Coastal News

Newsletter of the New Zealand Coastal Society
A Technical Group of IPENZ

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Contents

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Coast Care

A Coastal Management Programme for Christchurch

The Christchurch City Council Beaches and Coastal Parks Management Plan, released in draft form in 1994, has undergone the submission and final approval process. There were 175 submissions received on the plan from which a report was written outlining proposed changes. Oral and written submissions were then given to a Council Hearings Panel with delegated authority to finalise the policies.

The policy document is now available at the City Council Parks Unit in the Civic Offices for $7.00. It contains policies that will guide coastal management in Christchurch into the future.

Policies govern a 27 km coastal strip from the Waimakariri River mouth south to Gollans Bay, on the south side of Godley Head. It follows the lead of the Resource Management Act, with policies that promote a sustainable management of the coastal dunes and foreshore (for example, the use of planting with sandbinder species for stabilisation, which will reduce the need for intervention with machines in the future).

The management plan has been supported by Council through the provision of a five year, two million dollar budget. It is unique in New Zealand to have this strong support for coastal management, and Christchurch is leading in this sense. However, the programme that has come from the policies and the budget, called Coast Care, is strongly based on Australian models of coastal management.

Briefly, the key elements of the Coast Care programme are:

- a big planting programme;
- the development of a good system of access tracks with fences to protect planting; and
- the use of sand fences to accumulate sand in eroded areas.

Major erosion features such as blowouts are "fixed" by using large earth-moving machines to shift sand back to the foredune front-face. This sand is then planted with sandbinders to stabilise. In conjunction with this, recreational needs will be catered for through provision of picnic areas, tracks for running, mountain biking and horse riding, and safer off-road car parking.

Another big part of the programme is to involve the community, both in practical work and with development planning. A lot of time will be put into increasing community awareness of the programme and empowering them with the ability to influence development in their local area. This must occur within the policy framework and certain management activities are mainstream.

Although it is very time consuming, community involvement is considered important because this gives the local users a feeling of ownership and responsibility for their beach. It will also make management an easier task, since many coastal management problems are a result of human impacts. These impacts can be minimised through increased awareness and education. Schools and youth associations will also be encouraged to become involved. We have already had success with planting days and rubbish collection days.

The staff at Coast Care are working hard to do the best for the coast of Christchurch. We have had quite a lot of contact with coastal management staff at Environment Waikato, where a similar community-based scheme has been functioning very successfully and which was a model for staff in Christchurch. However, we are keen to hear from any others involved in coastal management of any sort. We believe that sharing of information is the key to the best management practices.

If you wish to contact Coast Care, the details are:

Melanie White, Coast Care Co-ordinator
Rodney Chambers, Coast Care Development Officer
c/o Parks Unit
Christchurch City Council
P O Box 237
Christchurch
phone/fax (03) 382 1678

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Chairman's Message
April 1996

The new management committee had a wide-ranging meeting in September and key tasks were allocated.

- Newsletter — continues with Victoria Caseley and John Lumsden in Christchurch. The intention is to crank up the frequency to three a year, so you can expect another before the Seminar and AGM in September and a third before year's end. But the perennial plea... it's only as good as your contributions. So please send any news items, whether from a professional journal or local rag to Victoria. Our editorial policy is, well, flexible. We would welcome informed debate and dissent: surely there's something out there that bugs you!
- Seminar '96 — Auckland have grasped the baton and with Waikato are setting up a two-day seminar, including site visits, on 26 and 27 September based at the Marine Rescue Centre and, hopefully, a Marae. See page 6 for details and preliminarily registration of interest.
- Seminar '97 — Not to be outdone, Christchurch, coordinated by past-Chairman Lumsden are gearing up for the 1997 Australasian Conference on Coastal and Ocean Engineering, which just happens to coincide with the peak of the ski season. See page 7 for details of this expanded event, which will incorporate the Australasian Port and Harbour conference and our own 1997 Seminar and AGM.

On the management side, Fred Smits, your Secretary, and myself have drafted a "Busyness Plan", which received committee ratification on 17 April, to focus our efforts and steadily expand them in such matters as membership, growth and training incentives, particularly for younger or student members e.g. to attend first overseas conferences, typically Australia — but why not NZ for that matter?

We also want to increase the Society's profile in commenting, preferably proactively, on topical issues. For instance, recently I wrote to the Royal Society expressing concern at the apparent lack of coastal focus in their latest annual report on climate change issues. Their reply indicates that the deficiency has already been recognised and more exposure is anticipated, possibly with the Coastal Society's input.

