange roughy. Many of the

commercial fisheries in New Zealand's EEZ are targeted in deeper water offshore. In addition to these trawl fisheries, inshore boats target shellfisheries and finfish, and there is commercial scale aquaculture. Fishing is managed under the Fisheries Act. Customary rights are an important aspect of marine resource management in New Zealand, particularly with respect to fisheries. Maori have the legal right to manage traditional fishing grounds at a community level through byelaws, which are used to create reserves.

The commercial fishery underwent considerable expansion during the mid 20th century, fuelled by government subsidy and encouragement of the domestic industry so that it could compete with foreign vessels. Previously, fisheries had been highly regulated and licensed, which had been good practice from a resource management perspective but had restricted commercial opportunities. With such a large EEZ, finding the balance between exploiting these opportunities and doing so in a sustainable way has essentially been the story of New Zealand's fisheries management "journey" from the 1960s to present day.

Tourism and recreation

New Zealand is a popular tourist destination, thanks in no small part to the high amenity value of its landscape. Marine-related recreation for visitors and residents includes watersports such as sailing and diving, wildlife spotting and fishing. Most activities are coastal or take place within the inshore marine environment, so the pressure is relatively concentrated in these areas, although cruises from Australia and the South Pacific transit the EEZ in addition to touring around the coastline of the main islands.

Ports and shipping

Shipping is vital to the New Zealand economy. The majority of imports to, and exports from the country are by sea (99% by volume). Although there has been little sign of the importance of marine transport declining, there has been some consolidation, with fewer, larger vessels and therefore perhaps less traffic overall. There are a number of ports encircling North and South island, of which Auckland and Tauranga (both North Island) are the largest. Shipping is managed under the Maritime Transport Act.

Other pressures

Seabed exploitation is important to New Zealand's economy, with petroleum prospecting and extraction taking place from the 1960s to present day. More recently, aggregate dredging and mineral prospecting (for ironsand and phosphates, for example) have been initiated. Minerals are not yet extracted on a commercial level, although the industry is undergoing development; similarly, aggregate extraction is moving from inshore areas into deeper water. Prospecting, exploration and extraction of seabed resources are managed under the EEZ Act, along with carbon capture and storage, aquaculture and marine energy generation.

What they do

Marine environmental management in New Zealand has undergone a process of restructuring since the 1980s. This has involved a realignment of the legal framework and government infrastructure from one which supported the previous model of sector-based

management, towards something more suited to deliver an integrated approach. Along with the introduction of the Resource Management Act, which replaced 55 previous statutes and 19 sets of regulations, 800 government and quasi-government bodies were merged, and their work redistributed to three new primary central government bodies and 86 local government authorities, of which twelve were regional councils based on watershed boundaries – a clear move towards ecosystem based management.

Alongside this leaner structure through which to deliver management, the nature of that management has also evolved. Faced with overcapacity in the commercial fleet, the Fisheries Act (1983) saw the introduction of a strong legal basis for licensing commercial fisheries but, crucially, it also mandated the need for extensive public consultation in the development of resource management plans and new regulations. Through this process, the system of Individually Transferrable Quotas and the Quota Management System were developed.

Individually Transferrable Quotas and the Quota Management System

The Quota Management System (QMS) and individually transferrable quotas (ITQ) have been in place since 1986, developed through the Fisheries Act, and are the twin pillars of fisheries management in New Zealand today. The majority of commercial fisheries are managed through QMS and ITQ. Management is based around MSY, although rather than being based on catch rates, it is set with reference to biomass targets for each species with the goal of maintaining at, or recovering to target biomass reference points. This approach is laid out clearly in the Harvest Strategy Standard.

Originally set as absolute tonnages, since 1990 quota shares are a *pro rata* proportion of TACC (total allowable commercial catch). Based on scientific data, stocks are assessed and an appropriate TAC (total allowable catch) is calculated based on how current stocks relate to biological reference points. From the TAC, a proportion is set aside for customary and recreational fisheries, leaving the TACC which is divided proportionally amongst quota owners.

There are 646 stocks (over 98 species) in QMS, of which 350 are “key” stocks. Regular stock assessments compare stock biomass against management targets, and TAC is adjusted accordingly. This is adaptive management applied to stock control measures.

Nested policy and management objectives

One of the important aspects of implementation is having a means of transposing higher level vision and strategy into practical management measures. In New Zealand, this is done using a hierarchical, nested set of policy documents. At the top is the overriding vision, which has been set out in Fisheries 2030, a result of the update to the Fisheries Act in 1996. Underneath this sit five national, objective based plans.

Figure 83 - Nested fisheries management

As Figure 13 shows, objectives feed into National Fisheries Plans (NFP); each of these has an Annual Operational Plan with specific implementation guidelines, and an Annual Review Report. The reviews inform subsequent years' Operational Plans, which in turn feed back into the Fisheries Plans, which are reviewed every 5 years. This is a practical mechanism for adaptive management whereby long term objectives and short term targets are responsive and iterative. Not all are yet complete, however.

The NFP for Deepwater and Middle-depth fisheries is probably the most developed Plan so far, and is approaching its first review. It includes policy strategy and management objectives for target stocks, bycatch stocks and environmental effects relating to fisheries in the deepwater sector. Within the Plan, key fisheries species (along with any associated bycatch species) have their own chapter; for example, Orange Roughy and Black Cardinalfish are considered together.

Stakeholder input

Effective engagement with relevant stakeholders is identified as key to the success of the Fisheries 2030 strategy. The scope of consultation is different for each Plan; for example, within the Deepwater NFP, recreational fishing is not considered significant and is scoped out. However, customary rights are a key concern, and so the tangata whenua[6] are an important stakeholder.

Tangata whenua input to National Plans comes at a local (iwi) level, through IFP (iwi Fisheries Plans) and through FFP (Forum Fisheries Plans) which allow consultation on a sub-regional level with groups of iwi where there are common interests. Once again, this is

[6] Tangata whenua: a term referring to the Maori but also denoting a specific legal status of indigenous people within New Zealand law

a nested structure, with the scope of engagement flexible and relevant to the interest of the stakeholders.

The commercial fishing sector is a hugely important stakeholder in New Zealand deepwater fisheries management in particular, to the extent that there is close collaboration between the Ministry of Primary Industries (MPI, formerly the Ministry of Fisheries) and industry. Commercial interests are represented by the Deepwater Group, which is a non-profit fisheries management company funded and operated by holders of quota in deepwater fisheries. The Deepwater Group is not just a voice for industry, but actively participates in management, alongside the MPI, via a Memorandum of Understanding. Through levies on quota holders, the costs of fisheries research, stock assessment, environmental research, monitoring and enforcement are recovered entirely from industry.

Environmental NGOs are specifically identified within the Deepwater NFP as a key stakeholder group, although currently the formal mechanism for input from environmental groups is being developed. The plan is to set up an Environmental Advisory Group, which will be an open forum and allow NGOs to be involved in management – both as observers, assessing adherence to environmental standards as well as management objectives, and as collaborators where appropriate.

Successes

New Zealand was able to reduce capacity by first buying quota (based on fishing track record over the three year period 1981-1983) from license holders. Fishermen then bid to buy back a quota share, with which they could access a proportion of annual TACC. This has succeeded in its intent of reducing effort, although it is important to acknowledge that the social context has been relevant here in terms of the relative lack of opposition to this change. New Zealand is a relatively young country, and its coastal communities do not have the same relationship with fishing, going back generations, as do many communities in Wales. The exception to this is the Maori, who pre-dated European settlers by about 1000 years. For the restructuring of resource allocation to work, it was necessary for the government to acknowledge the importance of fishing to Maori communities and find a way to reconcile their historic rights within a modern context. Nevertheless, the new quota system does favour larger operators over smaller ones, and part-time commercial fishermen were not entitled to the same compensation, so the makeup of the fleet is less diverse in this regard.

One of the advantages (and indeed features) of a well-structured, relatively robust and transparent management system is that it is able to stand up to external scrutiny. In New Zealand, this is further complemented by good public availability of data, policy, consultation documents and research. This has facilitated early adoption of international sustainability standards, and as such one third of all New Zealand fisheries are engaged in the Marine Stewardship Council (MSC) programme, with three certified fisheries (hoki, albacore tuna (troll), and the Ross Sea toothfish) and others undergoing assessment. This shows that, in terms of fisheries management at least, New Zealand's framework is in line

with international best practice. One of the comments of assessors, and a criticism of some environmental NGOs, is that understanding of ecosystem effects of fisheries is a weak link. This is an aspect which is acknowledged within management objectives in Fisheries 2030 and the Fisheries Plans.

