

INTEGRATING COASTAL MANAGEMENT FOR CHANGE

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Introduction: the challenges ahead

Over the next three or four decades Australians in the coastal zone are likely to face some considerable challenges, some of them novel. Currently some 75-80% of Australians live within 50 km of the coast, mostly in the four eastern states. It has been predicted that by 2050 Australia will have a population around the 35-million mark, as opposed to about 22 million now – and much of the increase will occur in the three largest state capitals. The eastern states may well then have coastal populations of perhaps 22-25 million people.

This increase in population will require very considerable attention to physical infrastructure: transport, housing, recreational and other amenities, and commercial and industrial establishments. Not only will providing such infrastructure be expensive, but it will involve organizational challenges much greater than those that currently bedevil some areas of New South Wales.

There will also be an increased pressure on ecological coastal and marine resources. There will probably be a greater emphasis on capture fisheries and aquaculture. Fisheries run the risk of depleting wild stocks (recently in the news as regards the southern bluefin tuna fishery). Increased aquaculture, too, even the “eco-friendliest” types like oyster and mussel culture, will make greater demands on local ecological systems.

At the same time Australian coasts will see the effects of a changing climate. Whatever one’s view of the scientific basis of the present climate debate, the data clearly indicate that there have been recent changes in a range of climate indicators: global temperatures, sea levels, incidence of Atlantic hurricanes and other tropical storms and the frequency and nature of El Nino events (Sang-Wook *et al* 2009). Furthermore, changes in patterns of rainfall may have effects on agricultural production, in terms of the amounts, types and locations of food grown – with consequent implications for the development of transport infrastructure and support of an increasing populations.

There is a vociferous, but small, group of people opposed to the idea that such changes are anthropogenic. But the whole business of planning of any sort requires a look into the future and acting on the best estimation of what future conditions may be like: those estimates may turn out to be inaccurate, but it essential to make those estimates as best we can. So in the absence of any cogent and synoptic evidence-based argument as to why and how the climatologists are wrong, most countries and jurisdictions will probably work on the basis of the IPCC’s predictions being closest to correct in this debate. In any event, the recent report of the National Sea Change Taskforce is likely to induce responses at a high political level and coastal managers will then be affected by the further evolution of national policies for coastal planning. That evolutionary process has, of course, been in progress for two or three decades.

All these changes will happen against a background of changing affluence in Australia. Overall it is likely that per-capita income will increase (more for some than others perhaps) but recent global events have shown clearly that financial development will probably not be smooth and may decline for greater or lesser periods. Such changes will affect (positively or negatively) the financial and other human resources available to

meet future challenges. They will affect the expectations of individuals and communities for the nature and quality of recreational and other amenities and services and for the efficiency of transport and other infrastructure.

Meeting these challenges will require more-precise resource management, including the ways in which we handle coastal resources. We can certainly expect more-intensive resource uses, which will need clever management to ensure that the resources and, importantly, the processes that maintain them, are supported.

That is easy to say, of course, but it is rather more difficult to see how we should proceed from here. Pitts (1993) quotes Dorsey (1986), who notes that CZM problems are “wicked” (in the sense in which Ross Garnaut described the climate problem as “diabolical”). Such problem areas are multidimensional and very like “complex systems” in the mathematical sense, in that there are many feedback loops between the various elements, the system as a whole can react unpredictably to perturbations, there can be many conflicting viewpoints, reflecting the fact that the “system” as a whole has no single “correct” view and, finally and importantly, it is remarkably difficult to calculate risks associated with particular management strategies or responses. Resource management is not the only area to suffer from such problems: Lindblom (1959, 1979) famously noted that economic decision-making often takes place in a fog, so that it tends to take the form of “muddling through”, where what progress is made comes from small and linear incremental decisions.

But can coastal management take this incremental approach successfully? Will incremental evolution, in terms of small steps solving the immediate problems, take us where we need to go? The ecologist W.E. Odum (1982, expanding on A.E. Kahn 1966) certainly did not think so, referring to the “tyranny of small decisions” as often resulting in undesirable results. In my view it is doubtful if incremental development of management systems will be completely optimal, since tackling all the problems at once requires a synoptic, systems-level view. And we have to tackle the problems all at once because band-aid solutions in one area of concern are likely to conflict with those in other areas.

Important features of coast management in this context

Coastal management, like most forms of resource management, has evolved from a variety of beginnings and with a variety of threads. It is by no means a linear process, but there are some consistent features of the overall approach that must be reiterated here.