A letter has also been sent to Ministry for the Environment observing that their proposed "National Environmental Indicators — Building a Framework for a Core Set" makes scant reference to the coast and marine receiving waters which are not fresh and do contain other things besides fish. A follow-up response is awaited!

John Duder

Changes in Sea Level
IPCC Second Scientific Assessment: Chapter 7 Summary

Lead authors: R A Warrick, C Le Provost, M F Meier, J Oerlemans and P L Woodworth

The purpose of this chapter is to assess the current state of knowledge regarding climate and sea level change, with special emphasis on scientific developments since IPCC (1990). The main focus is on changes that occur on the time-scale of a century. We thus look for evidence of sea level change during the last 100 years, examine the factors that could be responsible for such changes, and consider the possible changes in sea level during the next 100 years as a result of global warming.

With respect to the past, recent analyses suggest that:

- Global mean sea level has risen 10-25 cm over the last 100 years. This range is slightly higher than that reported in IPCC (1990) (i.e. 10-20 cm). The higher estimate results largely from the use of geodynamic models for filtering out long-term vertical land movements, as well as from the greater reliance on the longest tide gauge records for estimating trends.
- There has been no detectable acceleration of sea level rise during this century. However, the average rise during the present century is significantly higher than the rate averaged over the last several thousand years, although century-time-scale variations of several decimetres almost certainly occurred within that longer period. The exact timing of the

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The above summary has been extracted from the GLOSS Bulletin, courtesy of the World Wide Web. http://www.nbi.ac.uk/psmsl/gb.html

Auckland Branch Meeting

Two presentations were given to a Coastal Society meeting held in Auckland on 25 March 1996. Libby Boak, a Geography and Environmental Science masters student at Auckland University, provided an update on her thesis research. Dr George Walker, a graduate of Auckland University Engineering School who now specialises in catastrophe modelling, discussed climate change scenarios, associated coastal impacts and the implications that these impacts might have for insurance.

Libby Boak

Libby Boak is working part-time as an officer with the Auckland Regional Council while completing her thesis. She has investigated the effect of boat wake on Torpedo Bay in Devonport, Auckland.

Torpedo Bay is a predominantly sandy, sheltered, inner harbour bay on Auckland's North Shore. It receives wake from harbour traffic, including commercial shipping, ferries and recreational craft.

Libby has recorded wind wave and wake characteristics at the beach. She used these characteristics to assess the potential for erosion posed by boat wake and wind waves in terms of mathematical models.

The wake and wind wave characteristics have also been correlated with the type of action (eroding/beach-building) they exert, based on modal beach types.

Libby's preliminary findings indicate that the effect of boat wake is relatively minor compared to wind waves because of the short duration of the wake compared with wind waves. In terms of beach management, Libby noted that long-term monitoring to assess the effect of increasing boat numbers would be desirable.

George Walker

Dr George Walker is the Research Director for Alexander Howden Reinsurance Brokers in Australia. He outlined the current thinking on climate change and the associated coastal impacts, including sea level rise, climate variability and distribution of tropical cyclones.

Dr Walker noted that initial sea level rise predictions have been reduced as modelling becomes more refined: 15 cm to 95 cm is a generally agreed range. Dr Walker then discussed the effects of climate change on the insurance industry and engineering design.

He concluded that the annual insurance renewal and review cycle enables the industry to monitor risk and adjust insurance premiums and availability as they feel appropriate.

In the long term, property owners should not take the continuing availability of insurance for granted and may need to assess insurance and risk as initial design parameters for a project. It is, therefore, possible that engineering design criteria could be based upon insurability considerations in the future.

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Regulations to Control Dumping at Sea

Last year, the Ministry for the Environment and the Maritime Safety Authority sought what was required of New Zealand to enable MARPOL and the London Dumping Convention to be met and how these regulations could be made under the Resource Management Act. Currently, work is being undertaken on writing those regulations required.

The MARPOL Convention specifies the circumstances under which many substances can be discharged into the sea from ships while the London Dumping Convention controls dumping of waste at seas from ships. Regulations are currently being written and a system of management is being put in place that will enable the whole scheme to work. The Maritime Safety Authority issues the draft rules, which then undergo a review process.