The collaboration with industry for management of offshore fisheries, through the Deepwater Group, has been instrumental in the designation of Benthic Protection Areas (BPAs). These are areas closed to bottom trawling, including at 10% of each representative habitat, amounting to 30% of the EEZ. The closures were proposed by industry, and areas were chosen both to minimise the impact on the industry, and because they were relatively pristine. These marine protected areas are important in the protection of the wider ecosystem. However, there is currently no similar control for deepwater mining – this can still take place within areas closed to bottom gear. This is not consistent with an ecosystem approach, and means that any protection afforded by fisheries management is compromised.

This situation highlights the main problem, which is that, while management is still transitioning in the direction of ecosystem based management, it is still to a large extent sector based. There is a lack of connectivity between different institutions, too – to the extent that certain relationships are evidently more collaborative and proactive (such as that between the offshore fishing industry and government), while others are more tentative (such as the involvement of the environmental sector within the Deepwater NFP framework).

It has been noted[7] that, as the scope of management increases, so does the scope of conflict between the many interests and stakeholders. One of the reasons for a sectoral or single-issue approach to management is an attempt to limit and control this conflict, but taking a simplistic view tends to result in failure of management long-term. Effectively, by keeping a narrow focus, problems are not avoided but simply deferred to be dealt with further down the line. The resolve must be to avoid the easy, short-termist approach in favour of building solid foundations to carry through management regardless of political changes.

Bringing the lessons home

It takes time to re-align existing management from a sector-based approach towards an integrated, ecosystem-based approach. New Zealand has restructured its administrative and legal framework, and is putting in high level strategy (via Fisheries 2030) that then is implemented through other tools (such as the National Fisheries Plans). Within the implementation, key features are adaptive management, the use of the best evidence, striving to address ecosystem needs within fisheries management, and incorporating stakeholder engagement. The MOU between the Deepwater Group and Ministry of Primary Industries is a strong example of co-management.

[7] McGinnis, 2012

However, there is still a lack of consistency between sectors – as seen in the lack of integration between management of bottom trawling and mining within Benthic Protection Areas. This is crucial to ensure the efforts of one sector don't undermine those of others, and is one of the fundamental aspects of EBA that Wales needs to strive for. One of New Zealand's strengths is a long history in marine management, and they are respected worldwide for fisheries management – but being established brings a weight of current practice, which means the rate of change to new, modern approaches such as EBA has to overcome a certain degree of residual momentum. It is also difficult to widen the scope of issues dealt with and integrate the approach taken to them all, as the task requires political will, commitment and investment.

Lastly, the scope of consultation and management is important, as is the social context and history of engagement in each relevant activity.

Reading

APEC (2010) Implementing and Ecosystem Approach to Fisheries in the Context of Broader Marine Ecosystem-Based Management. Report of the APEC Fisheries Working Group. 2010. 176pp. Available from: http://publications.apec.org/publication-detail.php?pub_id=1074

Connor, R Initial allocation of Individual Transferable Quota in New Zealand Fisheries. In: Case studies on the allocation of transferable quota rights in fisheries, FAO Fisheries and Aquaculture Department. Available online at: http://www.fao.org/docrep/005/y2684e/y2684e21.htm (*This has a good account of the process of transferring to ITQs, and discussed the context and impact of the resulting changes*).

Deepwater Group Website – gives information on the setup and role of this group within fisheries management. http://www.deepwater.co.nz/

EPA (2014) About the EEZ. New Zealand Environmental Protection Agency. Available online at: http://www.epa.govt.nz/EEZ/about_eez/Pages/default.aspx

LINZ (2013) New Zealand EEZ and Continental Shelf map. Land Information New Zealand. Available online at: http://www.linz.govt.nz/sites/default/files/hydro/projects-programmes/continental-shelf/images/cs-high-res.jpg

McGinnis, MV (2012) Ocean Governance – The New Zealand Dimension. A Summary Report. Emerging Issues Programme, Institute of Policy Studies, School of Government, Victoria University of Wellington. 58p.

MFE (2014) Offshore Options. New Zealand's jurisdiction in the EEZ under international law. New Zealand Ministry for the Environmen. Available online at: http://www.mfe.govt.nz/publications/oceans/offshore-options-jun05/html/page4.html

OECD (2012) Review of Fisheries 2011: Policies and Summary Statistics. OECD Publishing, 2012.

University of Auckland (2014) New Zealand Fisheries Management Research Database. University of Auckland, New Zealand. Available online at: http://magic.lbr.auckland.ac.nz/fish/ *(This online database is current and comprehensive, and is a working bibliography of working papers, journal articles and theses on topics relating to marine management. Many are open access.)*

The Great Barrier Reef Marine Park

Summary

The management of the Great Barrier Reef Marine Park (GBRMP) is widely considered to be regarded as one of the best possible examples of an Ecosystem Based Management (EBM) plan. The Great Barrier Reef Marine Park Authority (GBRMPA) uses a suite of management tools to look after the GBRMP. These range from stakeholder partnerships, research and education initiatives to legislation, permits and zoning. The current zoning scheme fully protects 30% of the GBRMP and is an important part of the success of the GBRMP management plan. There have been a number of changes made to the zoning plan since its implementation in response to the inefficient management of resources – an example of adaptive management practice.

Aspects of Ecosystem Approach in this case study (Welsh Government Core Principles)

- Societal choice
- Localised decisions
- Adjacent effects
- Ecosystem resilience
- Economic drivers
- Ecosystem resilience
- Environmental limits
- Spatial and temporal scale
- Long term approach
- Managing change
- Biological diversity
- Evidence
- Stakeholder engagement

Where on Striking the Balance spectrum

Implementation phases demonstrated

1. Understand context and issues
2. Objective setting
3. Explore management options & develop plan
4. Implement preferred management
5. Monitor
6. Evaluate & adapt

Why it works

- Has support from federal and Australian government departments, research communities and public and commercial stakeholders
- Benefits from economic backing through the government and revenue acquired through tourism to the GBRMP
- Allows most activities to take place within the GBRMP through a spatial zoning plan

- Constantly assesses management approaches and adapts to changing requirements or when things aren't working
- Stakeholder input has the appropriate "scope" – in terms of expertise, capability and interest; different groups consist of the right people for the right job
- Agreement of higher level objectives and "vision" for a sustainable multi-use site

Introduction

The Great Barrier Reef (GBR) is the largest living structure on Earth, stretching over 2300 km over an area of approximately 344 000km^2 of the Coral Sea off the east coast of Queensland, Australia (Figure 14).

Figure 94 - Map showing the Great Barrier Reef Marine Park (from Day & Dobbs, 2013).

The Great Barrier Reef supports a huge diversity marine species (Figure 15) - including over 300 species of molluscs, 630 species of echinoderm (e.g. starfish, sea urchins and sea cucumbers), more than 350 species of hard coral, over 1500 species of fish, 133 species of sharks and rays and six of the world's seven species of marine turtle. There are a diverse range of habitats, which include:

- over 2900 individual coral reefs
- deep water features of the adjoining continental shelf; including canyons, channels, plateaux and slopes
- over 2000 km^2 of mangroves, with species representing 54% of the world's mangrove diversity
- approximately 6000 km^2 of seagrass meadows

Figure 105 - Photographs showing some of the coral reefs that comprise the Great Barrier Reef and some of the marine biodiversity that is supported by the reef

The classification of the GBR as a UNESCO World Heritage Site in 1981 recognises its importance as a highly diverse ecosystem. A large proportion (99.25%) of the GBR World Heritage Area is protected by the Great Barrier Reef Marine Park (GBRMP). The GBRMP is the third largest MPA in the world and was created through the Great Barrier Reef Marine Park Act in 1975. It is managed by the Great Barrier Reef Marine Park Authority (GBRMPA).

Fishing

The GBR supports commercial, recreational, Indigenous and charter fisheries, all of which target a range of species including fish, sharks, crabs and prawns. There are approximately 185,000 active recreational fishers living in the region adjacent to the park. Commercial fishing is entry limited and is spread across the GBRMP. There are ten major commercial fisheries in the GBR region, and the main commercial sectors include net, trawl, line and pot fisheries. The commercial fishing industry is important to both domestic and international markets, with a substantial proportion of GBR trout landings exported to Hong Kong. Under an agreement with the Australian Government, Fisheries Queensland undertakes much of the fisheries management within the GBRMP.

Tourism and recreation

Tourism is a major use of the GBRMP, with approximately two million tourists visiting each year. This is in addition to an estimated 14.6 million recreational visits made to the GBRMP by local residents annually. About 60% of local recreational visitors visit the reef between 1 and 10 times in a year, with 15% visiting the area more than 50 times a year. Domestic and International tourism in GBRMP contributes AU$5.8 billion to the Australian economy per annum and sustains 55 000 jobs.