Importantly, we mostly do not manage resources directly, but manage the ways in which we use resources. There are some exceptions, mostly relating to physical alterations of coastal environments. Examples include harbour works like development of navigational channels, establishment of river-mouth training walls and beach renourishment for the maintenance of recreational beaches. Where, however, we require “ecosystem services”, such as fisheries, we must rely on natural ecological processes to provide us with what we need.

Resource management thus requires a considerable control and guidance of human behaviour, so in an agency sense it is usually done under the umbrella of legislation (mostly at State level in Australia) that gives agencies the powers to determine many of the human activities of resource exploitation.

Much resource management is done by what are known as “sectoral agencies”, such as agriculture, forestry, fisheries and so forth. These agencies were initially established to promote the “orderly exploitation” of particular kinds of resource (land, fish stocks etc) and to assist exploiters in methods of exploitation. Their work has greatly assisted

the prosperity of primary industries but these agencies now have a much wider remit that reflects wider changes in our relationships with exploited environments and greater insights into those relationships of our society.

Some agencies thus cover a wide range of activities – environment protection authorities and, local government agencies especially. Environment protection agencies count as resource managers in this sense because they control uses of the resources represented by the ability of the environment to accept and process waste materials discharged to water, land and air. Local government has grown by evolution over the last century or so from the original role that was mostly concerned with controlling urban development. Local government agencies now have a much wider range of activities and, in the coastal context, may well do over half of the on-ground management activities. Yet they still largely work within the planning legislation under which they do much of their resource-management work.

One good example of the enhanced role of local government concerns the NSW State Environmental Planning Policies, which started developing about twenty years ago. SEPP 14, relating to coastal wetlands, shows how local government can well handle some sorts of wetland problem. SEPP 14 prohibits four major activities in wetlands, namely (i) clearing a wetland of vegetation, (ii) draining a wetland, (iii) infilling of a wetland and (iv) building levees within or around a wetland. Environmentally, those are the four activities that are most likely to change the hydrology of a wetland and thus damage or destroy it. At the same time, they all require physical activities on a particular site and thus fit very well within the general planning legislation and with the local-government role and experience.

The idea of integrated coastal management

It has been recognized for the last 40 years or so that coastal management has been fragmented at a global level. Different countries do things in different ways and at different levels, and some sort of international move to enhance global performance was seen as desirable. After considerable discussion in the 1980s the idea was formally adopted by Agenda 21, the outcome-document of the Rio conference in 1992. Much has since been written of Integrated Coastal Zone Management (ICZM) (e.g. Harvey 2004, 2009, Kenchington and Crawford 1993), mostly along the lines of discussing the international programmes of integrating coastal management in various regions, especially Asia and the Pacific basin. Some authors have discussed the successful development of integrated management at a regional scale within a country, e.g. in Australia (Harvey 2009). Given the high policy levels of these programmes, much of the literature pre-supposes that having some sort of umbrella agency or agreement would be a good idea.

Establishing super-agencies to look after the extended concerns of coastal management can have problems of defining boundaries and relationships with other agencies, especially if it is bigger than they are. This is reflected in a wider problem. Every agency has its own history and sees things in its own particular way, so it can't necessarily work well with other agencies until they have a shared view and experience. This is natural and inescapable, which may be one reason why new governments tend to recast the structure of their public-service departments, to get them to have a common set of objectives.

Given the nature of the present intra-national and international discussions about decarbonizing our present post-industrial society, looking for consensus about a given problem may lead to disappointment and may well be unrealistic in the early stages of dealing with an issue. It takes time for a common view to emerge. The 1987 Montreal Protocol regarding CFC emissions is an exception, however: the process worked well

(and quickly), with the current (incomplete) controls on CFC emissions seeming to have limited the seasonal loss of stratospheric ozone in the Antarctic.

For many global environmental issues and *in the short term*, however, one can be forgiven for thinking that the term “international agreement” is an oxymoron. This problem reflects the fact that, as noted, relationships between any groups, especially at an international level, require time to evolve and cannot mature until negotiations have established a common ground and common objectives. The early phases of a developing relationship have several elements, including a tendency towards “short-termism”, differing views of a situation among the different nations and stakeholders within nations, defence of “turf” and vested interests at all levels and, often, a genuine lack of understanding of all the dimensions of a problem.

One particular challenge at national and international levels is that there is a natural tendency to meet the needs and views of the most active stakeholders, or tackle the most-evident aspects of a problem (not quite the same as short-termism). This approach is essentially unbalanced because it merely oils the squeakiest wheel, but it is important to ensure that as many issues and factors as possible are handled sustainably and, in global and national terms, coherently. This returns us to the report of the National Sea Change Taskforce, which is clear about the fact that tackling the likely future problems of coastal change will have knock-on effects that will reach to every aspect of Australian society.