The Ministry for the Environment is aiming to include all five MARPOL Annexes in the regulations. These will cover the prevention of pollution by oil, by chemicals carried in bulk, by chemicals carried in package form, sewage and garbage and will affect all commercial shipping from all nations.

These regulations will provide a management tool that will enable better standards for the protection of the marine environment to be met. The controls that the regulations will put in place will allow stricter standards of protection than currently exist and will also give a consistent base for planning and management of marine pollution.

For further information with regard to the marine pollution regulations, contact David Eyres of the Maritime Safety Authority, P O Box 27-006, Wellington.

Victoria Caseley

Bringing the Concept of Risk to Managing the Coastal 'Environment'

One of the spin-offs of the fast ferry debacle under our supposedly effects-based Resource Management Act was the discovery by some planners that not only did we not know what was happening along our shore lines, we also did not have routine mechanisms for assessing and comparing the significance of events or process changes. The same comment could equally apply to understanding the consequences of sand mining in harbours, the modelling of long-term effects of cumulative sequestration of coast by fish farming, and the biological pathways taken by marine paints, among other things.

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When looking for ways of responding more effectively to complex planning problems, it is worth looking for both the common and distinguishing features. Common features are particularly useful for constructing management systems. An important feature present in each of these case studies appeared to be the degree of defined/calculated risk to safe and productive coastal functioning. Risk arises when our activities intersect with ongoing processes.

The concept of risk is generally understood in relation to civil defence, but less so when applied to the environment. Risk in this context is like any other risk, i.e. it is made up of particular hazard or effect (note that hazard may indirectly be made up of economic cost of responding to it), compounded by probability of occurrence.

Risk-based decision-making is an obvious option on which to base a two-tier system of data collection and analysis feeding into 'sustainable management' planning. The advantages are that it is doubly effects-based in that it receives information on effects on biophysical systems and is then used to make decisions based on the implications of that data for human values. The two tiers are, however, conceptually different and intended to do different things. They are linked in that the demands placed on a management planning system will dictate what questions are asked of that environment and what is measured. In turn, the realities of the biophysical and social (use patterns) environments should define some of the questions that, for example, a risk-based management system asks about the relationship between effects and environment.

In manipulating various components of risk, i.e. (V)ulnerability over (R)eversibility plus (V)alue (which is a measurement based on the geographical/biological scale of importance), I had the objective of providing an initial generic hazard or problem index for place, process, species or habitat. In practice, this sort of risk assessment may be made for several aspects of the same planning issue, e.g. separate assessments for species, habitat. Along with a hazard assessment equation, a probability assessment figure is also obtained on the basis of some combination of experience, monitoring, base data and equivalent situations (see Figures 1 and 2).

The risk event may be represented in matrix form to provide another representation of a likely risk envelope or indice (see Figure 3). In Figure 3, the higher probability levels are given higher ratings in a reverse order and multiplied against the environmental hazard index figure to display an envelope of the possible risk of a given problem occurring. Again, the hazard and probability figures should be founded on the best available information in order to provide more exact estimates of a problem. However, these sorts of assessment systems at the least provide a systematic way of evaluating a problem and deciding whether a precautionary approach is appropriate.

Figure 1: Components of a risk assessment model

(V)ulnerability	(R)eversibility	(V)alue scale	(P)robability (T)>
Nil=0	Irreversible=0	Undetectable=0	10^{-1}=1-"high"
Unlikely=1	Major trans=1	Insignificant=1	10^{-2}=2-"high"
Minor=2	Expensive=2	Local import=2	10^{-3}=3-"high"
Moderate=3	Remediable=3	City/Ec Dist=3	10^{-4}=4-"high"
Significant=4	Minor chg=4	Reg/Ec Reg=4	10^{-5}=5-"med"
Major=5	Reversible=5	Nat/Ec Prov=5	10^{-6}=6-"med"
	Positive ch=6	International=6	10^{-7}=7-"med", etc.

