

THE JOINT STANDING COMMITTEE ON ENVIRONMENT, RESOURCES AND DEVELOPMENT MET IN COMMITTEE ROOM 2, PARLIAMENT HOUSE, HOBART, ON WEDNESDAY 4 JUNE 2008.

COASTAL EROSION

Dr ERIC WOehler, OF BIRDS TASMANIA WAS CALLED, MADE THE STATUTORY DECLARATION AND WAS EXAMINED.

Dr WOehler - In addition to the submission that I made approximately 18 months ago, when I was given the terms of reference for the inquiry I provided additional submissions.

The submission this morning does not differ greatly from the previous submission but it expands on particular issues and relates more closely to the terms of reference. The original submission was a very general one that we also submitted as a response to the climate change strategy by the State Government.

I would like to introduce Birds Tasmania. Some of you will have come across Birds Tasmania in the past. We are a community group, completely voluntary. All the effort is in our spare time and no-one gets paid to do anything for Birds Tasmania. We have about 350 members in Tasmania and we are a part of a national organisation of about 6 000 members throughout the country.

Our interest in birds is both the species and their habitats. We see our role as providing information. We are apolitical; we have no affiliations with other lobby groups or community groups. We simply provide information.

With regard to coastal erosion, we are fortunate in that we have some of the longest data sets for shore birds and coastal birds in Australia. Some of our data sets go back to the early 1960s for areas in the south-east where they have been counted twice a year, if not more frequently, for more than 40 years. So we have a very good signal about the state of the health of the coastal environment.

In some cases we have data going back to the 1940s. Some of you may remember Len Wall, who used to write an article in the *Mercury*. We have data of his going back to the 1940s for some beaches and areas around Tasmania.

The general pattern we are seeing in Tasmania is similar to what we are seeing on the mainland of Australia. We are seeing a loss of species, a loss of diversity and a loss of numbers of birds. There are fewer birds on our beaches now than there were 10, 20 and 30 years ago. With time the numbers of birds are decreasing. The reason for this is many fold, typically from human activities on the beaches. We are a society that loves our time on the beaches and it is unfortunate that the birds' breeding season in the summer months coincides with the peak of human activity.

The story is also true for migratory species. There are shore birds that breed in Siberia and fly all the way to Australia, including Tasmania, as part of what is called the East-

Asian Australasian flyway. Recently there were media reports by Richard Kingsford from Macquarie University where he was showing 75 per cent decreases in the last 25 years for shore birds associated with inland wetlands of Australia. We are seeing similar trends for similar species in Tasmania, more so for coastal wetlands rather than inland wetlands because we do not really have the same inland wetlands as on the mainland.

Coastal erosion will now be an additional threat to many of our coastal birds. Earlier this year there was a story in the *Mercury* about the South Arm Road being washed over at high tide and people driving through 10 to 20 centimetres of water. That is a taste of the future; we are going to see more and more of that. We are going to see an increased frequency and severity of extreme events - storms. We are going to see higher tides, higher tide surges, storm surges, and the coastal margins are going to be under increasing pressure in the future. As a consequence we expect to see fewer of our birds on the beaches and we expect to see some of our species potentially disappear as a breeding species from Tasmania.

These expectations are based on current trends in terms of the slowly decreasing numbers of these species in Tasmania over time. Now, having to deal with increasing sea level and coastal erosion, adds additional pressures and threats to birds. In some cases some of these birds may be able to move to alternative habitats or locations to breed, but virtually all of these species are dependent upon the coastal zone for feeding, nesting and what is called 'roosting' or resting. Without the coastal habitat and with the increasing human pressures that we are seeing on these coastal margins, we expect some of these species to be lost as breeding species from Tasmania. The prognosis is not good for many of these species. The submission that is being copied at the moment will provide further details.

One of the single biggest threats that we see to shore birds that can be managed in the short term is the presence of four-wheel drive vehicles on beaches. Four-wheel drives have a major catastrophic impact on beaches. The four-wheel drive effort is that they generally go into areas that haven't been visited before. In my time of surveying shore birds around Tasmania I have yet to walk a beach anywhere on the east coast of Tasmania or anywhere on the west coast of Tasmania between the Pieman and Stanley that didn't have four-wheel-drive tracks on the beach. The four-wheel drives have numerous impacts, not only the crushing and destruction of the eggs and nests but they also lead to increased coastal erosion by breaking down the vegetation on the dunes. The increasing mobility of the sand through wind and wave action results in increased erosion. If you could manage four-wheel drives on beaches you would have a temporary, at least, impact on the rates of coastal erosion in Tasmania.

More longer term, we need to think about a more proactive approach to coastal management as the sea level rises. I am sure the geomorphologists will tell you the various rules they have about the inward movement of beaches. We need to look at how to provide habitat for the formation or movement of beaches as sea level rises. If we don't, we are likely to see a coastal margin with no birds present on it at all. There are already some beaches on the east coast of Tasmania where we have lost all of our breeding birds.

CHAIR - Eric, I just noticed on page 2 of your first submission, you talked about the fact that the terms of reference were couched in economic terms, minimising costs to business and industry. Then you go on and talk about the importance of the environment and

perhaps the way that these have been couched are unacceptable. I might point out to you that there is the old catch-all 'other matters incidental thereto', which falls into that ambit. You are covered in that respect.

Dr WOEHLER - I have now addressed those particular terms of reference in the submission that is being copied and about to be circulated to the committee. When we made the original submission we had the coastal erosion inquiry hard on the heels of the draft climate change strategy response. As a community group we are constrained by our capacity. So, given the overlap in issues, we felt it was sufficient to enter the process and at least address some of those concerns.

CHAIR - You talk about the drought-proofing of Tasmania and that the construction of farm dams for irrigation results in the massive loss of water from evaporation. My observation, having built farm dams and having a couple at home, is that there is a proliferation of bird life on those dams.

Dr WOEHLER - Indeed. They will act as foci for birds' visits. Potentially, it is a predictable source of water, but it doesn't provide nesting habitat for those birds. The original description that I made regarding farm dams is that what is happening is we are capturing the water up into the catchment and not allowing it to flow through to the coast. The water has a role all the way through the catchment, not just in the farming areas, but there are coastal areas that require the water.

The beaches require the water, the coastal wetlands, the estuary areas all require the water, and what we are seeing is that the coastal wetlands that we do have in Tasmania are starting to dry up because we're not getting the water coming downstream from the farms. So even though the farms do provide a focal point for the birds in terms of either feeding or potentially roosting, it's not providing sufficient breeding habitat for these birds. You will see an increase, perhaps, in things like wood duck or swan or chestnut teal, or something like that, and you'll get the water fowl, but you won't actually see them breeding around those farm dams. You'll have more birds around your farm dam using it as a water source than you will have potentially being able to breed in the area.

CHAIR - It depends on the year, doesn't it? Some of those farm dams by regulation have to let out as much water as is coming in. If it's a year with better rainfall, then all those dams stay pretty well full, anyway, and it's just a matter of an empowerment but the water is still getting.

Dr WOEHLER - Yes. We've been involved in several discussions with the Dam Construction Assessment Committee where we've raised concerns with them, and we're aware of the need for environmental flow being typically 50 per cent for some of these larger dams. As you know, we've had, I think, 11 years now of below average rainfall for the State, and so what's happening is that there is a greater urgency for the land owners and the farmers to try to capture whatever rain is coming down, and we're just not seeing that water going through to the coastal areas where it's needed as well by the natural systems.

CHAIR - If you say there's been 11 years of below average rainfall, would that not occur, anyway, that there will be less water obviously getting down there, even aside from the dam issue, I suppose?

Dr WOEHLER - Sure. Many of the species of birds that we are dealing with in Tasmania, certainly the resident species, have evolved in Australia, and Australia is the driest continent on the planet. So the birds have evolved to deal with the natural fluctuations in the system, be it drought or flood conditions. It is as always the situation where you have human influences adversely affecting the environment on top of the natural variability.

Mr BOOTH - Just going back to that topic of loss of water down the coast, do you have a handle on the comparison between, say, farm dam interceptions and loss of catchment capacity through clearance of native forests and that sort of thing?

Dr WOEHLER - No. What we are seeing is an increased ease for farmers to build dams, and typically they are creeping up into the tens of megalitre capacity. So we are just conscious of the fact that there is an increased proliferation of these smaller dams scattered throughout the catchments capturing the water that would otherwise be running through to the coastal areas.

Last weekend, for example, I was in Bicheno doing some work up there and it was very apparent, particularly on the central east coast, just how dry it is. Some creek beds are now completely dry; there is no surface water. There may still be subterranean water, but there's no surface manifestation of some of these creeks and rivers up the east coast. To some extent, the capture of water upstream for irrigation or for agricultural purposes will be contributing to that loss of river flow, but we have no sense of the total volume or the capacity or the percentage of the normal flow.

Mr BOOTH - With the coastal retreat, basically, where you're losing a lot of the roosting and breeding areas and habitat for shore birds, in a natural system where you didn't have - I am not saying humans aren't part of the system, but where we've got a lot of infrastructure that then becomes the interface between the ocean and you lose that - is that the littoral zone?

Dr WOEHLER - The littoral zone, yes.

Mr BOOTH - If there wasn't built infrastructure there and we've got this process of coastal retreat, would ordinarily new habitat for the birds be created as the sand dunes shifted in and so forth? So in areas where there is no infrastructure, is it still a problem - setting aside the four-wheel drives and all those other things - if you didn't have the infrastructure and then had the four-wheel drives, would the bird communities adapt to sea level rise, climate change and coastal retreat?

Dr WOEHLER - All else being equal, yes. As that inland migration of the coast occurred with rising sea level, as a generalisation those intertidal areas and those areas that are flooded on a regular basis are quite rich for birds, so you would see a temporary increase in the numbers of birds and/or species diversity reflecting as the movement of the water goes inland. Eventually there would be some new equilibrium established over time with the new coastline and that would then settle down to a new set of rules for that particular coastal ecosystem. Yes, the infrastructure that we are seeing behind the coast is going to prevent that inward movement. There has been some interesting work done by the coastal CRC before it was disbanded by the former Federal Government where

they looked at this whole issue of coastal erosion and coastal movement and the inhibition by coastal infrastructure to this movement inward of the coastline. If we're not careful, we're going to end up a coastline that is made up of concrete walls and roadways rather than a beach and natural areas.

Mr BOOTH - In terms of a strategy to deal with this, you would be suggesting that you would need to map a zone behind which you would need to retreat with infrastructure to ensure that there was some form of natural ecosystems that regenerate themselves?

Dr WOEHLER - Yes. In the submission that you now have in front of you there is a proposal that in some areas you end up with a coastal buffer that is deliberately set aside to be flooded on the expectation that as sea level rises that area will be eventually flooded and form part of the new coastline.

Mr BOOTH - Is the impact of four-wheel drives significant along the high tide line or between the intertidal zone, if they were restricted to that area?

Dr WOEHLER - It depends on which issue you are looking to address. In terms of coastal erosion, the major impact there with the four-wheel drives is the formation of tracks through the dunes. The dunes act to stabilise the beach and the role of the vegetation on those dunes, typically marram grass in Tasmania, which was introduced to stabilise the dunes, or the native spinifex grasses, is to stabilise the face of the dune. Take away the vegetation as a result of four-wheel drives destroying the vegetation or cutting tracks through the dunes and you end up with increased mobility of that sand. There is nothing holding it down and so the wind and the wave action will move the sand more freely than were the vegetation there. When it comes to four-wheel drives' the impact on shore birds, it has a manifold disturbance associated with simply the presence of a four-wheel drive going along the beach at 60 kilometres an hour, which they do. They can go through at the low tide at the water's edge - unfortunately that's where the birds are feeding. They are feeding in the wet sand rather than on the dry sand. Their nests are up on top of the beach above the high-water mark where the eggs and the chicks are. Any four-wheel drive on a beach has potentially the impact to not only destroy the vegetation and increase the coastal erosion but also then destroy nests, eggs and chicks at the top of the beach and then also disturb or kill feeding birds in the wet sand. It is a major issue and on the mainland, certainly New South Wales and Victoria and the south-east of South Australia, they are very proactive and they are closing off beaches to four-wheel drives, particularly during the summer months, to protect nesting habitat for the birds. That is the targeted management action but clearly it also has implications for formation of tracks and destruction of coastal vegetation.