Many visitors come to the GBRMP for nature based activities. These range from cruise ships and live-aboard vessels to day trips on high speed catamarans, kayaking, snorkelling and diving. Tourism and recreational activities are generally concentrated in a small portion of the GBRMP, with approximately 80% of all activity occurring in an area equivalent to 7% of the GBRMP. Recreational activities that do not involve fishing can be undertaken in almost all of the GBRMP. In more intensively used areas (e.g. off shore Cairns and the Whitsunday islands), there are detailed management measures in place to reduce the impacts of recreation and tourism. These measures limit the intensity of recreational use within these areas and are largely managed using the GBRMP zoning scheme.

Ports and shipping

There are 12 ports in the GBR World Heritage Area, with two located within the GBRMP itself. The Authority is currently in the process of developing a ports position statement; this will outline environmental aspects of the development, operation and management of ports in and adjacent to the World Heritage Area. In addition, the Queensland Government has also developed a GBR Ports Strategy plan to cover 2012 – 2022; this is focussed on port development and planning.

Although there are stringent management arrangements for commercial shipping in the GBR, shipping activity is increasing. Shipping traffic is limited to designated shipping areas and measures are in place to reduce the risk of ship groundings and collisions. Despite careful environmental impact management, further development of ports within the GBR is likely to have impacts on the marine environment. Damage to the GBR may be through physical impact (collisions, groundings and anchor damage) or environmental degradation through poor chemical and waste management practices. There is also a risk of introduction of non-native species in ballast water.

Other uses

Defence

As a multi-use area, the GBR plays a critical role in Australia's defence training programs, by directly contributing to the training and operations of Australia's defence services. Intensive training activities are regularly undertaken in a few designated areas of the GBR; these cover less than 4% of the GBRMP. Activities include navy clearance diving training, boating and navigation exercises and amphibious landings. While all defence training activities are managed directly by the Australian Department of Defence, the management of potential impacts of defence training within the GBRMP is undertaken in collaboration with the GBRMPA. The Australian Environment Department and the Queensland Department of National Parks, Recreation, Sport and Racing are also involved.

Scientific Research

The GBR is an international hub of marine research, with a well-established history of scientific investigation. The first formal scientific investigations began in the late nineteenth century, and today, the GBR is probably the best studied marine ecosystem in the world. There are six research stations within GBRMP and research cruises are conducted by

both government and private bodies; these provide research opportunities for scientists from Australia and around the world. Scientific research in the GBR is essential to understanding the functioning, health and resilience of the GBR ecosystem and to improving its protection and management. Scientific research zones provide opportunities for research in relatively undisturbed areas of the GBRMP and individual research activities are managed through a strictly controlled permit scheme.

Traditional Use

Indigenous Australian and Torres Strait Islanders have lived along the Queensland coast for over 60,000 years, with over 70 indigenous groups still maintaining use of the GBR as their "sea country". They undertake traditional hunting, fishing and ceremonial activities within the GBRMP. This is known as traditional use of marine resources and includes undertaking activities as part of Traditional Owner custom and tradition to satisfy personal, domestic or communal needs.

Traditional use of marine resources is allowed under the Zoning Plan and in all zones (including non-extractive use in Preservation Zones). Traditional Owners can formalise their aspirations for sea country management through agreements involving government agency partners. These include Traditional Use of Marine Resources Agreements (TUMRAs), Indigenous Land Use Agreements (ILUAs) and Memoranda of Understanding (MOUs). In the GBR region, there are four TUMRAs in place (covering more than 19 000 km^2), two MOUs and two ILUAs. In addition, some Traditional Owner groups have made arrangements within their communities for sea country management, but have chosen not to formalise these arrangements with government agencies. Current responsible hunting by Traditional Owners is considered to be sustainable and the GBRMPA works with Traditional Owners and scientists to address the best information available on culturally important species such as dugong and green turtles. Furthermore, there are now indigenous representatives within the GBRMPA and associated management authorities.

What they do

The governance of such a large and iconic MPA and World Heritage Area is complex due to the overlapping federal and state (Queensland) jurisdictions. Effective management, therefore, relies upon a number of state and government agencies working within a framework of the GBR Intergovernmental agreement. The various agencies involved in GBR management include:

- The GBRMPA; the primary federal agency responsible for planning and management of the GBRMP. The GBRMPA is an independent statutory authority with its own federal legislation and is responsible to the federal Environment Minister.
- The Australian Government's Department of Sustainability, Environment, Water, Population and Communities; responsible for the regulation of activities that may have a significant impact on matters of National Environmental Significance including world heritage values.

- Various Queensland agencies assist in the management of the GBR; the Queensland Parks and Wildlife Services have a major responsibility for field management activities.
- Other Australian and State government agencies are involved in specific aspects of management addressing issues such as shipping, fisheries, defence training and aerial surveillance.

This multilateral approach is important for effective delivery of management. By working together, management of separate issues and activities can be integrated properly.

The GBRMP Act (1975) is the primary federal legislation for the GBRMP. Following a comprehensive review in 2006, the objects of the Act were amended. Today, the main objective is "to provide for the long term protection and conservation of the environment, biodiversity and heritage values of the GBR region".

Spatial management

As a multiple-use MPA, the GBRMP has employed a comprehensive statutory Zoning Plan.

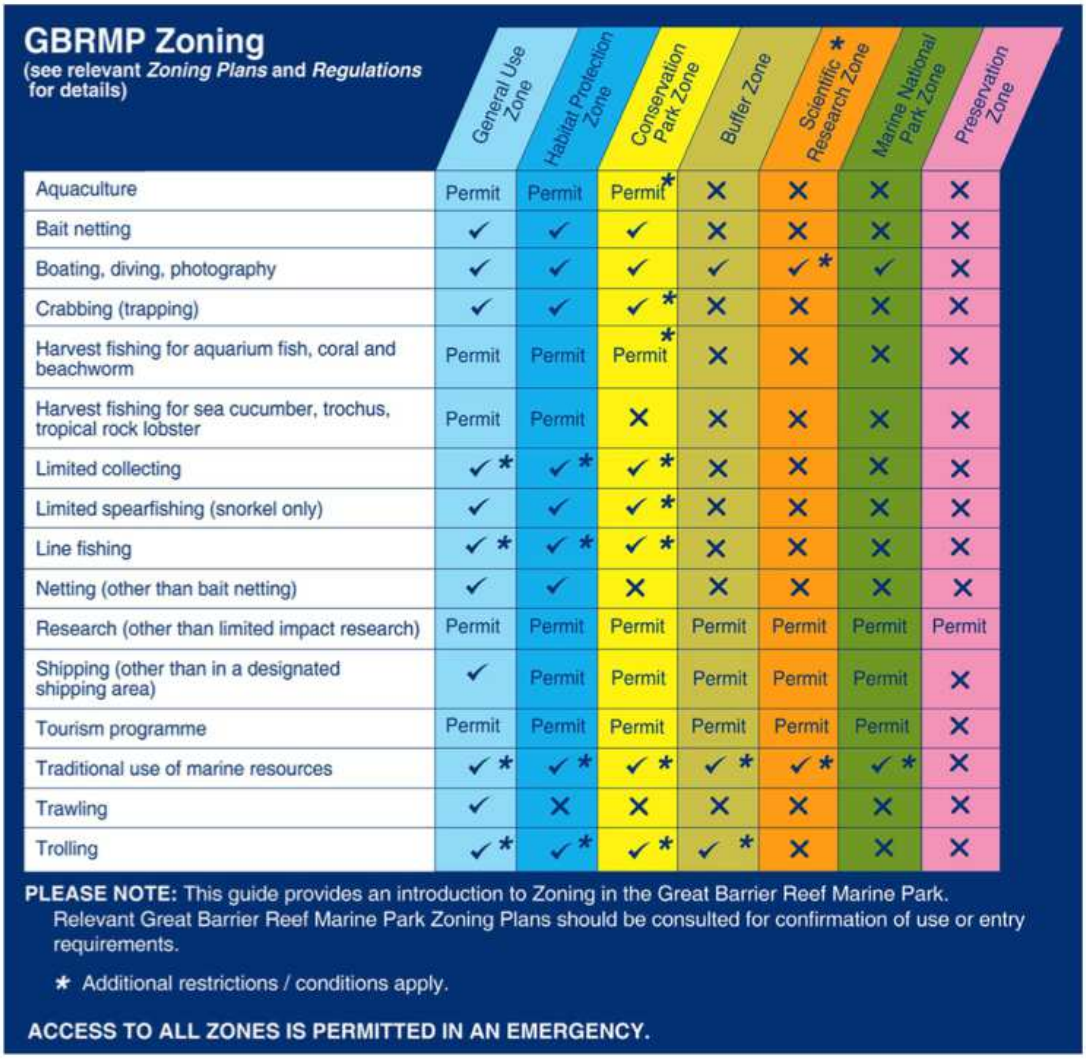


Figure 16 - Activities matrix indicating which activities can occur in which zone, which are prohibited and which need a permit (from Day & Dobbs, 2013).