Integration as a way of improving performance in resource management is thus interpreted in many different ways and at different levels. But there has been relatively little attention to ensuring that management decisions are based on a contextual view of a problem, recognizing systems-level issues (how the parts of a problem fit together to show what sorts of decision may be optimal).

Nonetheless, ICZM has had some remarkable successes in facilitating international co-operation and building management capacity in individual countries and across regions. Perhaps the best example close to home is the South Pacific Regional Environmental Plan, (SPREP), which was initiated in the early 1980s and now includes twenty-one Pacific island nations and has established a collaborative programme of coastal management – Island Ecosystems, with four subprogrammes on terrestrial, coastal and marine ecosystems, species of special interest and people and institutions.

Overall, ICZM as a formal process has most definitely been worthwhile internationally and sometimes intra-nationally (e.g. Harvey 2009). But intra-nationally and within States one does not hear so much about it in concrete terms, probably because there is already a functioning structure of agencies and collaborative links. The Australian version of this is quite strong in inter-agency collaboration and the elaboration of national and State-level policies for guiding coastal management decisions. Nevertheless, even tighter coastal management looks like being essential and one way of working towards it is through integrating the processes of management into a more coherent framework. Much progress has been made, but there is more to be done.

Why should we seek to integrate coastal management activities more than at present?

Most people involved in any form of resource management will recognize that there are many players: political, legal, economic and fiscal, community, business and industry, scientific and technical and others. Organizational and jurisdictional factors may be especially important at both policy and operational levels.

All of these areas tend to have different world views, different rules of evidence and different ways of communicating among individuals. That can make it difficult to

understand the range and true complexity of an issue that crosses several discipline areas and jurisdictions. It can be easy to over-exploit a resource, for example when fisheries quotas are defined more in terms of the industry needs (e.g. maintaining investment or jobs) than according to what the fished stock can handle sustainably.

But the major aim of resource management in general is to allow maximal satisfaction of social needs etc while maintaining the resources in a sustainable state. That means ensuring that decisions about controlling resource-using activities must be valid in as many “discipline” areas as possible, ideally all of them. So an ideal decision would be good politics (parliamentary and community), good economics, good science, backed up by legislation and acceptable to all the stakeholders. And, of course, environmentally sustainable.

That sounds very much like a counsel of perfection and is probably unrealistic. But many decisions have failed to be consistent across most (or even a few) of these “discipline” areas. This can lead to real problems, which in the following examples are mainly political or administrative, but which can have important resource implications.

Failure of agency/political communication. In December 1989 an oil refinery in the south of New South Wales briefly exceeded its discharge licence conditions regarding phenols. The licensed concentration was 15 ppm, but the discharge went as high as 23 ppm, possibly for a matter of hours. The matter attracted media attention, and an activist group plugged the outfall pipe under the eye of underwater television cameras.

The then State Government announced that it would prosecute the refinery under the Environmental Offences and Penalties Act, 1989, (EO and P Act), which allowed for a maximum fine of one million dollars. The executive clauses of that Act say that any prosecutable illegal discharge must be “wilful or negligent” (no contest there) and must have “caused harm or be likely to cause harm to the environment”. There was a significant problem with that latter criterion.

Phenols are organic compounds that occur naturally in coastal waters, often in significant fractions of 1 ppm. They are exuded mostly by large brown seaweeds, which are numerous in the offshore areas south of Sydney. At the same time, the outfall pipe in question was about five metres below the surface of a very wave-exposed coast, so that dispersion of the discharged material was very rapid (down to background levels within metres of the pipe). Indeed, the agency concerned had told the refinery that its discharge arrangements were very efficient. Finally, the consistently high wave energy resulted in a subtidal community that was poor in species and in the numbers of individuals, so the effects of the physical environment far outweighed any putative effects of the excessive phenol discharge. At a philosophical, theoretical or empirical level it was impossible to show that the brief exceeding of the licence limits for phenols would have “caused harm to the environment”.

As a result it was not possible for the State Government to prosecute the refinery under the EO and P Act and it had to fall back on the Clean Waters Act, with a maximum fine of a mere \$30,000 and some minor embarrassment to the Government. In fairness to the agency it must be said that it was probably not consulted before the political decision was announced. In that case any political embarrassment was a self-inflicted injury and could have been avoided by better communications between the agency and the Government.