Figure 2: A risk assessment equation

$$\frac{Vu}{Re} + Va = EH^* \qquad \frac{3+3}{1} = 6$$

$$\frac{EH^*}{P^*} = R^* \qquad \frac{6}{4} = 1.5$$

Figure 3: An example of a risk assessment matrix

env haz> prob	11	10	9	8	7	6	5	4	3	2	1
1=13	143	130	117	104	91	78	65	52	39	26	13
2=12	132	120	108	96	84	72	60	48	36	24	12
3=11	121	110	99	88	77	66	55	44	33	22	11
4=10	110	100	90	80	70	60	50	40	30	20	10
5=9	99	90	81	72	63	54	45	36	27	18	9
6=8	88	80	72	64	56	48	40	32	24	16	8
7=7	77	70	63	56	49	42	35	28	21	14	7
8=6	66	60	54	48	42	36	30	14	18	12	6
9=5	55	50	45	40	35	30	25	20	15	10	5
10=4	44	40	36	32	28	24	20	16	12	8	4
11=3	33	30	27	24	21	18	15	12	9	6	3
12=2	22	20	18	16	14	12	10	8	6	4	2
13=1	11	10	9	8	7	6	5	4	3	2	1

How would you use a risk-based approach? Firstly, as a screening device to gain an understanding of planning issues arising out of action or use. Secondly, as a means of focusing on what data and monitoring are necessary to support a management planning system. Thirdly, as a way of refining an effects-based planning approach to link the operations of scoping, fact gathering, screening and initial assessment, decision-making, more fact gathering and monitoring into a coherent process. The RMA arguably does not yet rest on an effects base, as we are simply not co-ordinated enough throughout New Zealand to consistently weigh the significance of different evidence. Using risk may be a useful route to promoting sustainable management of our finite coastal resource.

Rob Harris

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onset of the present, higher rate of sea level rise remains uncertain.

It is likely that the rise in sea level has been due largely to the concurrent increase in global temperature over the last 100 years. The possible climate-related factors contributing to this rise include thermal expansion of the ocean and melting of glaciers, ice caps and ice sheets. Changes in surface water and ground water storage may also have affected sea level. The assessment of the scientific evidence suggests that:

- Global warming should, on average, cause the oceans to warm and expand, thus increasing sea level. The various models, from simple upwelling diffusion models to complex coupled atmosphere-ocean GCMs, all agree that oceanic thermal expansion is one consequence of global warming. The thermal expansion over the last 100 years is estimated to be 2-7 cm. Large-scale observations of changes in sub-surface ocean temperatures are beginning to support these estimates.
- Global warming should, on average, increase the melt rates of glaciers and ice caps, causing sea level to rise. Observational data indicates that, globally, there has been a general retreat of glaciers during this century. Based on both observations and models, recent analyses suggest that this enhanced melting may have increased sea level by about 2-5 cm over the last 100 years.
- With respect to the Greenland ice sheet, a warmer climate should increase the melt rates at the margins. The increase in melting should dominate over any increase in accumulation rates in the interior, causing sea level to rise. However, observational evidence is insufficient to say with any certainty whether the ice sheet is currently in balance or has increased or decreased in volume over the last 100 years.
- With respect to the Antarctic ice sheet, a warmer climate should increase the accumulation rates, causing sea level to fall. Here, too, the observational evidence is insufficient to say with any certainty whether the ice sheet is currently in balance or has increased or decreased in volume over the last 100 years.
- It is unclear how changes in surface water or ground water storage have affected sea level. Estimates vary widely of the net effects of activities (largely anthropogenic) such as dam construction and reservoir filling, which lower sea level, and ground water pumping, defor-

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New Zealand Coastal Society Seminar 1996

Coastal Environment: Progressing Sustainable Management

Auckland, 26 and 27 September 1996

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Theme

The objective of the seminar is to discuss practical implementation of the RMA in coastal management focusing on the purpose and principles of the Act as they relate to the coast (i.e. Part II).

Structure

The seminar is particularly addressing four key issues: sustainable coastal management (overview), natural character (Section 6a), protection of natural coastal values (Sections 6b and c) and tangata whenua concerns (Sections 6e, 7a and 8).

For each topic, at least two points of view will be presented in a short presentation (approximately 15 to 20 minutes), typically from both technical specialist and practical work experience views. After the speakers have presented their views on each topic, a panel will co-ordinate discussions from the floor, attempt to respond to queries and offer their perspectives on the topic.

Proposed topics and speakers

Day 1

Keynote address:	Judge D Shepherd
Sustainable coastal management:	Ali Memon/Craig Batchelor/Stephen Priestly
Natural character:	Simon Swafield/Simon Smales
Protection of natural coastal values:	Graeme Campbell

Day 2

Tangata whenua perspective:	Hirini Matanga/Bill Kapea
Introduction to site visits:	Graeme Murdock/Andrew Benson
Site visits:	Mission Bay/Kohi/Port/Viaduct Basin/Bayswater
Registration:	A second announcement will be made in May 1996, together with further details and registration forms.
Venue:	Marine Rescue Centre, 3 Solent Street, Mechanics Bay, Auckland

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estation and wetland loss, which tend to raise sea level. However, the potential future effect on sea level from such sources is probably relatively small, of the order of a few centimetres during the next century.