The multiple-use zoning system governs all human activities, providing high levels of protection for specific areas, while allowing a variety of other uses elsewhere. This means that virtually all reasonable activities are allowed - including most types of fishing, shipping, dredging and aquaculture - in certain zones within the GBRMP. Zoning ensures an overriding conservation rationale for the entire area, minimises impacts and conflicts, and provides for high levels of protection for specific representative areas, while allowing a variety of other uses to continue in other zones (Figure 16).

Through the designation of no-take zones and no-go zones, a high level of protection for one third of the GBRMP (115,550km^2) has been ensured. A further one third of the GBRMP is zoned such that the benthic habitat is fully protected, including a prohibition on bottom trawling.

Successes

The Great Barrier Reef Marine Park has been managed under a complex but strong regime with exceptional government support, financing and research and monitoring expenditure since it was established in 1975. The management system is often regarded as the leading contender for the best example of EBM. The success of the management regime in halting the decline of many species and ecosystems is mixed; for example, coral cover appears to decline annually, although this is likely to be at least partly attributable to forces outside the control of the management body. Notable successes include:

- Increased fish populations as a direct consequence of no take zones
- Little loss of mangrove habitat as a result of strong prohibitions on damaging marine plants under the Queensland Fisheries legislation
- Dramatic improvements of sewage effluent discharges from resort islands and mainland cities

There is a strong relationship between reef tourism enterprises and reef management agencies. A good example of where this relationship has been a benefit to EBM is in the control of outbreaks of crown-of-thorns starfish (*Acanthaster planci*). Since the 1960s, large outbreaks of these starfish – thought to be related to fishing pressure and high nutrient loads from terrestrial run off - led to mass coral mortality. The tourism industry has made large investments to preserve areas of living reefs from crown-of-thorns starfish by actively monitoring and removing them. Furthermore, since 2009 the GBRMPA has provided incentives for conservation practices by allowing tourism enterprises with Advanced Ecotourism certification (provided by Ecotourism Australia) to obtain an extended permit for operating tours to certain areas within the GBRMP. This certification is awarded to enterprises that commit to achieving best practice in resource use, ecological sustainability and the provision of quality ecotourism experiences.

Spatial planning and zoning in the GBRMP is widely regarded as the cornerstone of its successful management and has evolved considerably since the first zoning plan in 1981. The multiple use approach of the zoning plan means that the entire GBRMP is managed

as an integrated whole, not just a series of isolated protected areas surrounded by “a sea” of unmanaged activities. This broad-area integrated management zoning approach is thought to be more effective than a series of small, isolated protected areas because: (1) ecologically it recognizes temporal/spatial scales at which ecological systems operate and ensures the entire GBR remains viable as a functioning ecosystem, (2) practically it is easier to manage; it buffers and dilutes the impacts in areas adjacent to highly protected areas, and (3) socially it helps to resolve and manage conflicts in the use of natural resources and ensures that all reasonable uses can occur with minimal conflict.

Bringing the lessons home

Key features contributing to the success of the current management approach in the Great Barrier Reef include a well-established and stable authority at all levels of government and an adaptive approach to a number of management challenges. The framework is set up in a way which:

- Establishes and maintains effective management partnerships
- Provides jurisdictional coordination
- Provides management resources, including an enforcement capability
- Develops public awareness and education
- Engages communities and stakeholders based on a sound understanding of their needs and how they interact with the ecosystem
- Incentives for good practice (for example, certification of Ecotourism operators).

It is a good example of how spatial management and zoning can be coordinated to allow sustainable use of a large area. Management measures are locally specific in many cases, but are coordinated and integrated on a regional level. This allows management to be proportional, relevant and complementary to both sustainable development and the ecological health of the marine environment.

In Wales, a similar multi-level approach might be appropriate, given the different needs within even the inshore fishing industry, for example. An understanding of interactions at different spatial scales will help make sure management is fit for purpose throughout the Welsh Government jurisdiction, both locally and in terms of regional, national and international issues. Once again, the importance of building and maintaining good relationships between all partners is demonstrated.

Reading

Biggs, D., Ban, N.C., Hall, C.M. 2012. Lifestyle values, resilience, and nature-based tourism’s contribution to conservation on Australia’s Great Barrier Reef. *Environmental Conservation,* 39 (4): 370 – 379.

Bray, M., Rist, P. 2009. Co-management and protected area management: Achieving effective management of a contested site, lessons from the Great Barrier Reef World Heritage Area (GBRWHA). *Marine Policy,* 33: 118 – 127.

Caveen, A.J., Gray, T.S., Stead, S.M., Polunin, N.V.C. 2013. MPA policy: What lies behind the science? *Marine Policy,* 37: 3 – 10.

Chuenpagdee, R., Fernandez, J.J., Szelianszky, E., Alegret, J.L., Fraga, J., Jentoft, S. 2013. Marine protected areas: Re-thinking their inception. *Marine Policy*, 39: 234 – 240.

Day, J.C. 2002. Zoning—lessons from the Great Barrier Reef Marine Park. *Ocean & Coastal Management*, 45: 139 – 156.

Day, J. 2008. The need and practice of monitoring, evaluating and adapting marine planning and management—lessons from the Great Barrier Reef. *Marine Policy*, 32: 823 – 831.

Day, J.C., Dobbs, K. 2013. Effective governance of a large and complex cross-jurisdictional marine protected area: Australia's Great Barrier Reef. *Marine Policy*, 41: 14 – 24.

DeFreitas, D.M., Sutton, S.G., Moloney, J.M., Ledee, E.J.I., Tobin, R.C. 2013. Spatial substitution strategies of recreational fishers in response to zoning changes in the Great Barrier Reef Marine Park. *Marine Policy*, 40: 145 – 153.

Dobbs, K., Day, J., Skeat, H., Baldwin, J., Molloy, F., McCook, L., Johnson, M., Elliot, B., Skeat, A., Vohland, K., Wachenfeld, D., Kenchington, R. 2011. Developing a long-term outlook for the Great Barrier Reef, Australia: A framework for adaptive management reporting underpinning an ecosystem-based management approach. *Marine Policy*, 35: 233 – 240.

Hunt, C. 2013. Benefits and opportunity costs of Australia's Coral Sea marine protected area: A precautionary tale. *Marine Policy*, 39: 352 – 360.

Kearney, R., Buxton, C.D., Farebrother, G. 2012. Australia's no-take marine protected areas: Appropriate conservation or inappropriate management of fishing? *Marine Policy*, 36: 1064 – 1071.

Kenchington, R., Hutchings, P. 2012. Science, biodiversity and Australian management of marine ecosystems. *Ocean & Coastal Management*, 69: 194 – 199.

Larson, S., DeFreitas, D.M., Hicks, C.C. 2013. Sense of place as a determinant of people's attitudes towards the environment: Implications for natural resources management and planning in the Great Barrier Reef, Australia. *Journal of Environmental Management*, 117: 226 – 234.

Olsson, P., Folke, C., Hughes, T.P. 2008. Navigating the transition to ecosystem-based management of the Great Barrier Reef, Australia. *PNAS*, 105 (28): 9489 – 9494.

Osmond, M., Airame, S., Caldwell, M., Day, J. 2010. ''Lessons for marine conservation planning: A comparison of three marine protected area planning processes''. *Ocean & Coastal Management*, 53: 41 – 51.

http://www.gbrmpa.gov.au/

The Galapagos Marine Reserve

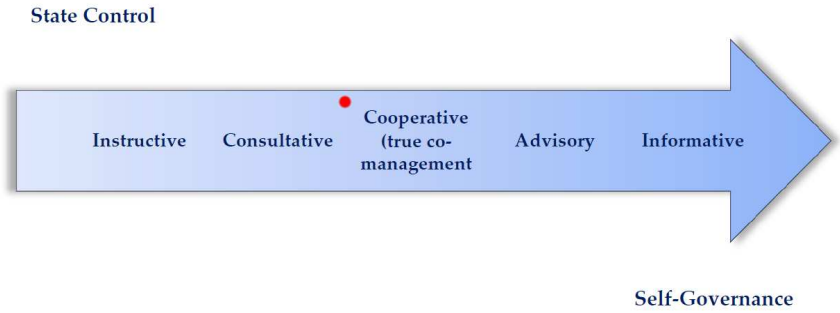
Summary

The Galapagos Marine Reserve (GMR) is one of the largest Marine Protected Areas (MPAs) in the world. The management system of the GMR was established in 1998 as part of the Law of the Special Regime for the Conservation and Sustainable Development of the Province of Galapagos. The implementation of the Galapagos Marine Reserve Management Plan (GMRMP) aimed to address conflicts over the use of natural resources among stakeholders of the GMR – primarily conservation, fishing and tourism - through regulating the use of these resources and promoting research into conserving marine biodiversity. Although the GMRMP has a strong foundation within a legally-based multi-stakeholder co-management regime, short fallings have been observed in the enforcement and implementation of many of the management plans in place.