Conflict of resource-protection legislation. From the mid-1980s to the mid-1990s Victoria used a legislative instrument called the Shellfish Protection Regulations under the then Fisheries Act. Under these regulations various parts of the Victorian coast were declared as Recognised Shellfish Habitat, where collection of any species was prohibited, excepting a few species used as recreational fishing bait, to be collected

only using specified methods. Since the Regulations were intended to protect intertidal, as well as subtidal, life Recognised Shellfish Habitat ran to the high-water mark.

In some areas Recognised Shellfish Habitat overlapped with declared Coastal Parks, which ran down to the low-water mark. Under the Shellfish Protection Regulations (part of the Fisheries Act), bait collection was legal in Recognized Shellfish Habitat, but not in Coastal Parks (administered under the National Parks Act). In areas where both sorts of legislation applied, as in the Cape Schanck Coastal Park, there was a clear conflict that was not resolved before new fisheries legislation was introduced in the mid-1990s.

Community/agency communications. Over the last twenty years it has become painfully obvious to many coastal-management agencies that the community has to be involved in management decisions, even if only at the consultation level. One outstanding example in NSW was the problem of establishing an effective Sewage Management Strategy for Coffs Harbour. In the mid-1980s it became essential to upgrade sewage-treatment and discharge systems in the area, which was being rapidly developed and had already outgrown its existing facilities. The local community, however, objected loudly to the proposals put forward by Council and the process of devising an acceptable strategy took the best part of twenty years. (It is fair to say that Coffs Harbour now has an excellent management strategy that could serve as a model for many other areas.)

In the Coffs Harbour case cited above, the basis of the problem seems to have been that council staff had not realized that community attitudes and aspirations had changed to the extent that larger-scale plans and decisions would now be examined in depth by the community. In this case the community apparently has become much more “environmentally aware” than it had been and Coffs Harbour City Council was certainly not alone in not recognizing this in time.

Sometimes, however, sentiment can turn the other way. In 1972 the community of the Mornington Peninsula and elsewhere in Victoria became concerned about the rapidity of industrial development of the eastern coast of Western Port, particularly in the Hastings-Crib Point area. The level of concern was such that the then State Government imposed a two-year moratorium on development there and commissioned the Westernport Bay study as a way of identifying how Western Port worked ecologically and, by extension, what the effects of further development might be.

In the event, economic conditions changed and industrial development in that area seemed less worthwhile and there were no further large proposals. However, over the next few years, up to 1984 and beyond, Western Port underwent some very significant ecological changes. It lost the seagrass cover from about 80% of the 270 km² of intertidal mudflat in the bay, with consequent great increases in turbidity of the water (from erosion of the mudflats) and severe knock-on effects on pelagic and benthic animals and plants in Western Port. In contrast to the loudly-voiced concerns of the early 1970s, news of the ecological decline of Western Port raised barely a ripple outside the groups of people who used the area for recreational or study purposes or were concerned with conservation matters in general. Clearly the community should and must be drawn into the coastal-management process, but equally clearly community attitudes may be moulded or overtaken by other issues.

Hopley (1990) discerned three levels of event involved in human responses to climate change. The primary event was seen to be an increase in various greenhouse gases, leading to global warming. Secondary events include the responses of natural systems, such as weather and rainfall patterns, storminess and changes to ecological systems (e.g. melting of permafrost). Tertiary events are concerned with human responses to changes in the natural environment represented by the primary and secondary events.

But given the present state and effectiveness of resource management in general and coastal management in particular, it may be worth thinking about a quaternary-level change: modification of present resource-management systems, especially trying to make the processes a lot more coherent and focussed.

“Drawing the Information Map”

How can we work towards a tighter and more coherent approach to coastal management? The idea of establishing some sort of umbrella agency, at State or Commonwealth levels, once seemed attractive, especially to those concerned with politics. The argument is that, over time, all the groups within that agency (who would be responsible for all coastal management) would come to adopt a common view of the nature of the job and a common intellectual approach to analyzing and solving problems.

There are two issues with that idea. The first is that changes of government, or the maturation of a government that has been in power for a few years, are usually accompanied by significant changes to the structure of the major public-service agencies and changes in the structure of the agencies' management. There is often insufficient time for the culture of an agency to grow strong enough to be resilient in the face of changes in management personnel, and new brooms may sweep away the good as well as the bad.