An exact accounting of the past sea level rise is difficult, particularly in the light of the large uncertainties associated with the mass balances of the ice sheets. However, the observed rise lies well within the combined ranges of uncertainty of the above factors.

Projections of future changes in sea level as a consequence of greenhouse-gas-induced warming were made for each of the six IPCC IS92 emission scenarios, with and without the effect of aerosol changes after 1990, for the period 1990 to 2100. In addition, high, middle and low estimates, using a range of parameter values based on key model uncertainties, were made for IS92a (the emission scenario most comparable to the IPCC (1990) Scenario A, the so-called "Business-as-usual" scenario). The results showed that:

- For Scenario IS92a, sea level is projected to be about 50 cm higher than today by the year 2100, with a range of uncertainty of 20-86 cm.
- For the range of emission scenarios IS92a-f using "best-estimate" model parameters, sea level is projected to be 38-55 cm higher than today by the year 2100.
- The extreme range of projections, taking into account both emission scenarios and model uncertainties, is 13-94 cm.
- Most of the projected rise in sea level is due to thermal expansion, followed by increased melting of glaciers and ice caps. On this time-scale, the contributions made by the major ice sheets are relatively minor, but are a major source of uncertainty.

It is evident that the choice of emission scenario makes relatively little difference to the projected rise in sea level, especially for the first half of the next century. This is because much of the rise has already been determined by past changes in radiative forcing, due to lags in the response of the oceans and ice masses. For this same reason, in model simulations sea level continues to rise over many centuries even after concentrations of greenhouse gases are stabilised. In contrast, the scientific uncertainties — as reflected partly in intra-model uncertainties in the choice of individual model parameter values, and partly in inter-model uncertainties in the choice of methods for climate, glacier and ice sheet modelling — make a very large difference in the estimate of future sea level rise.

A major source of uncertainty concerns the polar ice sheets. Not only is there a lack of understanding of the current mass balance, but there is also considerable uncertainty regarding the possible dynamic responses on time-scales of centuries. Concern has been expressed that the West Antarctic Ice Sheet might "surge", causing a rapid rise in sea level. The current lack of knowledge regarding the specific circumstances under which this might occur, either in total or in part, limits the ability to quantify the risk. Nonetheless, the likelihood of a major sea level rise by the year 2100 due to the collapse of the West Antarctic Ice Sheet is considered low.

The changes in future sea level will not occur uniformly around the globe. Recent coupled atmosphere-ocean model experiments suggest that the regional responses could differ significantly, due to regional differences in heating and circulation changes. In addition, geological and geophysical processes cause vertical land movements and thus affect relative sea levels on local and regional scales. Finally, extreme sea level events — tides, waves and storm surges — could be affected by regional climate changes but are, at present, difficult to predict.

Overall, the basic understanding of climate-sea level relationships has not changed fundamentally since IPCC (1990). The estimates of global sea level rise presented here are lower than those presented in IPCC (1990), due primarily to significantly lower estimates of global temperature change which drive the projections of sea level rise. Thus, if global warming were to occur more rapidly than expected, the rate of sea level rise would consequently be higher.

Christchurch to Host Pacific Coasts & Ports '97

Pacific Coasts & Ports '97 is the theme of the 13th Australasian Coastal and Ocean Engineering Conference, which is being organised by the Coastal Society. The conference will be held in Christchurch, in September next year and incorporates the 6th Australasian Port and Harbour Conference.

The purpose of the conference is to provide a forum for the discussion of coastal, ocean, port and harbour engineering, coastal science planning and management issues. The focus is not just engineering and it is expected that a wide range of disciplines will be represented at the conference. The next issue of *Coastal News* will contain further information on this conference.

Corporate Members

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- Beca Carter Hollings & Ferner Ltd, P O Box 6345, Auckland
- Canterbury Regional Council, P O Box 345, Christchurch
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- Environment Waikato, P O Box 4010, Hamilton East
- NIWA Marine, P O Box 14-901, Kilbirnie
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Management Committee