Aspects of Ecosystem Approach in this case study (Welsh Government Core Principles)

- Societal choice
- Localised decisions
- Economic drivers
- Spatial and temporal scale
- Long term approach
- Managing change
- Evidence
- Stakeholder engagement

Where on Striking the Balance spectrum



Implementation phases demonstrated

1. Understand context and issues
2. Objective setting
3. Explore management options & develop plan
4. Implement preferred management
5. Monitor
6. Evaluate & adapt

Why it works

- A strong legal framework ensures the rights of stakeholders are appropriately represented
- A co-management approach provides a sense of ownership, responsibility and partnership to local stakeholders
- The two-tiered decision making process allows input from a wide range of stakeholder groups with appropriate expertise
- Stakeholder input has the appropriate “scope” – in terms of expertise, capability and interest; different groups consist of the right people for the right job

Introduction

The Galapagos archipelago has been described as one of the most unique, scientifically important, and biologically outstanding areas on earth, providing a “natural laboratory” for both terrestrial and marine biologists.

The Galapagos islands straddle the equator in the Pacific Ocean approximately 1000 km west of the South American coast and is counted as one of the 24 provinces in Ecuador (Figure 14). The archipelago comprises 13 large islands, 6 smaller islands and 107 islets and rocks, with a total land area of approximately 8000 km^2. The islands are volcanic in origin, with several active volcanoes in the west of the island group.

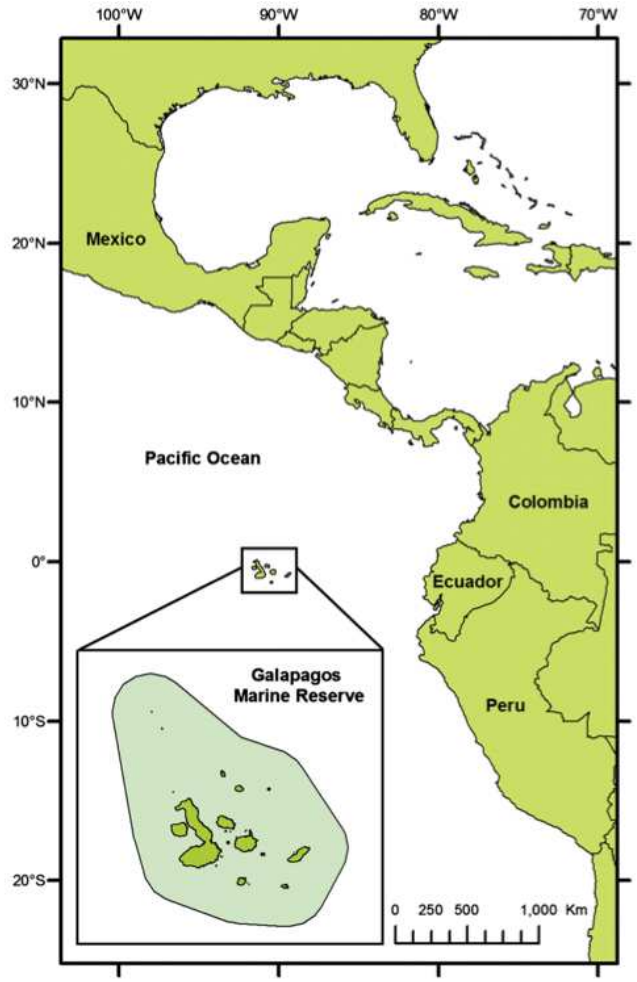


Figure 117 - Map showing the location of the Galapagos Islands and the area covered by the Galapagos Marine Reserve (Castrejon & Charles, 2013).

The Galapagos Marine Reserve (GMR) was established in 1998 under the management of the Directorate of the Galapagos National Park Service. The Reserve includes inland waters (e.g. lagoons and streams) and stretches out to 40 nautical miles from the coast, covering an area of 133 000 km^2. The GMR is also a UNESCO World Heritage Site, recognised for its value in conserving and maintaining unique species.

Fishing

Although industrial fishing is prohibited within the Galapagos Marine Reserve, the local fishing sector - legally defined as artisanal - has in recent years seriously depleted its coastal waters of several key species, including the sea cucumber (*Isostichopus fuscus*) and the spiny lobster (*Panulirus penicillatus*). The sea cucumber fishery in the GMR has received widespread attention due to the conflicts surrounding it, and was responsible for a large influx of opportunistic fishers from continental Ecuador in the early 1990s. The over-exploitation of these species could have serious consequences for marine communities and ecosystem stability throughout the GMR.

Fisheries of Galapagos finfish species are currently not regulated, and lobster and sea cucumber populations are heavily over-fished. Many of the targeted finfish species include several top predators and endemic species, which occupy keystone roles in the marine food web. Although shark fishing has been prohibited throughout the GMR since 1989, illegal shark fishing has been reported.

The majority of Galapagos fishers do not represent typical traditional fishers having followed their fathers' and grandfathers' trade, but arrived from mainland Ecuador to join the gold rush of sea cucumber fisheries as late as the 1990s. Today there are over 1000 people currently registered in one of the four fishing cooperatives. However, it is estimated that only half of those registered actively fish; the remaining 50% are thought to maintain their fishing licence in order to benefit from incentives, such as transferring a fishing permit into a tourism permit. Furthermore, many of the new fishers arrived after having participated in the collapse of the sea cucumber resource along the mainland coast, so rather than having past successful experiences, they have had a history of sequential depletion. Today, fishing generates approximately US$4-6 million annually. This fishing activity has generated great international interest, primarily for its potential impact on the biodiversity of the marine reserve.

Socioeconomic background

The Galapagos islands had no aboriginal inhabitants and were officially discovered in 1535 by the Bishop of Panama, Tomas de Berlanga. Up to 1950, the islands were barely populated, with just 1346 residents registered that year. The early 1970s showed a huge population growth with the number of residents estimated at 4000. The Galapagos population has continued to grow (Figure 18) with the latest consensus estimating the population to be over 25 000 legal residents, 1 800 temporary residents and up to 5 000 residents whose status in Galapagos is characterised as "irregular", all of who live within 3% of the land area of the islands. It has been reported that due to the absence of an indigenous community, the Galapagos community behaves more like a frontier community; characterised by a vicious cycle of rapid expansion, overcapitalisation and overexploitation of natural resources rather than an oceanic island community aware of social ecology and resource limitations.

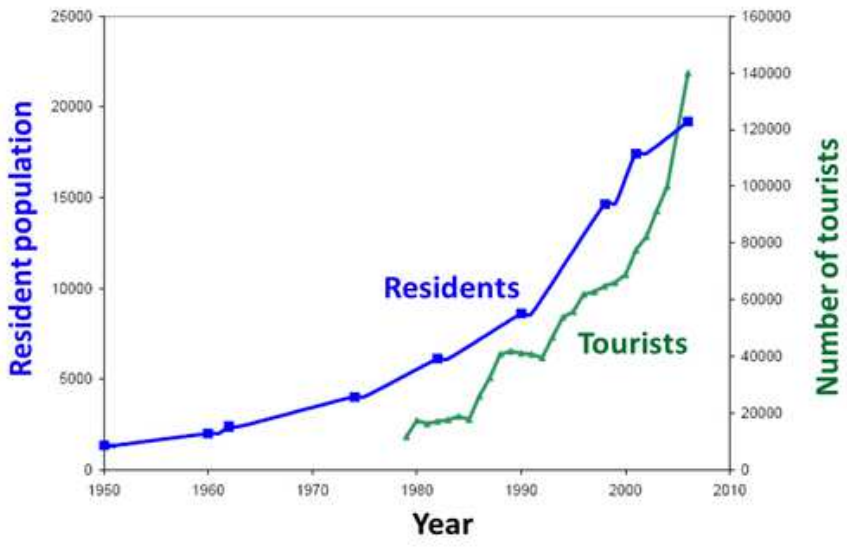


Figure 18 - The growth of Galapagos permanent residents and tourists between 1950 – 2010 (www.galapagos.org).