Mr BOOTH - What about the marram grass? Is that having a negative effect on the habitat of the birds?

Dr WOEHLER - Yes. The marram grass was introduced deliberately into Tasmania in an effort to stabilise the dunes and to stabilise along-shore transport of sand. The marram grass has a different root system than the native grasses. There are still some beaches on the east coast of Tasmania that don't have marram grass. The foredune has a very gentle slope - a 10° to 15° slope - a very long foredune face. The roots of the marram grass go deep, 2 to 3 metres, and you end up having a root system that binds the sand vertically

rather than in a horizontal plane and so winter storms or high tide surges or whatever end up cutting into the dune face and you end up having dune cliffs.

Several years ago I was on Bruny Island at Adventure Bay, just below the muttonbird colony on the Neck at Bruny Island, just after a winter storm. There were 5 to 7 metre cliffs of sand that the penguins were coming off onto the beach. They were unable to climb to their nests and to the colony because they had this wall of sand, and that is directly the result of the presence of marram grass.

The interesting aspect of marram grass at the moment is that there seems to be a resurgence of the native grasses on many of the east coast beaches of Tasmania and we are seeing more and more spinifex returning onto the beaches at the cost of marram grass. So it may be after 30 or 40 years that we have seen the marram grass in Tasmania that there is a new equilibrium or a new balance between the two species on Tasmania's beaches.

CHAIR - Have both of those native grasses been reintroduced, is that what you are saying?

Dr WOEHLER - No.

CHAIR - They have naturally occurred?

Dr WOEHLER - As far as I am aware, there has been no effort made by any community group or government agency to -

CHAIR - So it is dormant seed that has come to light again, or has there been any interferences with fire to promote that?

Dr WOEHLER - Again, I do not know the life history strategies of the native grasses. You would have to talk to a botanist. It is certainly possible that either fire frequency or changes in rainfall patterns or changes in inundation by tides might have some trigger for these seeds.

CHAIR - Basically what you are saying is that they have a lateral spreading root system which therefore is better?

Dr WOEHLER - Yes. Essentially what happens is that it changes to face of the dunes. So if you were to go, for example, to Marion Bay Beach, there are alternating patches of spinifex and native grasses and marram grass on the length of that beach and where the marram grass is present, you have a very steep foredune, perhaps with a 45 degree slope.

CHAIR - I understand your point and that is a question the committee might refer to somebody later in the day as to what is the best.

Mr GREEN - On the same lines, rice grass?

Dr WOEHLER - Rice grass has been a major issue particularly in the north-west and there has been a lot of effort by both community groups and government to get rid of the rice grass. Rice grass acts primarily in intertidal estuarine areas where it chokes the foreshore. I am not aware of the most recent one or two years efforts for the Swan River

area, but certainly there was a very concerted effort by the community group and government in the north-west to eradicate the rice grass. It was also present in the Tamar and I believe they have eliminated more than 90 per cent of the rice grass in the Tamar estuary.

Again, it is one of these things that you need to hammer for four or five years, year after year. If you do that it just will not come back. If you let it slip, even for one year, in that initial burst it then regenerates very quickly.

Mr GREEN - I was thinking that while you are quite correct, in some areas of the north-west and around Smithton they have large infestations, the major infestations that I have seen are in the Tamar, Rubicon and Frankland systems.

Dr WOehler - I was unaware that it was in the Rubicon?

CHAIR - Yes, the Rubicon estuary right at the bottom near Port Sorell is pretty well chocked up as well. But there are groups who work there every year and try to control it. There have been at it for a while.

Dr WOehler - It does take a concerted effort for a four to five-year period to hammer it. Once you are over that big hump, it is relatively easy to manage.

If I can just add, the other big issue that Bryan would be aware of is the sea spurge now coming through. It is an introduced species. It is self-introduced, originally from the Mediterranean region of Europe.

CHAIR - Is that the sea perch?

Dr WOehler - Sea spurge. It is a coastal weed and I am sure that people within the Department of Primary Industry would be able to give you much better information about the sea spurge. It is primarily on the west coast. It is a big problem on King Island and it is coming, I believe, from South Australia. At the moment that seems to be the source area for the Tasmanian plants.

Mr GREEN - Also Flinders Island and outlying islands.

Dr WOehler - Yes. It is coming down the east coast as well. I have seen it on the Friendly Beaches and at Marion Bay as well. It is a plant - a euphorbia - related to the succulent plants. It has a very caustic sap. If you get the sap on your fingers and then touch your face or your eyes, you are a hospital case for 24 hours. This has the capacity to choke beaches, not just in the intertidal area but also up into the paddocks behind. On King Island I have seen patches where it is 300-400 metres wide, just swaths of this species.

Mr GREEN - Quail love it.

Dr WOehler - For the seeds?

Mr GREEN - Yes.

Mr BOOTH - You made a comment about the rice grass in the Tamar. I am surprised you say that that is 90 per cent reduced. I thought they were deliberately not removing it because of the amount of silt it is holding.

Dr WOEHLER - I may be wrong but my understanding was that they had been working really hard to get rid of the rice grass, simply because, if you have a population present, it will then spread from there. I'm aware of the very strong efforts to eradicate it and the very successful eradication in the north-west. I didn't know that they hadn't done anything with the Tamar population.

Mr BOOTH - There are enormous areas there.

Dr WOEHLER - In the last couple of years there has been a question about some of the chemicals or sprays that they were using to kill the rice grass. That was a potential reason for not doing something for the last one or two years. There were questions about the biological impacts of the spray.

Mr BOOTH - It was my impression that they were deliberately leaving it there because of the huge amount of silt it caught.

The other point was in terms of damage to the roosting areas and so forth by cattle on beaches. I am aware of areas on the east coast where cattle have had fairly free access or have been deliberately put onto the beaches between the sea and the fences. My personal observation has been that the boobialla and the coastal vegetation have been trashed. Can you give us a bit of a run down on that?

Dr WOEHLER - It is not confined to cattle; it is sheep as well. Many of the east coast graziers' pastures aren't fenced on the ocean side so they basically see the beach and the beach weed as theirs. In some cases the title does run down to high-water mark. One or two properties on old titles go down to the low-water mark. As part of the Coastcare environment, and now through NRM, Birds Tasmania has been working with councils and landowners to encourage fencing of paddocks, pastures or whatever to stop cattle and sheep coming down onto the beach. This is not only from the bird perspective in terms of disturbance and/or destruction of nests and chicks by the cattle and the sheep, but also because of the impact on the native vegetation and the potential changes in the native vegetation by overgrazing on the dunes. The last thing we want to see is a herd of sheep or cattle walking around the beach, trampling everywhere and eating everything in sight up and down the east coast of Tasmania.

It is a problem also on the west coast. The Arthur-Pieman area allows for cattle and a lot of those areas are not fenced. Many times I have walked beaches on the west coast and sheep and cattle were on the beach. It is the same thing on King Island. I haven't been to Flinders Island so I don't know if there is a similar issue there.

Mr BOOTH - If there were a couple of measures that you could take to ameliorate the problems that we are seeing at the moment, how high in the order of priorities would be removing domestic animals or stock from those coastal areas?

Dr WOEHLER - I think they would be second to four-wheel drives. I think four-wheel drives are the single biggest threat to coastal birds. Given its contribution to coastal

erosion, four-wheel drives are a major issue. Cattle and sheep don't have so much of an issue with coastal erosion but they certainly have an impact on the breeding success of birds on the beaches.

Mr BOOTH - They trample the nests as well, wouldn't they?

Dr WOEHLER - Oh yes. As I mentioned in the introduction, we have some very long-term data sets for some of our breeding shore birds in Tasmania. With the hooded plover, which is a small shore bird that some of you would have seen in the beaches, statewide we've lost 25 per cent of our breeding population in the last 25 years, so the population is going down very rapidly. On some east coast beaches we've lost more than 50 per cent of our hooded plover population. We're seeing fewer and fewer birds and fewer and fewer species of shore birds on our beaches, particularly on the east coast of Tasmania. That is partly because of the prevalence of human recreational activities in Tasmania on the east coast, but we're also now starting to see similar losses on west coast beaches.

Mr HARRISS - I want to go to Eric's initial submission under dot point five. You've made the comment there that the precautionary principle needs to be at least taken account of. Then you go on in the second last paragraph of dot point five to talk about best practice that others around the world, if not Australia as well, have adopted and that we ought learn from that. What are the key issues there that you could point to?

Dr WOEHLER - The biggest hindrance we're seeing to coastal management in Tasmania is a reluctance to control people's actions and recreational activities on beaches - I am speaking of Tasmania. On the mainland of Australia the State governments are prepared to close beaches off to four-wheel drives. They are prepared to see beach closures to protect sensitive bird nesting areas and sensitive feeding areas where there is a clear conservation value in those birds on the beaches.

Over the past, Birds Tasmania has approached past ministers for the Environment, or whatever portfolio, and there's been a complete unwillingness to consider beach closures for the protection of nesting areas or important feeding areas, particularly during the summer months because that's when the birds are nesting. That nesting time coincides with peak recreational use of the beaches. What we are seeing is simply a reluctance to infringe upon what people see as their traditional right of access to the beach.

What we at Birds Tasmania have been trying to do in the last couple of years with NRM and the various councils up and down the east coast of Tasmania is engage in a program to look at education and awareness. One of the issues that we've also been dealing with is dogs on beaches. Over the next six to 12 months you'll see an increase in the number of signs going in to educate dog owners about the issues relating to unleashed dogs and dogs as predators on beaches. We are trying to raise people's awareness of the need to protect some of these areas. We have been successful with the NRMs and the local councils now pretty much all the way between Tasman and Eddystone Point, which is the boundary of the Mount William National Park, where we have been able to essentially close off beaches to dogs. The councils have taken the values on board. They see the potential role of tourism and increased recreational use that is compatible with birds and bird breeding areas. They don't see closing beaches to dogs as having an impact on people's recreational activities. There are alternative areas where people can

take their dogs. In some cases there are beaches where we no longer have birds. They are able to be used as dog exercise areas and have no further impact on the birds.

However, from a State government perspective there's been this very strong reluctance to really do anything about closing beaches to four-wheel drives or closing sections of beach. We have never advocated for complete closure of beaches. What we have tried to do is close off the important high-value beaches so that we still have a core area for the birds to use as breeding areas and still allow people to have their access to the beach. The State Government in the past has tended to polarise the issue, saying that we are looking to close off all beaches. We are not trying to do that. In the same way that we have provided councils and NRMs with the high-value beaches and low-value beaches the State government has not been as responsive or receptive to the idea as have the councils and the NRMs.

CHAIR - So no beaches at all have been closed off for four-wheel drive recreational vehicles or have there been some?

Dr WOEHLER - Any time a beach is closed off to four-wheel drives the barriers generally last less than 24 hours.

CHAIR - You say it is not policed at all?

Dr WOEHLER - There is no enforcement whatsoever. This is one of the issues we have.

CHAIR - Whose jurisdiction is that? Is that Parks?

Dr WOEHLER - Part of the problem is that there is either confusion or a multiplicity of ownership. In some cases it is crown land, in some cases it is crown land leased by council, in some cases it is managed by Parks and Wildlife, and sometimes it is public open space. It is an ad hocery of land owners/managers and everyone is quite happy to pass the buck to somebody else. In the submission I have presented today there are a couple of pictures. Sometimes we use rocks, FBRs - F being a word I cannot use -

CHAIR - I know what you are talking about.