The second issue is perhaps more important? Where do we draw the line? Coastal management has so many angles and aspects that it is difficult to see what sort of agency could handle them all. There are other possible routes to coherence, though. The problems of fragmentation are in essence *not* that there are many agencies, but that views of what the issues are, and how to identify new issues, and how to tackle them when they have been identified, differ markedly between “disciplines”. Yet coastal management looks very much like a “supra-discipline”, in the sense that it must ideally combine the insights of many views into some sort of decision-making process aimed at solving definable problems.

So one sort of integration that might help is to try to see any management issue or problem as a whole, but recognizing the various elements that need to be addressed and crossing agency boundaries where appropriate. That pre-supposes amicable and productive relationships between agencies and the marked increase in collaborative groupings of agencies over the last 10-15 years indicates that this approach can work.

One good way to improve coherence is to make problem analysis a specific and overt process, so that the initial stage of tackling any issue is to work out on paper what needs to be done and why. And, importantly, problem analysis must start with a clear identification of the objectives of management of an issue, including the views of all relevant disciplines and agencies. It is this problem-analysis process that I refer to as “drawing the information map”.

Most projects do go through a problem-analysis phase, of course, but very often it is not made explicit and is therefore difficult to test – and is likely to reflect the unseen, agency-influenced, biases of the people doing the analysis. But a clear **and comprehensive** analysis of the problem/issue is necessary for any form of adaptive management, which is basically a matter of checking whether the management decisions were effective and how they might be improved.

A useful problem analysis approach could well start with a linear set of questions, but must include some fundamental aspects, as discussed by Holmes et al (1992).

- (i) A clear recognition of the nature of the issue and the objectives of the management response. This step will necessarily include an understanding of the

issue in all its dimensions: social, legal, political, economic, planning and, of course, the science and technology issues (i.e. whether the management response can actually solve problems with resource degradation).

- (ii) Identification of the social requirements that lead to the resources being exploited in the first place.
- (iii) Identification of the target resources (those needed to satisfy the social requirements) and the secondary resources (those experiencing collateral damage as a result of the methods and intensity of exploitation of the target resources).
- (iv) A reasonable assessment of the processes that maintain the target and secondary resources and, on that basis, a definition of the types and intensity of resource exploitation that would allow sustainable of exploitation. That is a very difficult matter and requires a very considerable input from all sorts of earth sciences and people with operational experience of enforcing current legislation and regulations.

Further steps will involve looking at the particular methods of resource use (much as current fisheries research looks at the efficiency and effects of particular fishing technologies), assessing the options for modifying those resource-use methods to reduce the effects on target and secondary resources and then devising systems of controlling those methods as allowed by the available legislation.

Building such process models is easy enough in itself, but the potential trap is that theory is always simpler than reality, which suggests that any such model must be tested and retested before it is relied on. In any event, it can only be a guide for the people involved in a problem, not a rigid protocol for action.

There may well be an answer on the doorstep: use the experiences of local government. All local government agencies currently have far too much to tackle given the available expertise and funding (and ongoing increases in what they are asked to do). Many LGAs are already moving towards a deeper collaboration with other such agencies and there are some quite-formal liaisons, such as the Sydney Councils group in NSW and the Association of Bayside Councils in Port Phillip Bay, Victoria.

Such associations can help in making available a much wider range of expertise – and experience – than is available to any single council. What is more, they can facilitate a greater “task-force” approach to major issues and thus enhance existing (and usually fruitful) collaboration with sectoral agencies. Given the great involvement of local government in coastal management, collaboration on this scale would naturally lead to problem-solving approaches that would be particularly focussed on the on-ground issues of coastal management, which may be no bad thing. Adaptive management approaches (in the sense of checking on the efficacy of management decisions) would be easier. Furthermore, the larger the group unified in pursuing a particular aim, the louder its political voice and (with luck) the better chance it has of acquiring more of the necessary facilities and funding. Finally, the collaborative approach is flexible and, crucially, doesn’t add much to costs.

Such collaborations can greatly help with plugging a major gap, that of testing whether a particular management approach or decision has actually worked and how they can be improved. That is, of course, adaptive management and much has been written about it. At the moment, agencies just do not have the resources to do much on those lines, but without it the learning process is far slower than it need be.

None of these suggestions is particularly novel and most of them are already in place to some extent. They are all part of an inevitable evolution towards a greater attention to the processes of coastal management and collaboration between management agencies of all types. Given the increasing complexity of the resource-use problems

that we face on the coast, it seems useful to try to hasten this evolution and, especially, to make the processes of problem analysis as formal, considered and comprehensive as possible. Coastal management really is a supra-discipline and it would pay us to recognize that fact and make use of it.

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