Tourism and recreation

The Galapagos National Park Service works to promote sustainable tourism and offers a specialised product to a well-informed and well-travelled group of visitors. Tourism is dominated by cruise vessels that visit sites of environmental interest on a number of the

islands. Visitors are typically professional or managerial classes or retired and undertake nature-based activities such as wildlife watching, fishing, snorkeling and diving. Holiday expenditure is high, particularly amongst visitors from the US and Europe. The number of tourists has increased dramatically over the past 60 years (Figure 18), from approximately 40 000 in the 1990s to 185 000 in 2011 and is the islands primary source of industry and income; there is an order of magnitude difference between the earnings generated by fisheries and tourism exports.

Employment statistics indicate that tourism-related employment accounts for 40% of total employment. The Galapagos is also one of the fastest-growing economies in South America; per capita income is higher here than anywhere else in Ecuador, with Galapagos tourism generating US$418 million annually, of which an estimated US$63 million enters the local economy. This is equal to 51% of the Galapagos economy.

In the larger protected areas and at designated visitor sites, the impact of increased numbers of visitors and residents has been fairly well managed using standard protected area management techniques. These include trails, guides, fixed itineraries and a limit on the number of tourist concessions. The GNPS monitors visitor sites and may close sites, increase necessary infrastructure -such as stairs or walkways - or change itineraries in response to growing pressures.

Ports and shipping

There are five ports on the Galapagos, with Puerto Ayora, Puerto Villamil and Puerto Baquerizo Moreno being the main three ports of entry. The number of cargo ships and the amount of cargo has continued to increase in line with the number of people visiting the archipelago, and increasingly more fuel is brought to the islands; this increases the risk of oil spills such as that of the cargo ship Jessica in 2001. There are now three Galapagos airports, with the number of flights from the continent increasing from just a few flights per week in the 1970s to an average of six flights per day today. Furthermore, commercial flights to Galapagos increased by 193% from 2001 to 2006 and more private flights continue to arrive from other countries.

Other uses

The Charles Darwin Research Station (CDRS), operated by the Charles Darwin Foundation (CDF) is located in Puerto Ayora on Santa Cruz island and has satellite offices on Isabela and San Cristobal islands. The CDRS was established in 1964 and currently has a team of over 100 staff, including scientists, educators, research students, support staff and volunteers. The main objectives of the CDRS are to:

- Promote, facilitate, design, and implement the scientific investigation necessary for the understanding of biological principles, better understanding of ecosystems, and adequate management of the islands' natural resources.
- Advise the Ecuadorian authorities on the subject of conservation and management of natural resources in the Galapagos Islands.

- Collaborate with Ecuadorian institutions on the implementation of programs involved in scientific investigation and education on the islands.
- Contribute to the development of scientific and technical personnel from Ecuador who are specialised in natural sciences and natural resource management.
- Contribute and collaborate on educational programs related to the conservation of the islands.
- Compile the results of the scientific investigations and the other activities of the organisation and to disseminate this information regionally, nationally, and internationally.

What they do

The importance of the Galapagos in terms of its biodiversity, tourism and fishing means that good integrated management of the Marine Reserve is needed. The Management Plan encompasses all activities carried out within the GMR, and is based on the Precautionary Principle and the principles of adaptive management, local participation and sustainable development.

The Plan details a series of specific objectives that are focussed on the long term conservation of marine and coastal habitats, endemic and vulnerable species and social objectives. These include:

- Supporting local fishers to maintain and improve their social and economic status, by ensuring fishing activities are compatible with biodiversity conservation.
- Balancing the demands of the tourist industry and the pristine habitats tourists seek.
- Developing research projects to increase knowledge of marine ecosystems for the proper management and administration of resources.
- Reducing conflicts between uses – principally fishing, tourism and scientific research.

Academic and technical scientific support is an important element of management. The Fisheries Research Project builds on many years of monitoring of sea cucumber and lobster fisheries in Galapagos, carried out both by the Charles Darwin Foundation (CDF) and by the National Park Service. The project aims to assess growth, reproduction, and recruitment patterns of the target species through collection and examination of biological samples. The results of these studies aim to provide scientific information and technical assistance to the authorities to improve fisheries management and work towards population recovery. The main fisheries management tool is the Five Year Fishing Calendar, which provides regulations for the lobster and sea cucumber fisheries and sets research priorities for other fisheries where information is lacking.

Stakeholder involvement

Local stakeholders have been involved in guiding plans on future management of the GMR. Their participation is deemed essential to progress in marine resource management and zoning initiatives within the islands. As a multi-use marine reserve, the GMR is

underpinned by Law of the Special Regime for the Conservation and Sustainable Development of the Province of Galapagos, which was approved and became part of Ecuador's Constitution in 1998. This is managed by a two-tier system involving the major stakeholders (Figure 19). On a local level, the Participatory Management Board (PMB) is responsible for producing, by consensus, a series of bottom-up management proposals which are then submitted to the Inter-institutional Management Authority (IMA) for final decision-making by majority voting. The PMB is made up of the tourism sector, naturalist guides, artisanal fishers and the conservation and science sector. The IMA is made up of Ministry representatives from relevant government departments, representatives of environmental NGOs, the local artisanal fishing sector and the Galapagos Chamber of Tourism. The Galapagos National Park Service acts as administrator and is responsible for coordinating the co-management system and for implementing the decisions reached by the IMA.

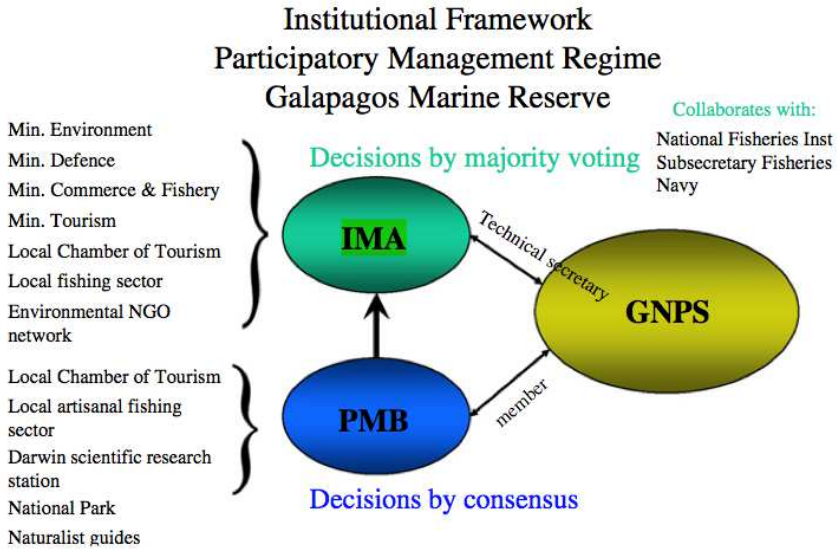


Figure 129 - Two tiered management scheme with stakeholder input (from Heylings & Bravo, 2007).

So stakeholder involvement is multilateral and multi-level within the management regime, and the scope of involvement may be local or wider, as appropriate.

Spatial management

In 2001 a Spatial Ecosystem Based Management (EBSM) approach was projected, with the main outcome being designation of the GMR into three zones:

(1) Multiple use zone: deep waters (> 300 m) located inside and outside the GMR boundary; in this zone, all human activities permitted by the GNP (e.g. fishing, tourism, scientific research, navigation and surveillance) can be undertaken.
(2) Limited use zone: includes coastal waters (< 300 m) surrounding the islands, islets or rocks.
(3) Port zone.

The limited use zone was further divided into four subzones (Figure 20) for conservation, tourism, fishing, and Areas of Special Temporary Management (ASTM). Whereas the first

three subzones have set boundaries and regulations, the ASTM can be implemented within any of the other subzones and includes special areas conceived to implement experimental management schemes (e.g. seasonal closures), or to allow the recovery of species or habitats that have been severely affected by human activities.