Dr WOEHLER - We are talking about rocks weighing more than a ton and yet magically they are moved overnight. There is this belief by the four-wheel drivers that they just have a right to the beaches as part of their recreational activities. It is a real shame.

Mr BOOTH - Can you give us a run down on what happens, say, if it is migratory species loses their habitat within a season. I understand these birds have a map in their genetic makeup or whatever that enables them to fly around the planet and do their breeding and feeding and so forth. What happens, then, if they return to an area that has been removed in the preceding season? What do they do?

Mr WOEHLER - The short answer is we do not know because it is only just starting to happen now and people are only just starting to look at this. We have a very large population of migratory shore birds that come to Australia from Siberia, China, Alaska; we are talking about millions of birds. The estimate is that somewhere between two and a half and four million shore birds a year fly between northern Asia and Australia.

Obviously we have no control over what happens to their habitats outside of Australia but we are able to keep track of the populations and the species mix to give us a sense of the relative breeding strengths for these different species. The Korean Government at the moment, for example, is reclaiming a large coastal wetland, the Saemangeum wetlands, which is a migratory feeding area for about two million birds. Because we knew it was happening there has been monitoring of those wetlands before the construction started and now during the construction and the reclamation.

Many of these species are long-lived birds. For example, several pied oystercatchers, if you are familiar with the black and white birds with the long red legs, here on the Derwent Estuary are more than thirty years old. They are banded and we can keep track of these birds. These birds have a long life expectancy. People walk a beach and they say, 'Oh, there is that pair of pied oystercatchers. They were here last year and the year before', but what is happening is that those birds are not succeeding in their breeding at all. What we are going to see is the population getting older and older. When those old birds die you do not have the young birds ready to take over that breeding habitat.

Mr BOOTH - It would soon collapse at that speed.

Dr WOehler - That is right. You see a process called 'blink out' in the United States: birds were there one day and gone the next. For the migratory species, the question is much more cloudy because we simply do not know. These birds are flying 15 000 kilometres return over each trip for, in some cases, 20 years and we do not know what is going to happen.

Ms THORPE - I have my perceptions of what is happening to the pied oystercatchers down on the South Arm peninsula at the spit. I wondered what yours were.

Dr WOehler - The South Arm area and the south-east of Tasmania is one of two primary areas for pied oystercatchers in Australia. Based on the most recent information in terms of the counts that we are seeing for the south-east, we are seeing 700 to 800 pied oystercatchers in that area during the winter months and in the north-west the Robins Passage Boullanger Bay area - the intertidal areas west of Smithton - we are seeing counts in excess of 1 500. Those two locations alone account for a quarter of Australia's population of pied oystercatchers.

As the sea level rises and we are seeing an increased frequency of these extreme winter storms, the question is: what are these birds going to do? Last year we saw the birds being pushed up on to South Arm Road and being killed by cars simply because the water was over the road so the birds were roosting on the roadway and then being killed by cars. We will see more and more of that happening in the future because the birds simply have nowhere else to go.

CHAIR - Dr Woehler thank you very much for your evidence this morning. We appreciate your taking the time to come along and talk to the committee.

Dr WOehler - Thank you very much.

THE WITNESS WITHDREW.

Mr DOUGLAS STANLEY WRIGHT, WAS CALLED, MADE THE STATUTORY DECLARATION AND WAS EXAMINED.

CHAIR (Mr Hall) - Thank you Mr Wright. You have just indicated that you wish to give verbal evidence so I would ask you to make a presentation to the committee and then we will have some questions.

Mr WRIGHT - I live at Eggs and Bacon Bay. I have been a resident of Tasmania since 1967 -

CHAIR - Just clarify where Eggs and Bacon Bay is.

Mr WRIGHT - About 12 miles south of Cygnet.

CHAIR - Okay, right.

Mr WRIGHT - I own two shacks there. I have the luxury of having two problems with two shacks on the beach, not through my design but through the Government's.

I am 62 years of age; I am a carer pensioner I care for my wife who has a disability pension. We live right on the foreshore there so we see all the sand erosion and bird activity. We have a couple of breeding pairs of pied oystercatchers. They are protected at the moment, but if the dogs are not cleared off the beach they certainly won't be.

Your terms of reference talk about the cost to government and the moral implications that you have to put before the Parliament. I contend that one of the major issues you have is that you should not be selling land to us shack owners and getting maximum price for stuff that is being inundated with sea water and that is exactly what is going on at the moment.

First of all, I would like to show you some of the inundation that is happening. Unfortunately I do not have a massive number of copies but here are photographs showing both the shacks that I own. The first shows the shacks back in 2003 with native grasses between the shack and the beach. The second shows what we have now - and they are clearly marked for you - and you will see where I have had to put up barriers up to a metre high. Last year when Huonville flooded the water level still exceeded that.

CHAIR - Would you be prepared to table those photos or we could get some copies of them.

Mr WRIGHT - They are here for you to keep, but I want to talk about them now and then pass them around.

CHAIR - I understand that, but they will be useful to the committee for evidence.

Mr WRIGHT - You will see where I have put logs in place - massive logs that have floated down the Huon River. I have done that by hand because being pensioners we have no money available to do anything else. What I am doing is a holding situation at the moment because tidal surges carry the logs away. You will see in the photographs where I have had to pour concrete into 20 litre drums to stop the logs from moving that way.

I also have photographs here that will show you the Council road where that has been inundated and eroded. The Council has put large spoils to stop the erosion - this all happened this year. In fact, they have only done it as a stopgap measure; if they do not do anything else shortly the road will be gone. Our shacks will be inundated, no doubt, in the future if there is not some sort of better coastal preservation done. In front of our shack we really need large spoils put. We have no access to vehicles, automotive power or quarrying - or the finance to do anything.

I hope I have clearly marked these photographs. The brown shack is shack 1, as we call it. That has been there since approximately 1938. It is first recorded with the department in 1946 when they started keeping records. The green shack was the old Gospel Hall from Woodstock. It was probably built in the early 1900s and was shifted there in 1950. I own that one too. These are historical shacks. The brown shack is the oldest one on record with the department when they were doing Shack Sites Act conversion. It does not mean to say that it is the oldest shack. There are older shacks but that is when records first started to be kept in 1946.

Whatever you put before the Parliament, you need to be aware that whatever you enshrine in legislation or recommendations can be changed to suit the bureaucratic ideals and needs. Paul Harriss has a shack sites amendment bill before Parliament at the moment. I think it comes up for second reading on 10 June. It is absolutely imperative to us shack owners that you people make sure that legislation goes through.

Paul, I have never been able to talk to you because of your lack of time and this is a hell of a way to get to say hello. But I really hope you did something about the 6 per cent charge on leasehold values because, if you did not, we are doomed. Let me tell you why. At the moment, they have put an annual lease fee of \$3 360 on that brown shack. Prior to that I was paying \$500 under an annual licence. Now \$3 360 by 30 years is over \$100 000. That is what they are charging for freehold blocks for a lifetime. That brown shack is doomed and it is doomed because of that inflation that has happened. I only kept the brown shack and bought the one next door because the Government of the day and the bureaucrats gave me a determination for a 30-year lease with two illegal conditions on it - that it could be moved at any time by the council and by a public forum. That is absolutely illegal and now I am stuck.

So what did I do? That was to be our future home. So I moved next door and I bought the one was granted freehold. They were both on the beach, but I am now landed with the brown shack. When I say, 'landed with the brown shack', I point out that it belonged to the family and it has more history in it than anything else.

Mr BOOTH - Is it okay to ask questions while you are going through this?

Mr WRIGHT - I am more than happy to answer them.

CHAIR - Yes, okay.

Mr BOOTH - I just wanted some clarification there. Is there a mixture of shacks that were made freehold under the shacks project and some that were left as leasehold? Is that correct?

Mr WRIGHT - Not left at leasehold. They were all on annual licence. The brown shack has been discriminated against and given a flawed decision. I have been before Bryan Green and I have been before David Llewellyn. David Llewellyn sat there and said to me, 'You have been shafted.' Those were his exact words, 'You have been shafted, but what do you expect me to do about it?' He said that the act of Parliament had passed and he could do nothing for a single person.

Mr BOOTH - So the brown shack that has now been converted from the old licence system to leasehold over 30 years and the other one is freehold?

Mr WRIGHT - Yes.

Mr BOOTH - You said earlier that the Government should stop converting them to freehold or converting them to leasehold as well?

Mr WRIGHT - No, the Government should stand by its shack sites legislation and allow it to continue. But they should not be trying to get maximum profit out of shack sites that are going to be inundated with water. Already both of those sites have had inundation in the last year. You say, 'What have you done about it?'. The shack site act allowed me to appeal against the value. I paid a solicitor a massive amount of money - \$7 000 - to fight this. I paid him money to appeal that decision. We had to have it in by 12 September last year, which we did. We wrote again on 3 December. In relation to the green shack I appealed against that decision on 11 December. So far, in relation to the brown shack, I have not even had an acknowledgment of those letters - not one acknowledgment by the Valuer-General. What does the act say? It says that he will review his pricing as soon as practicable. I have spent massive amounts of money to a solicitor to prepare these documents and send them in and not even one acknowledgment.

On 26 March it got the better of me and I thought I'd better ring to see what was going on. They told me that they didn't have any correspondence from me. In other words, I had failed to submit them on time. I went back to my solicitor and we produced a letter to them where they wrote in relation to the second shack on 11 December that 'as soon as practicable' they would review their valuation. So I proved to them that they had to have had the correspondence. They searched their files and they found it sitting on a field officer's desk, but at the moment they're very busy. Here we are in June and I have had no acknowledgment of letters written in September and December and 'as soon as practicable' in December means that nothing is done here now. If something is not done before the end of October, which I doubt very much whether it will be, I am then up for another review. This is what they did to every other shack site in the district. Instead of having the old valuations as they were, people have had to suffer revaluations. It is absolutely crazy that a government department under an act of parliament cannot do something 'as soon as practicable'.

CHAIR - I understand your concerns, Mr Wright, with that particular issue. As you quite rightly pointed out, Mr Harriss has a bill coming up next week and I think members will have taken on board what you have said in regard to that issue. If we could just set aside that issue at the moment - and everybody understands completely where you're coming from and I think you've made your point well - would you be of the opinion then, setting aside crown shack sites, if we go back to what we're looking at here - coastal erosion and

the potential rise in sea levels - if a person owned freehold a block of land right on the coast almost at sea level, do you think a planning authority - that is, a council - should in this day and age give permission to build on that site on the evidence you have seen, where you are?

Mr WRIGHT - It is completely up to your coastal policy strategy, which I think says that at the moment you can't build below the 3-metre sea level. It is up to government to change it. If it has to be 5 metres in 50 years' time and 10 metres in 100 years' time, so be it. That is the government of the day's decision. At the moment we have the existing coastal policy and unless you change it they should allow them to build. Once again, there should be no recourse back onto government. There's no moral issue there I don't believe. That is a freehold landowner making a value judgment at the time. In this particular instance that I'm trying to point out, we were granted these leases and freeholds under the Crown Lands Act 1997 and I believe that should be honoured.

Believe me, right opposite me - don't think that we're only getting inundated - there are shacks lower, and they were granted freehold. But, you know, I have a major bitch about the way this was done. SKM were the ones that did the report. We've had three engineering reports done at Eggs and Bacon Bay on this sewerage system. Three engineering reports, and they came down with their legal conditions on it. SKM didn't even know what the Australian standards were in relation to sewerage, and let me tell you why, because they said none of the shack sites at Eggs and Bacon Bay could be seweraged; they didn't have enough room on their sites.

Mr BOOTH - Septic or sewer?

Mr WRIGHT - Well, septic or sewer, or able to handle their waste and solid refuse.

Mr BOOTH - Within their own site?

Mr WRIGHT - Within their own site. This was their ruling, and that's why the brown shack only got a 30-year lease - part of the reason - and these were the people that made the recommendation to the Government. Well, let me tell you, that brown shack, when I was faced with the \$80 000 cost to put it into the communal system they've put down there - which is an absolute eyesore and a white elephant, if you like - to get rid of me, the minister granted me permission to seek an alternative system, and if I didn't come up with that within 28 days and have it approved by the Huon Valley Council, I either had to pay the \$80 000 or remove the shack. I've got the letters, and everything, that say, 'We'll give you \$5 000 towards it'. In other words, they wanted me to fall on my sword. Well, guess what - it's got a septic tank in and it's approved by the Health department, approved by the Huon Valley Council and approved by the minister's department.

Mr BOOTH - Was that existing or since then you've put it in?

Mr WRIGHT - Since I got the minister's approval to seek my own. This is the engineering that was being done on this coastline, and you know, Paul, I desperately tried to get onto the other committee meetings. I call this briefcase what the Legislative Council don't want to know. Do you realise they've put in 85 metres of 225 mm stormwater pipe underground at Eggs and Bacon Bay and it goes to nowhere. It goes to nowhere and it

just stops. My cost of putting sewerage onto the green shack is \$73 000; back in 2003 it was supposed to be \$13 000.

Peacock, Darcy and Hanson, the people that did the first report back in 2000, approved all 10 shacks at Eggs and Bacon Bay for freehold. You tell me where the wheels fell off. What I am saying to you here is, whatever you do on coastal erosion, don't leave it to engineers and other people and bureaucrats, because I tell you what, it won't happen. As a matter of interest, I'm only a layman but I noticed in Saturday's paper the Federal Government has advertised for community coast care, and they tell us in that there's \$2.25 billion to be spent around coastlines and it's available for coast care organisations, small community organisations. They can get \$50 000 to \$250 000.

I believe this Government, post-haste now, ought to be appointing a person to coordinate those applications, otherwise that \$2.25 billion will end up on the Gold Coast in Queensland and we'll get nothing. The little Coastcare group that is Eggs and Bacon Bay - and I don't want to knock them, I am not part of them because there are too many idealists and non-doers amongst them - they all want to talk to one another. There's Madam President, Madam Chairman, and they won't do anything. This degradation could be covered by a Federal Government grant, but it closes on 25 July and I believe your Coastcare groups in Tasmania are splintered so much that they haven't got the expertise or somebody with an engineering knowledge who can say, 'We need 200 metres of spoils and they're going to cost in the order of \$50 000 from Duggan's Quarry, the closest one', and therefore put an application in on that basis. And who cares if you get a \$50 000 grant and you only get halfway there? At least it's something, but I am saying to you that I don't believe - and I might be wrong - any of their Coastcare groups will make an application under that because I do not think they are coordinated enough and have the expertise, and they need government help.

Mr BOOTH - You have been down there 30-odd years, I think you said?

Mr WRIGHT - I have had the brown shack 20 years.

Mr BOOTH - In terms of your local knowledge, does it appear to you that the ground around those shacks is being inundated more over that cycle?

Mr WRIGHT - Yes. Those photographs there are evidence. It came over those 1 metre high logs, and that is at its worst. Do not get me wrong, that is at its worst. When it is normal, my two shacks are saved because of the protection I have put there. But lesser tides still erode that beach area and along the roads. When they have exceeded that is when Huonville floods basically. It is not so much the coastal erosion but it the influence of storms from the Huon and the coastal erosion. But they happened last year and they happened in 1988, I think, when there was the maximum bull tide and, at that stage, it was up higher than that. That was recorded at 1.56 this year, I think. I think the highest one was 1.58. I am going from memory; it was in 1988. They are going to happen. But the gradual erosion is happening regularly, more and more every day, and you can see where we had the coastal grasses in 2003 holding it back. All that was washed away and I had to start putting the logs in place.

CHAIR - Excuse my ignorance, is Eggs and Bacon Bay a small bay? Can you describe it?

Mr WRIGHT - It is probably about 300 metres long.

CHAIR - Right. Are there any other watercourses flowing into it at all?

Mr WRIGHT - No. There is a small drain next to the brown shack that only takes the surge from the tides up into a dam and back out.

Ms THORP - It is fair to say it is the mouth of the Huon River, isn't it?

Mr WRIGHT - Yes it is. Eggs and Bacon Bay is basically the mouth of the Huon River.

Mr BOOTH - Just as a hypothetical, and I know you cannot change the past, but effectively you have had a licence to rent a structure on crown land under the old system and then you were forced by the shacks project and the act to buy that land freehold. Would it have been better to have simply left you with a licence to rent the structure on crown land?

Mr WRIGHT - At \$500 a year I would have been more than happy. I invited the Government to buy back the brown shack off me because what do I want two shacks for? My kids do not even want the brown shack, which is very dear to my heart, because it is \$3 360 per annum. It is a financial burden but I have to keep paying it. I sold my house in Claremont back in 2003 on the advice of the department then that they would be ready in June 2003 to transfer title to me. I sold my Claremont house in November 2002.

Kenny Thomson copped a triple whammy, according to him. If he copped three, then I am copping four because if they revalue my land, as they are supposed to at the moment, the pittance I received for my house in Claremont of \$135 000 which is in superannuation will be no help. I have lost a third of that in the last six months. Why wasn't it revalued and why wasn't everything done previously? That is why I am saying Paul Harriss's legislation is absolutely imperative because if I have to draw that sum out now and pay within two months, I do not think the share market is going to change for me in two months and I am stuck with the loss. In fact, I am going backwards and I still have to lease the brown shack at \$3 360 per annum, which is more than freehold will ever be in 30 years' time.

Mr BOOTH - Would a solution be, for example, the Government to simply resume that land and put it back to the old system of the licence to rent and give you your money back?

Mr WRIGHT - Of course it would have been. Do you know, if they had not given me a 30-year lease - you have to understand why I am so upset about this -

Mr BOOTH - I can totally understand.

Mr WRIGHT - They said that the shack impeded public access so they gave me a 30-year lease. It's no good of shaking your head, Bryan, because it is the truth. Do you know what the act of 1997 said? It forbids the secretary from granting a long-term lease if it impedes public access. Well, he gave a long-term lease but do you know the reason for giving a long-term lease? They said I impeded public access. It has been a mockery, an absolute shambles and a mockery, and these shacks need protection from the coastal erosion.

I agree with what you are saying, that nobody in government wants to do anything about it. Bryan Green went down and had a look at my shack -

Mr GREEN - No I didn't.

Mr WRIGHT - Yes, you did; you went down and inspected it at Port Huon and you saw it from the water. Peter Pearce should be able to confirm that with you. Peter Pearce came back and said to me - I have the dates, I have the records of phone calls - 'Bryan can't see anything wrong with your shack but we cannot change' -

Mr GREEN - I apologise. That is correct, I did go and I did see it from the water. I didn't drive in.

Mr WRIGHT - Exactly.

CHAIR - Mr Wright we are running out of time. I do realise that it is a very emotive issue for you and Mr Harriss, as we said before, has something in hand coming up next week but we do have to stick to our terms of reference in terms of coastal erosion as well.

Mr WRIGHT - Can I just say one more thing?

CHAIR - Yes.

Mr WRIGHT - Your terms of reference say that you have to take into account the nature of the risk of current and future liability and moral implications.

CHAIR - Yes.

Mr WRIGHT - I believe the historic nature of shacks in this State has to be taken into account in anything you do with coastal erosion. So it is no good Kim just saying let us pull it down. It is there, it is has an historic value. In 30 years' time that shack will be 100 years old. You probably don't believe me but I want to submit this to you.

That is a pearl-covered manuscript that has been in that shack since 1946. It belongs to my family. In there are 16 handwritten entries all dated between 1859 and 1893 and that is the sort of history that coastal protection should enforce. There is no reason for the shacks to be removed; proper barriers will keep the shacks going for another hundred years. I guarantee the authenticity of that and I am telling you there are 16 handwritten entries there between 1859 and 1893 and they are all from the Huon - Glaziers Bay, the Huon, wherever the communities were - and eventually it came down to our family through the shacks.

That brown shack was owned by members of my family originally but it came into my name 20 years ago. I am telling you that it is not much good saying let us get rid of the shacks. What are you going to do about your history and your heritage in this State? Shack site culture and shack site history has to be taken into account and I beg you to keep that in mind too. I believe proper barriers would save them.

I approached the council about the road when it was eroded and Councillor Armstrong said, 'The road is ours but the foreshore is the DPIW's. They have no money, we have the same problem at Dover and we cannot get any money out of them to do it'. So what did the council do? They made that stopgap measure of putting in large spoils there, so there are all these issues that you must address and I am sorry I have run out of time.

CHAIR - Thank you very much, Mr Wright, and I do thank you very much for your frankness. I think the committee understands the emotion which is attached to your particular issues down there. I thank you very much for coming along and doing what you have.

THE WITNESS WITHDREW.

Mr CHRISTOPHER EDWARD SHARPLES, COASTAL GEOMORPHOLOGY, GEOCONSERVATION AND LANDFORM MANAGEMENT, WAS CALLED, MADE THE STATUTORY DECLARATION AND WAS EXAMINED.

Mr SHARPLES - I have come along to answer questions on any issues you may have in regard to my submission or anything else related to coastal erosion.

Since I made that submission a year ago a few things have changed for me professionally. I have been a consulting geologist specialising in geomorphology for the past 15 years or more. I have been basically self-employed for most of that time. A couple of years ago I did a geomorphic map of the Tasmanian coastline and used that to generate a coastal sensitivity map, basically showing parts of the coast that are vulnerable to different types of erosion, slumping, flooding and so on. In the last year I have been under a contract with Geoscience Australia and the Department of Climate Change to do the same thing for the whole country, which is a fairly big project that I think is quite exciting. It involves making the first nationally consistent coastal landform map of the whole country and then using that to identify, on a national level, where the sensitive shore lines are. I am doing that work through the university.

CHAIR - You are locally based, aren't you?

Mr SHARPLES - Yes. I'm not a staff member of the university; I'm still essentially a contractor but I am doing it in association with the university. My interest in coastal erosion is still essentially the same but I am now looking at the national level. I still have plenty of involvement locally.

Ms THORP - What is your response generally to what this committee is trying to achieve? Is it timely, appropriate, and are we going far enough?

Mr SHARPLES - Certainly timely. As far as your terms of reference go, I don't have any particular objections. They seem reasonably broad to me.

Ms THORP - If you were a benevolent dictator in Tasmania at the moment and had all the power you needed to do things about our coastline, from your professional point of view what would you be suggesting?

Mr SHARPLES - I do not actually have a good solution. What we are doing at the moment nationally is trying to identify the areas of coast most likely to be at risk of flooding and erosion over the next hundred years. To me, I think that is the logical first thing to do. You have got to know where your problem areas are and we are doing that. Then you have two problems. You have areas at risk that have not yet got any assets on them. There are two types of assets - there are natural assets and there are human socioeconomic assets. As far as the socioeconomic assets go, for areas that are potentially at risk and that have not already got some assets such as housing and industry or other infrastructure, the first and most obvious thing to me is not to put any there. The second case is areas where you already have infrastructure - housing and shacks and so on - in areas that are at risk. I do not know what to do with those.

Mr GREEN - With respect to the RPDC and the decision making on planning for the future, has any of your work been taken into consideration or have you had any formal

discussions with the RPDC with respect to the formulation of their decision making policies on that matter?

Mr SHARPLES - No, I have not actually. You are talking in terms of current decision making?

Mr GREEN - Yes, current decision making that sets benchmarks with respect to planning approvals in coastal zones.

Mr SHARPLES - No, they have not approached me.

Mr GREEN - And or coastal policy?

Mr SHARPLES - Well I made a submission a couple of years ago when the coastal policy was being reviewed. I have not had any involvement in that for a while. My main involvement in policy was when I was preparing my coastal vulnerability map of Tasmania. I was doing that with the climate change project in DPIWE. The steering committee included people like John Hunter and John Church and various other people involved in oceanography and coastal geomorphology in Tasmania. We did have quite a few discussions on whether we should recommend some sort of coastal setbacks as part of my project. On the information we had, given all the uncertainties, we could not actually come up with something that was really defensible, so in the end we opted to just say that these are the bits of coast that are at risk and it still remains to work out what policy should actually be adopted for setbacks for development and so on.