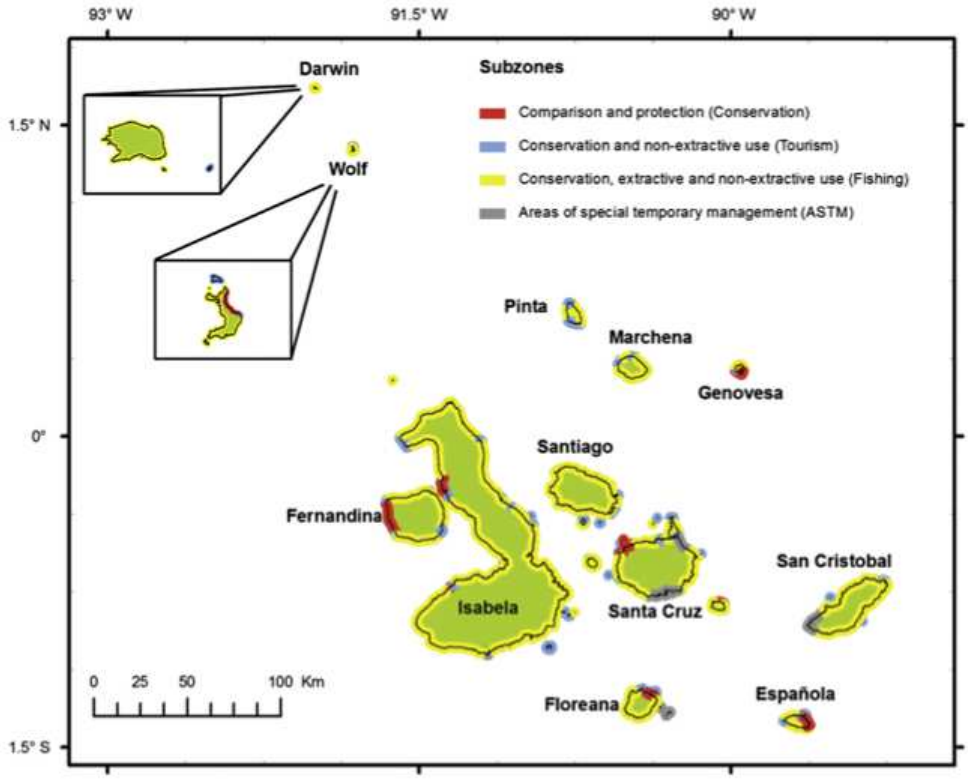


Figure 130 - Marine zoning - limited use zone (from Castrejon & Charles, 2013).

Representatives of four major stakeholder groups - Science, conservation and education experts; tourism operators; local fishers; management authorities – participated in negotiations. Although the selection and siting of the conservation subzones was largely based on expert opinions within the science and conservation stakeholder group, useful data on shallow benthic biodiversity were limited. Whereas most tourism subzones were already in place either as designated sites or already in use by the industry, before the initiation of the zoning plan in 2000 regulated fishing occurred throughout the archipelago. The designation of no-extraction zones, therefore, caused much conflict between fishers and other stakeholders.

Successes and challenges

The role that the legal framework has played in institutionalising the co-management process is an important one. Establishing the rights of stakeholders to participate in decision-making has proved a vital factor in engineering institutional change. Results from an evaluation of the GMR Management Plan shows that the co-management process performs well, in design and in practice, in terms of strategic vision, participation, empowerment, consensus orientation and resilience. There is an extremely high level of

participation within the co-management bodies and a huge investment in gaining consensus has led to real power for grassroots proposals. There process is increasingly resulting in real change and has been able to turn agreements negotiated at a local level into legally-binding management regulations.

However, without proper enforcement of these changes, the resilience and credibility of management can be undermined. An example of this is with the marine zoning programme. While this represents a practical and sound framework for management of the GMR, based on ecosystem based management principles, in practice it has been greatly limited by lack of long-term planning, lack of attention to spatial structure and lack of enforcement.

The Galapagos is an example of where fishery management policies have been established without first understanding the behavior of fishermen. Since the creation of the GMR, there have been no studies in the archipelago that investigate fishing behaviour and the factors affecting this behaviour. This lack of understanding might be one of the reasons of why many of the policies applied in the GMR have been ineffective in achieving sustainable fisheries; this is evidenced by the continued reduction in lobster and sea cucumber landings (Figure 21).

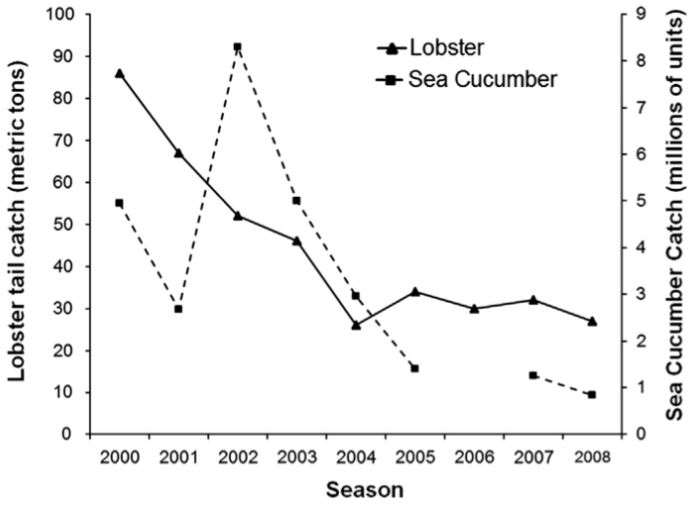


Figure 14 - Total catch of spiny lobster and sea cucumber in the GMR in fishing seasons between 2000 – 2008. There were no sea cucumber data available for 2006. The source of these data is the Fisheries database from the GNP and CDF (Bucaram & Hearn, 2014).

Additionally, political instability both on a local and national level has weakened the institutions charged with the administration of Galapagos. For example, a succession of 11 National Park Service directors and interim directors was appointed between 2004 and 2007 (with eight of these changes occurring in 2004); this has made long term planning to promote management effectiveness practically impossible.

Ultimately, there is a good infrastructure in place with strong elements of the ecosystem approach including stakeholder participation and co-management, scientific input and expertise, aspects of adaptive management and spatial management measures. The trouble has been that executing these ideas has proven difficult, due mostly to social, economic and political factors. As a result, the environmental integrity of the site is not fully benefitting from the protection set down in the Management Plan.

Bringing the lessons home

Stakeholder involvement has been key, with strong correlation to Galapagos' successes (where it's been done well) and failures (where it hasn't). Inviting input and true joint working from a broad section of stakeholders might not be possible at a legislative level, but ensuring that management is driven from a bottom-up approach guarantees that stakeholders at a local level are included in the decision making process.

The principle of marine zoning is well set out within the GMRMP, and demonstrates the need to ensure that zones are designated and managed appropriately with a long-term vision in mind.

Crucially, the Galapagos example demonstrates that a good management setup is not enough; a long term approach and adequate funding are needed to sustain the development of management measures and support proper implementation, including enforcement where needed. A full understanding of the social and economic impacts of management is equally as important as knowledge of the ecosystem, and the spatial nature of activities, features and pressures should be taken into account.

Reading

Baine, M., Howard, M., Kerr, S., Edgar, G., Toral, V. 2007. Coastal and marine resource management in the Galapagos Islands and the Archipelago of Sand Andres: Issues, problems and opportunities. *Ocean and Coastal Management,* 50: 148 -173.

Bucaram, S.J., Hearn, A. 2014. Factors that influence the entry–exit decision and intensity of participation of fishing fleet for the Galapagos lobster fishery. *Marine Policy,* 43: 80 – 88.

Castrejon M. Perceptions of the status of the whitefish fishery in the Galapagos Marine Reserve. In: Galapagos Report 2007-8, Puerto Ayora, Galapagos, Ecuador, 2008.

Castrjon, M., Charles, A. 2013. Improving fisheries co-management through ecosystem-based spatial management: The Galapagos Marine Reserve. *Marine Policy,* 38: 235 – 245.

Davos, C.A., Siakavara, K., Santorineou, A., Side, J., Taylor, M., Barringa, P. 2007. Zoning of marine protected areas: Conflicts and cooperation options in the Galapagos and San Andres archipelagos. *Ocean & Coastal Management,* 50: 223 – 252.

Edgar, G.J., Bustamante, R.H., Farina, J. –M., Calvopina, M., Martinez, C., Toral, M.V. 2004. Bias in evaluating the effects of marine protected areas: the importance of baseline data for the Galapagos Marine Reserve. *Environmental Conservation,* 31 (3): 212 – 218.

Gross, M. 2010. Fears over new Galapagos status. *Current Biology,* 20 (16).

Hearn, A. 2008. The rocky path to sustainable fisheries management and conservation in the Galapagos Marine Reserve. *Ocean & Coastal Management,* 51: 567 – 574.

Heylings, P., Bravo, M. 2007. Evaluating governance: A process for understanding how co-management is functioning, and why, in the Galapagos Marine Reserve. *Ocean & Coastal Management,* 50: 174 – 208.

Jones, P.J.S. 2013. A governance analysis of the Gala´pagos Marine Reserve. *Marine Policy,* 41: 65 – 71.

Jones, P.J.S., De Santo, E.M., Qui, W., Vestergaard, O. 2013. Introduction: An empirical framework for deconstructing the realities of governing marine protected areas. *Marine Policy,* 41: 1- 4.

Kenchington, R.A. 1989. Planning for the Galapagos Marine Resources Reserve. *Ocean & Shoreline Management,* 12: 47 – 59.

Schuhbauer, A., Koch, V. 2013. Assessment of recreational fishery in the Galapagos Marine Reserve: Failures and opportunities. *Fisheries Research,* 144: 103 – 110.

Shepherd, S.A., Martinez, P., Toral, M.V., Edgar, G.J. 2004. The Gala´pagos sea cucumber fishery: management improves as stocks decline. *Environmental Conservation,* 31 (2): 102 – 100.