Some other States have adopted policies. I think Western Australia uses a setback of 100 times sea level rise, so there is a setback for the next 100 years of 100 times the projected maximum predicted sea level rise as a setback envelope in which development ought not to occur.

Mr BOOTH - Is that independent of the sediment type they are built on?

Mr SHARPLES - Yes.

Mr BOOTH - So even in soft sediment, or does it go on height as well?

Mr SHARPLES - I think that is basically for sandy coastlines. One of the reasons it is complicated is that different types of coastline are eroding at different rates. Sandy coastlines are a lot more mobile than what I would call clay and gravel coastlines. A lot of the coastal erosion we have around Tasmania is not in sandy coastlines; it is in clayey gravelly coastlines, which in Tasmania are generally tertiary aged sediments. They are clays with a lot of gravel. They are not solid rock but they are not as soft as sand or mud either. Examples include a lot of the western shore of Pitt Water, Rokeby Beach, around Tarooma and also down the channel south of Woodbridge. Around Margate there are quite a few areas where you have coastal erosion in a different type of sediment. It is progressively eroding but the rate is slower than a sandy shoreline so you would probably think about a different setback envelope for that kind of shoreline because it is not going to erode at the same rate as a sandy shoreline.

CHAIR - In the Western Australian example you gave a while ago you talked about 100 times the projected sea level rise -

Mr SHARPLES - Yes.

CHAIR - What does that extrapolate out to in WA, for example?

Mr SHARPLES - They'd be using the global prediction of sea level rise from the IPCC. Basically, they're predicting somewhere between about 20 cm and about 80 cm for the next century, just roughly, with a median of about 40 cm. Let's say the worst possible case would be a metre sea level rise through the next century, then you'd had a set back of 100 metres. What that is based on is a sort of rule of thumb called the Bruun Rule. That is thought to be a fairly reasonable figure, but it will vary a lot from place to place. Some sandy shorelines aren't eroding at all, some are eroding a lot faster than that, and it all comes down to local conditions. Each beach is subject to different processes, different local conditions. A good example in Tasmania is Ocean Beach over near Strahan. The northern two-thirds of the beach are eroding quite dramatically; the southern part of the beach is actually growing, it's prograding seawards. The main reason is that the eroded sand is drifting southwards and piling up at the southern end of the beach.

You get a similar thing in a lot of places. All these shorelines don't just progressively erode in a very simple linear fashion; it is much more complicated. It depends on a whole lot of local factors.

Mr GREEN - Wrecks that have not been seen for 50 years and then all of a sudden start to appear; things like that.

Mr SHARPLES - Yes. There are a lot of cyclic processes related to periods of stormy weather. There are longer-term processes like sea level rise; there are issues with weather and long-shore drift of sediment. There are some places, not so much in Tasmania, where rivers supplying sediment replenish the beach. That's not so much the case in Tasmania. A whole lot of things like this can change it. Each beach along a coast can behave differently because of the local conditions.

That 100 times sea-level rule of thumb is very much a rule of thumb. This is what we're dealing with in this national assessment that I'm involved in. To give some kind of national indication of Australia's vulnerability to sea level rise, you have to apply these rules of thumb and you have to take them as being a sort of average reasonable estimate, because the only alternative is to look at each beach, each bit of shoreline in detail in succession, but you can't do that - it's too big.

So to get a broad picture you basically have to apply these rules of thumb to get an idea of where the hot spots and critical areas are likely to be. Then if some of those critical areas are areas which are particularly valued for reasons of urban development or whatever, then you need to zero in and look at particular sites.

CHAIR - When we took evidence in Launceston yesterday we talked about the fact that the committee will need to get out and have a look at some of these areas, some of those hot spots. That would be useful, in your view?

Mr SHARPLES -Yes. There are quite a few places around Hobart that would be worth looking at.

Mr BOOTH - Can you paint us a picture of, say, the worst hot spot in Tasmania and what's likely over the next 50 years?

Mr SHARPLES - I wouldn't like to go on the record as saying that any one spot is the worst example.

Mr BOOTH - No, but just as an example. One might be Ansons Bay, or Eggs and Bacon Bay.

Mr SHARPLES - I am not familiar with shoreline at Eggs and Bacon Bay, but I am familiar with Ansons Bay, which is a very low-lying shore. It has a little sandy beach but it's basically a very gravelly shoreline. It is not so much a sandy shoreline; it is a semi-consolidated gravel which is eroding progressively and it's also very low lying. So it's got an erosion scarp and it's prone to flooding. That is one spot where there are going to be problems.

Mr BOOTH - Can you paint us a bit of a picture so that the committee is aware of what we're likely to be looking at having to deal with?

Mr SHARPLES - In terms of giving you a few examples of hot spots around the State?

Mr BOOTH - What will happen to those? What would be your predictive modelling, say, for Ansons Bay for the next 50 years?

Mr SHARPLES - For the line of shacks immediately behind the shoreline, they are prone to flooding already. Some of them have already had floodwater around them in the past during storm surges. The frequency of those floods will increase, not because of the frequency of storm surges is necessarily going to increase, although it might, but simply because as the sea level rises a storm surge of a given height will occur more frequently. What was a small storm surge under a lower sea level, the same storm surge when the sea level is higher is flooding further inland. So a flood to a certain distance inland occurs more frequently, even if the intensity and frequency of the floods isn't changing. That is the sort of thing that will happen at places like Ansons Bay. That will also happen at places like Lauderdale. To my mind Lauderdale is one of the hot spots in Tasmania because it's a very large area of urban development, all of which is below 2 metres above sea level. It also has the issue of erosion on the Roches Beach side. Over the last 50 years the southern part of Roches Beach has receded about 12 metres horizontally. Further north it has been a 4-5-metre recession. Most sandy coasts have a cut-and-fill cycle. They will erode during a storm and then some of the sand will come back after the storm and be washed back up onto the beach. They will erode in a storm and then rebuild. In theory, an equilibrium beach with a stable sea level and all other things being equal would erode a bit now and then but it would rebuild and move back and forwards. What is happening at Roches Beach is that over the last 50 years there has been back-and-forward movement but there has also been a progressive recession, which is up to about 12 metres south of the canal. That comes from my interpretation of historic air photos - a project I did a year or two ago.

Lauderdale is one hot spot for both erosion and flooding. Similarly, another example is Kingston Beach. There you have a lot of buildings on a very low sand spit basically. Browns River comes in around behind the sand spit and there you have the potential - it has already happened, I think - for it to happen more in the future with sea level rise where you have a storm surge - storm surges are usually associated with low pressure weather systems, with a lot of rain et cetera - where you get a rise in the sea level coming onshore, at the same time you have a lot of rain in the catchment. Browns Rivulet floods and you can have a situation where the flood in the river meets the storm surge coming in from the sea and you get more flooding than usual in the estuary. I think the same thing happens in the Huon River too. If you have a storm surge coming up the river and a flood coming down you get elevated water levels. Again, simply as a result of sea level rise causing the storm surges to be higher in places such as Browns Rivulet, Kingston Beach, the water is likely to back up further as the sea level rises.

Ms THORP - You noted earlier the situation with presently undeveloped areas in some sense is simpler. It sounds like your concern is more to where there is already infrastructure and buildings.

Mr SHARPLES - That is obviously a problem because people have their houses there. I was quite interested to hear the last gentleman because there are quite a few issues with shacks and sea level rise at places such as Ansons Bay.

Ms THORP - That's where have people have built shacks.

Mr SHARPLES - Yes, and there is the issue of historic and heritage value of the buildings. There is also the issue that there will be more and more costs associated with flood damage and stopping erosion damage in those kinds of places in the future and what to do about it. I do not have a solution I am afraid. I think that is what you are supposed to work out. I do not have a simple solution.

Ms THORP - Some of the evidence we had yesterday suggested that quick-fix engineering is not the way to go either.

Mr SHARPLES - The normal reaction is, let us just build a sea wall and stop it eroding. There are two points there. One is that a lot of this coastal erosion - not so much the sandy beach erosion, but some of the other, what I call clayey, gravelly shorelines - is not only related to sea level rise. It has been going on for thousands of years because those shores are still adjusting to the pre-existing sea level. In theory they would keep eroding until the earth was completely flat. That has never happened because land masses move up and down and the sea level changes. But, in theory if the earth was completely tectonically stable and the sea level never changed, eventually everything would just become flat. That is a basic principle but it never happens.

Mr BOOTH - It is still round.

Mr SHARPLES - It never happens because land masses are moving up and down and sea levels are changing. So these erosion processes stop and start. But most of the erosion that you are seeing around the coast is occurring naturally anyway. The hard rocky shores are eroding very slowly, obviously. But some of the softer shores, not only sandy

shores, those erosion scarps would be there even without sea level rise. It is just that sea level rise is causing some acceleration of it. So when you start thinking of just building concrete walls to stop erosion so that dwellings will not be threatened, you basically have to realise that it is not an unnatural process that you are trying to stop, it is a natural process. So if you want to do that you have to do it everywhere that there is a threat.

There is an experience they have had in England which I think is worth mentioning. A lot of the English coast is subsiding at a rate of a few millimetres a century as a result of it still responding to the melting of the icecap in the last glaciation. The North Polar icecap basically sat over the North Pole and extended down to Northern England. Scotland was depressed by the weight of the ice. Because the crust is elastic, Scotland was depressed and England was pushed up. When the icecap melted Scotland and Scandinavia started rising and Southern England started sinking and that is still going on. It is still adjusting to that weight being removed. So England is still sinking slowly. Sea levels have been rising relative to the land for thousands of years, basically because the land has been sinking and there has been coastal erosion there as a result for thousands of years and it has been a problem. There are places on the east coast of England where there are the foundations of an old fifteenth century cathedral about 300 metres off-shore and things like that.

CHAIR - We do not have that sinking feeling here in Tasmania, have we?

Mr SHARPLES - No, we are much more stable than that. Places like England and also a number of other places in Europe and part of the east coast of North America around North and South Carolina, are places that have been experiencing a relative sea level rise for a long time, simply because the land itself has been sinking, which is not happening here. But you can observe the effect of relative sea level rise on the land and that is one of the reasons that we are saying that sea level rise causes coasts to recede because we can see it happening, where sea level has risen relative to the coast for reasons other than global sea level rise, just local sinking of the land.

In England they have had this erosion problem for a long time and a lot of their shores are quite soft. I had a look at the Norfolk coast on the east coast of England a couple of years ago and that is very soft, it is old, gravelly, clayey sediment which is still quite soft. It is similar to our tertiary sediments but produced in a different way. They have had a constant erosion problem for centuries. In about the late 1940s or the early 1950s they decided to stop the erosion and this erosion extends for hundreds of kilometres along the coast. So they built these wooden structures in front of the shoreline in the lower intertidal area that were supposed to deflect the wave energy and stop the erosion. But they were fairly cheap because they were trying to protect hundreds of kilometres of coast and basically they did not make a scrap of difference. It did not stop the erosion at all. There are long stretches of coast now where you have an eroding scarp and this ugly structure off the shore which is not having any effect at all. To really stop the erosion they needed to build big concrete walls. If you want to stop the erosion you have to build a concrete wall six meters high and three meters wide all along the coast. Nothing else will really stop it.

Just in the last few years they have been looking at their coastal management strategy in Norfolk. They have made a decision that they cannot afford to defend the whole coast because to build structures that would really stop the erosion for that whole coast, and it

is a long coast that is subject to this erosion, would be really expensive and also really ugly. I think this is still pretty controversial over there but they have decided to go with the strategy of protecting high-value assets. Build some concrete sea walls and protect high-value assets such as historic towns and things like that and let the rest of the coast go, let it recede naturally. There has been a lot of opposition to that because a lot of that coastal land is owned by private land owners and they are losing their land at a metre a year so there have been a lot of objections to that. The reason that policy has been proposed is that the alternative of stopping that erosion is even more expensive than compensating the land owners.

I think I said this in my submission that there are places like England where they have had coastal erosion for different reasons and have a lot of historical experience in coping with that and managing it.

Ms THORP - Are you saying there are lessons there?

Mr SHARPLES - Yes, I think there might be some lessons there. I would particularly look at the English cases because a lot of the English coast is eroding and has been for years.

Ms THORP - Even though it is for a different set of circumstances.

Mr SHARPLES - Different reasons, but ultimately it is sea level rising against the land. The sea level has been rising because the land has been sinking. With global sea level rise that rate of sea level rise against the land has now increased for places like England so they have the problem worse than anywhere else. There are some parts of the world that at the moment have essentially no problem with sea level rise. Scandinavia is one of those areas. They have what they call the 'high coast' in Scandinavia. Holland have subsidence; they are just across the Channel from southern England. Subsidence is one of the reasons they have had problems for years. Holland has been subsiding the same as southern England for centuries and that is part of the reason for their coastal issues.

The high coast in Sweden is World Heritage area because I think it is the fastest rising piece of coast in the world. I am not sure how high, but 20 or 30 metres above sea level there are medieval docks, fishing villages and things you can see. Places like that do not have such an issue with sea level rise because they are rising faster than the sea level but there are not many places like that. Most of the world has a problem.

Ms THORP - Is it possible to identify hot spots in Tasmania?

Mr SHARPLES - You can certainly identify places where you have either a flood prone or an erosion prone shoreline and some assets that are of value. There are the socioeconomic assets. The Tasman Highway at Orford is very much at risk of inundation; it is very low and it has had storm waves almost up to the road already.

Ms THORP - What is the name of that beach?

Mr SHARPLES - Raspins Beach. There are quite a few places where you've got the combination of a place that's at risk, and assets. Mostly I am thinking here in terms of socioeconomic assets - infrastructure and housing and so on - but there are also things like salt marshes. If there was no infrastructure and development and clearing in

Tasmania then some of those areas would simply be able to migrate inland, but they run up against places like Lauderdale, for example, where the salt marsh runs up against a road and it's not going to be able to migrate inland.

That is another issue. You've got the natural coastal ecosystem assets where, if there was no land clearance or development or roading or anything in Tasmania, a lot of those ecosystems would simply shift as the shoreline shifted, but because the landscape is now fragmented by clearing and roads and so on, a lot of them can't shift. I think there's also a need there to identify some of those natural assets that can be managed to protect them. Just as I think there are places where, if there's no housing there now, you shouldn't put it there, there are also places where there's the potential to protect some salt marsh so you shouldn't build a road through that area because that would then limit the potential of the salt marsh.

There are quite a few places around Hobart worth visiting. Apart from Lauderdale and Kingston Beach, we could look at eroding shorelines down at Margate and Rokeby. If we went as far as Raspins Beach there are quite a few other places that would be worth looking at. I could also at the same time show you examples of shorelines that aren't eroding and aren't likely to change very much. There is a need to be aware that some shorelines are much more prone to change than others.

Mr GREEN - The Derwent must have changed markedly over time. Just looking at the photos of Parliament House when it was the Customs Building, it was a customs building because the ships used to pull up right outside the front door.

Mr SHARPLES - This a completely artificial shoreline now. If you have seen the reconstruction, there used to be a little sandy beach and there was an island where the monument is, and stuff like that. I think that's actually one of the decisions that needs to be made in terms of protecting against coastal erosion. We need to decide that some parts of the coast are eroding, things will be at risk, so let's make a decision we're going to protect this. We're going to make a completely artificial coastline and we're just going to do it. With other places I think we have to recognise that it is going to be really hard to protect these things, so is it worth it?

Mr GREEN - It's a pretty good example because the bottom of Parliament House, which is the museum, has problems with rising damp.

Mr SHARPLES - I know someone who lives at Marieville Esplanade and he's dug himself a wine cellar under the kitchen floor. He showed it to me at one time. I figured, 'Hang on; the bottom of his wine cellar must be nearly at sea level now, so what's it going to be like in a few years?'

CHAIR - Chris, I thank you on behalf of the committee.

THE WITNESS WITHDREW

Dr JOHN ROBERT HUNTER WAS CALLED, MADE THE STATUTORY DECLARATION AND WAS EXAMINED.

Dr HUNTER - My submission concerned a single issue but it is probably best if I give some background to that and raise another couple of issues that are related. I work for the Antarctic Climate and Ecosystems Cooperative Research Centre in Hobart. I am involved in sea level rise. I am an oceanographer and do quite a lot of work with coastal erosion, looking at the changes of extremes with sea level rise.

To put you in the picture concerning sea level rise, you obviously know that the world is warming. The sea level rose something like 17 cm over the past century. For this present century, sea level will rise probably between half a metre and one metre; it could even be higher but an average would be about a half a metre. Most people think it will be higher than that. For a number of reasons the projections we have had for sea level rise are probably underestimated, so I would tend to aim for something like a half to one metre.

CHAIR - That seems to be the benchmark that everybody is talking about right around the world.

Mr BOOTH - Will that be lineal across the next century?

Dr HUNTER - No, it seems to accelerate. At the moment we're going up at about 3mm a year and that is about 30cm a century. We're going to finish up with probably a total rise over the century of say half to one metre. I guess by the middle of the century we will probably be at about 20 cm, which is about what we saw over the whole of the last century.

There are a number of effects of that. One is coastal erosion, which is what I am here to talk about. There is a rule of thumb which people use for estimating how much soft and sandy coastlines will erode with sea level rise: for every 1 cm of sea level rise you get about 1 metre of erosion, on average. It is very much a rule of thumb, so it is only approximate. It doesn't happen everywhere; it is an average. There will be places where the coastline will erode more than that and places where it will erode less. That only applies to sandy shorelines. We don't understand fine sediment shorelines and clay shorelines nearly so well. They will certainly erode with sea level rise but there is no simple rule that tells you how fast they will go back.

The upshot of that is that if we are talking about half to one metre of sea level rise this century then we are talking about erosion on average of, say, 50-100 metres. There is a lot of property, certainly in Tasmania, within that distance of, say, the front of a dune. You also have to remember that if you are building on top of a sand dune you need to be some way back from the front of the sand dune just for the stability of the foundation. If you think that sea level is going to come back 50 metres, then it is no good putting your house 50 metres back from the front of the dune; you have to put it back farther than that to make allowances for foundation strength.

The particular issue that I raised in my letter was that about a year ago now I had a phone call from an architect who designed a house for a client in Sydney. It was going to be

built on a prominent beach in Tasmania on sand dunes. They were just about to start building the house when the client was in a taxi in Sydney and he heard me on the radio talking about sea level rise. He got worried about this because he realised that his house, just about to be built, was very close to the front of the dune. Subsequently I talked to the architect and the owners and it turned out that the house was going to be about 50 metres back from the front of the dune. I warned them that this probably wasn't sensible if they wanted the house to last for 50-100 years and that it would probably be under threat within, say, 50-100 years. In the end I believe they didn't build there. This had gone through all the standard planning permissions and everything was completely above board.

The point I wanted to make was that we know that the State Government appreciates that sea level is rising and erosion is happening, but there is a certain time scale within government for these processes to get through to the final planning so that they can control the planning regulations. I believe it will be several years down the track before we really have solid planning regulations in place to stop people doing this. The sensible thing to do up until then is to educate owners so they are not necessarily stopped from building in places like this but they are at least warned about the risks. We can put reasonably firm numbers on what the risks would be. It turns out that if you talk to people who live on beaches, a lot of them are quite happy to take that kind of risk because they really want to live overlooking a sandy beach. A lot of them are surfers and they will take risk. But it seems to me only fair that we do warn them.

One thing that the Government has done is to release the Sharples Report a couple of years ago. It is good that that is open for the public to read. I suspect a lot of them do not understand what it is, so probably it would be good to have some documentation that explains in simple terms what it represents and what the risk are.

The thrust of my letter was not to force the planning process through because I am sure that is going to happen. It was really to do something while the processes of government are going through and planning regulations are being put in place so that during that period we do educate people who are buying houses and people who are building houses about the dangers of building on sand dunes.

That was the main thrust of the submission. There are a couple of other issues, if I may raise them. One is not directly to do with erosion but to do with sea level rise. One thing that comes with sea level rise is the fact that extreme flooding events will happen more often simply due to sea level rise and not because we get more storms. If you think of a wharf as being a certain height, if it floods once every one hundred years now, then if sea levels rise it is pretty obvious it is going flood more times.

If we look at the sea level records for Australia over the last century, we see that extreme events during that time, flooding events, increased by a factor of about three. So we have about three times as many extreme flooding events for any given height. During the last century it increased by about that factor.

During this century, if you only have half a metre of sea level rise - that is the lower end - then we believe that extreme events will happen something like 300 times more often. So this means if you design a building so that it will weather a one-in-100-year event, an event that now only happens once every 100 years, it is going to be happening every few

months by the end of the century. Things that happen once a year now will be happening every day, with every tide, by the end of the century. So with sea level rise comes this increase of frequency of extreme events. There is a lot of infrastructure around Hobart which will lead to cognisance of that.

CHAIR - Those figures that you have quoted are a bit hypothetical, but what quantum of infrastructure might be affected right around Australia?

Dr HUNTER - We are just doing that at the moment. Ports are starting to get interested in it because ports really seem not to have thought about it. They build their docks to the level at which is appropriate for ships at the time to unload. A lot of those probably will not get flooded for a century or so, but there is quite a lot of infrastructure which is below ground, things like electrical junction boxes and general machinery, which could be flooded. We are starting to talk to ports about doing vulnerability assessments

CHAIR - When I talked about infrastructure I meant houses as well.

Dr HUNTER - There is some documentation. Macquarie University have a unit called Risk Frontiers that has done quite a bit on this. Around Australia it is quite difficult to find out exactly what heights properties are above sea level. The actual resolution of standard maps is not really good enough to resolve down to the odd 10 or 20 centimetres, which is what we are talking about. Work done by John McAneney from Risk Frontiers has looked at statistics of where people live. He has looked at address lists all around Australia and how close they are to the sea and how high they are above sea level. So these statistics do exist.

CHAIR - Of course on an international scale you look at some of those atolls - for example, the Maldives - which are very low lying. Obviously they must be at considerable risk you would think?

Mr HUNTER - The lucky thing we have in Australia is that we can basically retreat. We live in a big country so as the sea level rises and shorelines go back we can at least move our houses backwards but with small islands like Tuvalu some of the necks of land are probably 50 to 100 metres across only there is nowhere to retreat to, so once the sea level rises you have basically lost your island completely.

Also with islands such as Fiji they may have mountains on them but a lot of the fertile land is low lying at sea level so although you may have somewhere to go to, you will have nowhere to grow your crops because they will be flooded.

CHAIR - So there are some pretty big ramifications potentially down the track?

Mr HUNTER - Yes.

There is one last issue which is to do with ecosystems and wetlands around the coast. Under normal conditions if you have a wetland along the coast or any ecosystem to do with the tidal flats, as the sea level rises the shoreline will tend to erode back and the natural ecosystems will migrate back quite happily with them. So assuming that there is no cliff behind, Australia will get slightly smaller but the ecosystems will still survive.

The problem nowadays is, of course, we have built infrastructure all the way around the coast, seawalls, roads and just general things associated with buildings, and there is nowhere potentially for the wetlands and ecosystems to retreat to so they will tend to get lost with rising sea levels. You can see that in places like the United Kingdom where they built seawalls a hundred years ago and in lots of places the beach is just rocks now with a seawall and there is virtually nothing living there at all.