Song, A.M., Chuenpagdee, R., Jentoft, S. 2013. Values, images, and principles: What they represent and how they may improve fisheries governance. *Marine Policy,* 40: 167 – 175.

Stone, S., Viteri, C., Cornell, J.C., Nøstbakken, L., Franklin, H. 2006. Fisheries Management in the Galapagos Marine Reserve: A Bioeconomic Perspective. Economic and Sector Study Series.

Toral, M.V. 2005. Requiem for the Galapagos sea cucumber fishery? SPC Beche-de-mer Information Bulletin #21.

Viteri, C., Chavez, C. 2007. Legitimacy, local participation, and compliance in the Gala´ pagos Marine Reserve. *Ocean & Coastal Management,* 50: 253 – 274.

Voyer, M., Dreher, T., Gladstone, W., Goodall, H. 2013. Who cares wins: The role of local news and news sources in influencing community responses to marine protected areas. *Ocean & Coastal Management,* 85: 29 – 38.

http://www.galapagos.org/

http://www.savegalapagos.org/

http://www.wildaid.org/ecuador

Discussion

In many respects, what has come to be called the Ecosystem Approach is the result of an iterative development of best practice, evolving through past successes and failures of previous management. As such, there are few true, mature examples of EA being implemented at the start of the process – more commonly, where adaptive management was in place, many schemes have adopted elements of EA over time. Equally, there are examples of successes that have become less so over time, as management has been inflexible in the face of changing social, environmental and political circumstances. In this sense, EA might be seen as an emergent property of adaptive management.

Figure 22 - Word cloud : "Why it works". The size of the keywords is proportional to how often they occur

Figure 9 is a visualisation of the bulleted lessons summarised at the beginning of each case study. It is entirely qualitative, and based on what the authors recognise as successful, which is necessarily reductive and subjective. However, it does highlight that there is broad consensus in terms of the types of things that have made for successful management. Note that qualities (such as appropriate, expertise, right and local) and action-based nouns (input, vision) combine with human and relationship-oriented descriptors (groups, partnership, stakeholders, government).

Ecosystem services

One of the least-well addressed of the Core Principles is that of ecosystem resilience. Although this is not a direct synonym for ecosystem services, it is a good proxy for it, as both relate to 1) an understanding of the ecosystem; 2) consideration of the demands on the ecosystem (the uptake of ecosystem services) and 3) the dynamics of the ecosystem in terms of those demands, including cumulative and combined effects and even externalities such as global environmental change.

Of the management regimes studied here, only the two longest-running, best-funded (Chesapeake Bay, and the Great Barrier Reef Marine Park) show any signs of addressing this aspect in practical terms. This is not to say the value of ecosystem services is not seen as important – clearly, communities such as Apo Island are well aware of the direct relationship they have with the environment, in terms of the provisioning and amenity-based services that sustain their livelihoods. But even strong management frameworks such as New Zealand, while acknowledging ecosystem effects and the need to better understand them, are often much further behind in terms of current knowledge and, more crucially, currently have no specific means of managing to improve ecosystem effects even if the nature of those effects were better-known.

In other examples, such as The Wash European Marine Site, there is a movement towards considering ecosystem services, although since this is being driven at a higher level by current national and European legislative developments, nothing has yet materialised in terms of practical management measures, so this aspect remains something of an elephant in the room.

The Great Barrier Reef Marine Park benefits from being an international hub of scientific research; domestic and international academic and research institutions have studied and continue to research most aspects of ecosystem function, and the relative wealth of Australia and income generated by the GBRMP itself give the site currency attracting this sort of attention. However, there also needs to be a system in place through which ecosystem knowledge can be incorporated into management policy, and this is made possible in the Great Barrier Reef by a progressive adaptive management regime, which is well integrated in its approach so that management measures can apply broadly enough to effect change.

Possibly the best implementation, however, is that seen in the Chesapeake Bay example. It, too, benefits from a well-funded governance and research infrastructure. Where it differs and possibly betters the Australian approach is in directly addressing “the ecosystem problem”. It does this in its fisheries management regime through the Fisheries Ecosystem Plans, which provide the necessary ecosystem understanding and a context in which to set fisheries-specific management objectives. However, they go further than that in incorporating ecosystem objectives, too. As a living document, and within the adaptive management framework of the Chesapeake Bay Program, the FEPs are a vessel into which any new research can be fed. This is to emphasise that the Plans are still relatively

new, but that they are a pragmatic and systematic means of implementing this aspect of the ecosystem approach.

Whether it is better to account for ecosystem effects in the context of one activity (as here) or in more general terms is an interesting discussion. Broadly speaking, it relates to the same issues of scope and relevance seen within any aspect of management – for example, stakeholder involvement. In the same vein, the answer is likely to lie in a balance between the need for specific detail and the need to integrate across a broad spectrum of activities, which might require a nested approach.

Lessons for Wales

Implementation of EA in a Welsh context is now a stated policy aim of Welsh Government. The case studies presented in this report highlight the importance of a system of management defined by its flexibility (adaptive management), with partnership working (co-management) at its centre, that acknowledges societal resource use and implements management measures on appropriate spatial scales. With the exception of the acknowledgement and balancing of human resource, none of these elements are traditionally considered part of EA theory. They are however quite clearly fundamentally important structural and operational elements required for the successful implementation of EA. They provide a systematic skeleton over which the flesh & bones of EA is laid (addressing the objectives for delivering ecological resilience, securing ecosystem services, spatial management, local management etc.).

The importance of an adaptive approach is clear for the implementation of EA in Wales where we are very often faced with insufficient knowledge of our sites and the wider marine environment. If we are to implement timely and proportionate management then there needs to be an acceptance that a complete understanding of our ecosystem is unattainable, at least in the short-term, and that management that provides a means of "learning while doing" represents lower risk than overly precautionary "do nothing".

From stakeholders to partners – the process of building and maintaining relationships & networks in Wales that this project has already begun and is apparent within the fishing industry is central to the successful implementation of EA in Wales. A system that is reliant on stakeholder involvement and participation where stakeholders have a more active role than a pure "consultative" one is seen in these case studies to result in a body of stakeholders that are more invested in the process. Human capital cannot be undervalued and can be maximised by getting to know individuals as more than representatives of an organisation; quite often, people are involved in or interested in more and has resulted in the destabilising of once successful local management. Conversely the best examples (such as Chesapeake and Great Barrier Reef) have co-management approaches that that were well founded and supported and have served to deliver successful management. Co-management may well deliver economic benefits in the long-term by addressing management issues to enhance ecosystem goods and services, increase profitability of fisheries and tourism but these systems do need than one aspect of marine use, and can help to create links and integrate discussion across different sectors.

Stakeholder involvement can occur on a variety of levels and some individuals will be able to contribute to dialogue at more than on level, others will only be interested in (for example) local issues. In Wales there is a relatively well developed and growing community of fishermen, scientists and some experts and managers who already have a good degree of contact and dialogue. This is an advantage in developing high level policy but also in accessing local knowledge and developing local networks demonstrated to be so important in these case studies.

The spatial scope of management was shown to be an important aspect of implementing EA. Spatial management at approapriate scales serves to account for the heterogeneity in terms of activity patterns and uses; some management may work best at a local/community level with minimal involvement of central government (like the Apo example, and byelaw-based reserves in New Zealand for the indigenous populations). Whereas other management – particularly where there's an international aspect, such as regional seas issues in Irish Sea may require collaboration with Ireland and other EU member states. A "nesting" of scales of management from "community" through "local" and "district" to "Regional" and "National" may be required for different issues and activities depending on their spatial footprint.

A common lesson from the case studies that should be highlighted is that where a co-management system is not supported or implemented well, it can jeopardise the success of management – for example, in Apo where the balance between local and central control changed adequate resourcing in the development stage and ongoing facilitation – adaptive management is a process, not a project.

Implementation of EA is a first step in the process and it's important that this is understood both by stakeholders and regulators. EA implemented using some of the best practice such as adaptive management and co-management is a way of doing things which requires a change of outlook at all levels, As many of the studies demonstrate the biggest "success stories" are those that have been in existence longest, and which have evolved (through adaptive management) to address and overcome both long lived issues and those that have arisen in the meantime including social, political and environmental change. Expectations may be high initially and these should be tempered by highlighting that it may take time before positive changes take effect; there may be rapidly apparent successes and failures but a long-view of the process is required to provide a true assessment of its progress.

Published by:
Natural Resources Wales
Cambria House
29 Newport Road
Cardiff
CF24 0TP

0300 065 3000 (Mon-Fri, 8am - 6pm)

enquiries@naturalresourceswales.gov.uk
www.naturalresourceswales.gov.uk