One thing that we probably should be looking at also is if we want to preserve the coast ecosystems: which bits of infrastructure can we afford to move back? With things like roads you can probably afford to move those back 50 to 100 metres, whereas if you have a line of buildings you cannot afford to move those back. So from the point of view of long-term planning, if we want to preserve coastal ecosystems we have to start thinking about which are the ones we would save and how we would do it, by moving what bits of infrastructure.

Mr BOOTH - So as a precautionary thing with any proposed road rebuilding, for example, they need to consider the implications of rising sea levels and ecosystem preservation and reroute them completely rather than reconstructing on existing foundations?

Mr HUNTER - Yes, think beyond just saving your own infrastructure; think about saving the environment as well.

Ms THORP - You seem confident that the changes to planning which you are aware of are going to take these things into account, if I understand you correctly?

Mr HUNTER - I am confident because the people I talk to do seem to accept that. I talk to people in the State Government and they certainly accept it and the new climate change office is very cognisant of these kinds of things and I talk to them regularly.

Mr BOOTH - In your understanding, in Tasmania are there any areas of built infrastructure that will have to be abandoned effectively, as they have done in England for example?

Mr HUNTER - Well, yes. One solution to the problem is to build seawalls and that is really expensive. Also if you look at the United Kingdom case, they are abandoning bits of coastline because they cannot afford to build seawalls. If you look at the number of people per kilometre of coastline in the United Kingdom, it is a lot higher than the number of people per kilometre of coastline in Tasmania. So if they cannot afford it in the United Kingdom we certainly cannot afford it in Tasmania.

So where you have houses on coastal dunes that are, say, within 50 metres of the shoreline those basically will go and there are a lot of places in Tasmania where you probably have two lines of houses in fact in a vulnerable zone. You are not going to just lose the first line, you will lose the second line as well because some of these lovely shacks and the houses that have been built based on shacks are reasonably small on small blocks and you can quite often have two of those within about a hundred metres of coastline.

Mr BOOTH - They are almost at sea level already.

Mr HUNTER - It does not matter; this is the catch. There are two things that you have to be careful of. One is that you are not going to be below the future sea level. What that means is that if you are going to build something nowadays you would probably make sure that it was 2 metres above any previous high tide. The other thing is the erosion issue with sand dunes. You could be on the top of a sand dune, way above where the sea level is ever going to reach, but the sea level erodes the sand underneath you and your house falls in the water. A lot of these houses are metres above sea level but they are still very vulnerable because the sand will disappear.

Ms THORP - What do you think are the most pressing things for Tasmania as a community - not just the State Government or councils, Federal or local Coastalcare groups - what are the pressing things that people have to do? One seems to be an acknowledgement of the reality of the change, but what next?

Mr HUNTER - I guess the natural thing is to get this knowledge into the planning schemes and regulations so that we do act appropriately. You probably do not want me to start talking about emissions; that obviously has been taken account of by the Government, that we have to start reducing emissions. That is, I think, pretty well accepted and pretty well in hand. Obviously there are the two sides of it. There is the adaptation issue and the emissions.

Ms THORP - In our terms of reference we are trying to be very practical and look at management tools rather than the whole issue of what we can do potentially about climate change. Given that reality, how do we act?

Mr HUNTER - I think from the point of view of planning future coastal infrastructure it needs to be done in a risk assessment framework basically. What you tend to do at the moment is look at a building code which will give a certain level above sea level - it will be, say, half a metre above maximum high tide; some number like that - and you are not allowed to build with your floor line below that, full stop. That does not really differentiate between building a hospital or building a garden shed and what we need to do is to try to elucidate what the risks are of flooding at a given level and then ask the builder or the planner/developer what risks they are prepared to take in the future. With things that are going to be in place for longer there will be a higher risk of flooding from the point of view of the fact that it is around for longer. So even without sea level rise, if you build something to last for a longer time you have to expect more flooding events but also because of sea level rise, towards the end of the life of that asset you are going to get more flooding events as well.

Mr BOOTH - Does it not go further than that, given the information you gave us in regard to a house built on top of a sand dune? Clearly that would be well above whatever height was given to build above so the planning consideration has to take into account the soil erodability.

Mr HUNTER - It has to take two things into account. It has to take height into account, which is something like 2 metres, say. When I advise people - and in some ways you are probably not supposed to advise people but we still do because I think there is a risk - my two rules are that if your house or your proposed house is less than 2 metres above any previous high-water level then seek expert advice. Do not panic but just seek expert advice. If you are above that you are probably going to be okay for a hundred years. If

you are closer than 200 metres of the front of a beach scarp, which is the front of a dune, seek expert advice. If you are not, do not worry. If you are on a muddy dune, fine sediment clay, and you are anywhere near the sea seek expert advice. Even without any government intervention at all, those are the kinds of things that I advise developers and planners and builders to do at the moment and get that kind of message out.

Mr BOOTH - Given the knowledge that we have now about sea level change, erosion and coastal retreat and so forth, what is your view on proposals such as the proposed canal estate development at Ralphs Bay and its ability to withstand climate change?

Mr HUNTER - I will say something which my colleagues sometimes think is heretical. If I were going to live in Lauderdale and I wanted to be safe, I would probably live on the new Ralphs Bay development because I cannot imagine any planning scheme which would allow it if it was not allowing for sea level rise. So it will obviously be on a hard substrate; it will be on rock basically that has been dumped. It will be in Ralphs Bay which is a reasonably small-wave environment. That is not to say I'd like to live there, but nowadays if something is made of rock and is in a reasonably quiet environment like Ralphs Bay then you can design it very easily to be safe from sea level rise for 100 years or 200 years, obviously.

Lauderdale has many other problems due to sea level rise and erosion, and those are the things you'd probably really need to be looking at, but that's not saying that the Ralphs Bay development should go ahead, I am not saying that. All I am saying is that it is quite possible we can design those kinds of developments anywhere to combat sea level rise because they are reasonably small developments. So if you are going to build a suburb that's on dumped rock then you can build it to a given height. You can armour it around the sides. Again I say that development is not open to the open ocean, it's in Ralphs Bay which has quite a small-wave environment.

The big problem really for Tasmania, as I see it, is the distributed housing and the fact that you've got long lines of houses all the way down the coastline, and you can't build a seawall all the way down there; it's just too expensive. We just have to be careful in the future when we're designing new houses and planning for new houses that we build them sensibly far back from the fronts of coastal dunes.

Mr BOOTH - So you'd be suggesting, then, that there be a strategy of a strategic retreat inevitably from certain places around Tasmania that now have a lot of built-up infrastructure on them, including roads, houses and so forth? You believe that we need to be planning some strategic retreat from these places rather than protecting them?

Mr HUNTER - I think in general that's the only strategy, basically. There'll be places where you can put seawalls in. They are put in places where you have a road where there's really nowhere else to put the road, and you have to build a seawall. But most of the time I think you will have to plan for retreat.

Mr BOOTH - At places in Tasmania you would see retreat within what period?

Mr HUNTER - Just taking one example, Lauderdale, certainly within 50 years you're going to be looking at problems there. Luckily, though, going down Roches Beach there's a reasonably wide strip which is crown reserve, it's not their back garden. That's what is

being lost to start with, so the community is losing that, and then they'll start to lose their property as well.

Mr BOOTH - And do you think with climate change and modelling of increased ferocity of strong high-energy weather, it means, for example, that they are likely to suffer significant inundation from storm events, and so forth, in those areas? Is that another risk?

Mr HUNTER - It's another risk. Nobody's really happy about saying whether storms are going to increase or decrease at these latitudes so all I have said about the increase in frequency of flooding events is just due to sea level rise which we are pretty certain is going to happen. The actual changes in the storminess is not nearly so obvious, but it is a risk. So if you want to be risk-averse - and this is why I was talking in terms of risk assessment - if you want to be sure to a few per cent, say, that your building is not going to be flooded during its lifetime of 50 to 100 years, then you'd obviously start thinking about the possibility that storms could increase as well. So you'd have to factor that in.

Mr BOOTH - As a planning tool, I suppose, do you think that in some of those high-risk areas where you're going to have retreat, legislators should be now simply refusing planning permission to replace buildings, and so forth, that ultimately and inevitably we will have to remove the infrastructure from them so therefore starting now we should not be allowing expensive infrastructure to be built in those areas as well?

Mr HUNTER - I guess that's a decision for government. I would guess that there will be two modes of working. One is where it's absolutely clear that you have to ban some kinds of building if it is obviously in a very vulnerable area, but I think there are obviously other possibilities where the owner takes the risk, basically. You advise the owner of the risk and if they lose their property then that's all their risk and they can't come back and say, 'Well, you allowed me to build here'. I think there will always be two possibilities. There will be the plain refusal to allow planning permission and there will be an allowance -

Mr BOOTH - A caveat emptor sort of thing?

Mr HUNTER - Yes.

Ms THORP - My question is along very similar lines. Do you think our current planning schemes, our local government planning schemes, are sufficiently well-informed about these potentials?

Mr HUNTER - I think with the schemes that are in place at the moment a lot of them won't come about simply because it hasn't been done yet. I think the process has to wind through. It's not as if people are saying it's not happening, I think we just don't have those processes in place yet. From the example I gave, this was probably just over a year ago, a local council allowed this building which I certainly would not have thought was prudent.

Mr GREEN - Isn't there a problem associated with the existing subdivisions, vacant land within those subdivisions? Approval has already been given for those subdivisions and the issues associated with building those subdivisions out, people who, as you say, want

to have a sea view, arguing that, 'I'm building next door to our house that exists in a permanent or permitted subdivision'. Isn't that going to be the problem on into the future until we get to that point where those subdivisions are built out?

Mr HUNTER - I can see it might be a problem but there are obviously options such as building at the other end of your block, I suppose. We're not talking about a huge distance.

Mr GREEN - We've got the guns trained on Lauderdale all the time these days and I guess it's because it is in a salt marsh sort of area and it is fairly low and flat.

Mr BOOTH - A vulnerable soil type too perhaps.

Mr HUNTER - I would say that the foundations of quite a few of the houses in Lauderdale are below the extreme high-water mark so although they might not get flooded, they are only protected because they have a sand dune that is essentially a wall protecting them. I think a lot of them are pretty damp.

Mr GREEN - Could the same be said effectively for any sort of delta systems, any low-lying areas? We know that Launceston has been prone to flooding over time. Are you suggesting that a place such as Launceston would find it more difficult to cope with events?

Mr BOOTH - Invermay and Inveresk might be what you are talking about, Bryan, rather than Launceston in general.

Mr HUNTER - Launceston is a special case because it has a big river so the flooding in Launceston has generally been due to the high river flows rather than high sea level.

Mr GREEN - They have big tides.

Mr HUNTER - That is right. We have what we call the 'boundary condition' at the end of the river so if the sea level is, say, half a metre higher you are going to have to expect that even when you have a high river flow coming down, you have to add half a metre on to that as well for a lot of the area around Launceston. You have to take into account, when you're looking at the effect of flooding from a river, what the height of the ocean is that the river is flowing into.

Mr HARRISS - John, in your letter you make mention that the Sharples Report was one of a broad-brush nature. Are you aware of any particular geographical spots which would deserve, pretty urgently, more detailed assessment?

Mr HUNTER - Lauderdale is one. We have looked at Lauderdale since then in a bit more detail. Over the last 50 years we've looked at the historical positions of the shorelines going down Roches Beach - that is on the east of Lauderdale - and it is just what you would expect. There has been a recession on average, not everywhere. In places the shoreline has gone the other way, but on average the recession has been several metres over the last 50 years, which is just what we would expect from sea level rise. You may not be able to exactly pin it down to sea level rise but it is certainly the kind of thing that we're going to see more of in the future.

Mr HARRISS - What brought about that extra consideration of Lauderdale? Was it as a recognition that the Sharples' Report had thrown up some particular vulnerability of that area?

Mr HUNTER - It was a number of things. One is that it looks quite vulnerable. The other is that we have a project called Tasmark, which I mentioned in the letter. This is a project getting community groups to make measurements of where the shoreline actually is because we realised a few years ago that there is virtually no history of where the shoreline was, say, 50 years or 100 years ago and certainly what the shape of the shoreline was or what the profile of the beach was. So we thought it would be a really good idea to get a benchmark of what Tasmania looks like now for people to compare with, say, 50 to 100 years down the track. So it is a community-based project where we get community members, Coastcare groups and Landcare groups to go out on a monthly basis, generally to one beach. Three survey marks have been put in down at the beach and the people will measure where the high water mark is at each one of those marks and also do a beach profile all the way down the beach, down to the waterline with the standard surveying techniques. This has been done with the assistance of the office of the Surveyor-General and the State Government. They have put a lot of survey marks in for us - probably about 50 marks have gone in. Something like 20 to 30 beaches around Tasmania, some in the north and some in the south, have been targeted. One of the first ones where we had the group working was at Lauderdale. This community group have been working there for about two years now.

Mr HARRISS - That work that you are doing with the support of State Government officers, has that flowed out of the Sharples Report, so that they are a particularly vulnerable area which have been identified?

Mr HUNTER - No, it happened just a bit before - about when the Sharples Report was being written in fact. All these things have been happening in the last few years, almost in parallel, so they support each other. But I would not say that any of led to any of the others.

Mr HARRISS - Lauderdale is one that there has been a particular focus on post-Sharples. I probably cut you off early and my apologies for that, but going back to that first question, are you aware of any other particularly vulnerable areas? Or should we ask Chris about that issue when we have him back before the committee again?

Mr HUNTER - That is the best way to do it, just to look at the maps that came out of the Sharples Report. There are a lot of beaches along the north coast of Tasmania, sandy beaches, which are suffering erosion. So it is worth having a look at those, obviously. One interesting one is Dolphin Sands. One of the things that makes a shoreline particularly critical to erosion is the actual slope of the sea bed all the way from about 20 or 30 metres of water depth coming into the shoreline and up over the dune. If you take that average slope and if that is very flat, that is going to be a vulnerable shoreline in general. It is all to do with this thing I said, called a Bruun rule, which you probably heard before, and that is really based on what that slope is; the flatter it is, the worse it is going to be. The bay south of Dolphin Sands is very flat and the surprising thing is that Dolphin Sands does not seem to have suffered much erosion. So it is a little bit of a puzzle there, that if you looked at it from the basis of what you think the erosion would

be just looking at the topography of the beaches, you would think Dolphin Sands would be very vulnerable, when in fact the story seems to be that it is not at the moment.

Mr HARRISS - But it is not exposed to particularly aggressive wave action?

Mr HUNTER - It will get southerly swells coming in which -

Mr HARRISS - So the swell is more than the wave activity?

Mr HUNTER - Yes.

Mr GREEN - So in those circumstances, Bass Strait, which obviously has a shallower coastal shoreline than the east coast or the west coast of Tasmania would be -

Mr HUNTER - I do not know if it is shallower. It is all very local. You really have to go and have a look at it. We are only talking about a kilometre from the shoreline. So the depth of water further than that off-shore does not really matter. It is really to do with the local shoreline. It is really from the point where the waves that come in can start to, what we call, 'feel the bottom', because if you are further out than the waves are not affected by the sea bed. When they get affected by the sea bed and they start to erode the sediment, that point is in about 40 to 50 metres of water. So it is the slope in-shore of that, basically, that is the important thing. If that is flat then you think you will probably have a problem with erosion.

DEPUTY CHAIR (Ms Thorp) - That information is available on a map, isn't it?

Mr HUNTER - Yes. The Sharples Report is a book basically but it is also a GIS. Also it is on the State Government database, which the State Government should be congratulated on. People coming from overseas and from other States are amazed at the amount of things that you have on your State database. So that is a very useful tool and all the Sharples data is on it. Any member of the public can look there and find where their house is and look to see what the vulnerability is, according to the Sharples Report.

DEPUTY CHAIR - Members are further questions?

Mr HUNTER - Is it worth my tabling a couple of other papers?

DEPUTY CHAIR - Absolutely.

Mr HUNTER - There are a couple of descriptions of sea level rise and also some of the other things I was talking about vulnerability.

DEPUTY CHAIR - Thank you very much for your time.

THE WITNESS WITHDREW.

Professor BRUCE DAVID MAPSTONE, WAS CALLED, MADE THE STATUTORY DECLARATION AND WAS EXAMINED.

DEPUTY CHAIR (Ms Thorp) - Thank you very much for making yourself available to us. The pattern we have been following is to give you an opportunity to put your submission to us and then give members would like to ask questions of you if that suits you.

Prof. MAPSTONE - I am happy to do that. In fact I am here on the suggestion of one of your departments to talk about some work that they are doing through the Antarctic Climate and Ecosystems Cooperative Research Centre. We did not formally provide a submission to the Committee.

As John said, he did and I think our submission would have been along similar lines to his. So I will not speak to something we have already said; I guess I am happy to fill you in on what this work is that Kim Evans has suggested be brought to your attention, if that will help.

DEPUTY CHAIR - Yes, thank you.

Prof. MAPSTONE - Broadly speaking in the CRC, the Cooperative Research Centre, we have a program of research on sea level rise and we deal within that program with a whole range of issues related to sea level and changes in sea level past, present and projected into the future globally, regionally and locally. John has spoken to some of the issues that come from that work.

We also have research in a range of other areas related to climate change and a couple of years ago we spoke to people around the State in government, in industry and the community about interest and the need for information on a fine scale on prospective climate change impacts in Tasmania. Out of that came a project which is funded jointly by the State Government, by the Commonwealth Government through the Commonwealth Environment Research Facilities Fund, by Hydro Tasmania and by a consortium of research providers.

The nub of the work is taking projections of climate change under different emission scenarios from a global scale down to a local scale - 10 to 15 kilometres sort of scale - across Tasmania. The reason we wanted to do that is that if you look at the global projections of climate change and changes in temperature, rainfall and all the rest of it, they are done at such a coarse scale that Tasmania is represented in that scheme of things by about one or two points. So the assumptions about the climatic circumstances that affect Tasmania are pretty coarse, clearly, as they are everywhere else. But this is quite different from a lot of the rest of Australia, for example, in that local climate conditions are affected substantially by topography. We stick out into the Southern Ocean off the bottom of Australia so the things that drive climate here are quite different.

So there was a need to take some of the forward-looking information and downscale it to the scales at which people are faced with making decisions, whether it is on a fruit farm, a sheep farm or in a coastal community.

It is fair to say that most of that work, although not all of it, is focused on terrestrial things such as rainfall, evaporation and catchment water flows and so on, but we do have a component of the work which is focused particularly on extreme events in the coastal region and that brings us back to the subject of this committee which is about sea level rise and vulnerability to changes in sea level around the coast.

The project has only recently begun and part of the work that will be tackled over the next couple of years in that project and some other work we are doing with the Department of Environment and Water here is about going to quite local scales and examining the prospects for impacts of rising sea level at those local scales.

In relation to things such as planning schedules, the sorts of things that John was speaking about, what are the likely consequences for building or development guidelines in these different regions, given that we have a set of guidelines now which will be fairly quickly dated and what sort of guidelines might we want to have in the future to manage the risk that is likely to come with changing sea level? Effectively the goalposts for which you are shooting in a safe planning regime are constantly changing now. They are not static as they once were.

One of the first pieces of work that we have done in that project is to commission a firm from Victoria to collect lidar data. Lidar is light detection and ranging information. It is analogous to radar, which is radio detection and ranging.

Mr GREEN - Could you just explain that again?

Prof. MAPSTONE - It is light detection and ranging. Essentially it is laser altimetry. They fly a plane at morally low altitudes over the ground and they use laser technology - and the exact details of it you will have to ask someone else about - which gives them a very high resolution - so down to metre scale resolution - in horizontal, and higher resolutions - measured in centimetres - elevation data.

It is well-developed technology. It is used quite a lot in all sorts of other places mostly over terrestrial landscapes, but one of the features that plagues Australia for coastal development issues and sea level rise impacts is that we do not have that sort of high resolution elevation data around the coast. So we have a pretty coarse map of how high above sea level and so how vulnerable are the different parts of our coast.

In this work we got together a team of people from the State Government, Emergency Services, Department of Primary Industries and Water, Minerals Division - some research people and so on - and said, 'Okay; partly based on the Sharples report and partly based on other people's knowledge of the coast of Tasmania, what are the priority areas where you would first want to get this information?' They came up with five high priority areas which include the Derwent, the Channel, Tamar and a couple of others.

Mr GREEN - What were the couple of others?

Prof. MAPSTONE - I have a map here I can leave with you and you can have a look at it. There are some areas along the north coast and a couple of areas up the east coast.

Mr BOOTH - More of a regional nature, rather than local?

Prof. MAPSTONE - The information goes down to very local scales but the cover of the flights is virtually regional so they cover quite a bit of territory in these flights.

Mr BOOTH - But the priority areas are regional?

Prof. MAPSTONE - Yes. They would be based on a variety of issues. I guess one is water flows, one includes the areas that John has been speaking about in that package. Most of this work is funded by the State Government through State Emergency Services and some funding from the Feds through the Natural Disaster Mitigation Fund.

Initially we expected we would get one of those priority areas covered for the budget but as it turned out the company was coming here to do some work for Forestry, we were able to get a little bit of money from elsewhere and in the end we got all of the five priority areas and then some extras areas done up around Woolnorth as well. So that starts to take you to the point where you have the sort of fine scale - local scale - information about coastal elevation that allows you then to move to the next step and ask specifically what are likely to be the issues in these places given changing sea level. That information is also on the LIST server now.

Mr GREEN - The map that highlights that significant area of the north-west coast, was that done as part of the second round?

Prof. MAPSTONE - Well, yes, effectively the first priority was around here. There has been a couple of sessions of this work over the last few months. It has all been done this year.

Mr GREEN - That is really very useful.

Mr BOOTH - So is this data logging effectively of your altitudes or your elevations of those areas above sea level that overload over Sharples soil vulnerability, like coastal vulnerability mapping in that sense?

Prof. MAPSTONE - I am not aware that that has been done yet but that would be an obvious thing to do with these data, yes.

DEPUTY CHAIR - What is the first most useful thing that can be done with that information?

Mr BOOTH - File it.

Prof. MAPSTONE - Make it available. It is available on your web site, on the LIST server. I would endorse John's comments there. It is an excellent resource.

I think a couple of first things would be to look at the elevation data and say where are the really vulnerable places, and they will vary at quite small scales; 10 kilometres down the coast will have, quite possibly, a very different risk profile than where we stand at a given place. So one would be a risk assessment just based on the elevation data. Another would be to merge it with the sort of data that Chris reported on about the soil types, sediment types which leads into what might happen to low-lying areas that are sandy, muddy, rocky and so forth. It is again an elaboration of the risk assessment. I

think one of the key next questions is how does this fit with planning schemes, how does this fit with coastal communities and which are the areas that are either slated for development or already have communities on them or have roads running right along the coast or whatever. That might then lead to some of the issues again that John raised which were, if we were planning for a future in which we had to move, say, a road but there was not a lot of other infrastructure at risk, where might we move that road to that would allow, not only the people to drive along the road in future but also the retreat of environments that were changing because of inundation.

DEPUTY CHAIR - So if a road was near a salt marsh, you are not just moving the road back, if I am understanding you correctly, to preserve the road into the future, but also to make sure that that salt marsh has space to move through. Is that what you are saying?

Prof. MAPSTONE - I think that is a consideration that would probably be worth making because then, with this information combined with some habitat information and soil type information, you are in a position to be able to plan to accommodate risks, not only to the infrastructure but also to the environments in which the infrastructure lives and where it is built.

Mr BOOTH - I am sorry, I might have missed what you said just prior to that because I was looking at the map. Are you saying that is what you are doing at present and that you are talking into account environmental risks, social risks and economic risks as well?

Prof. MAPSTONE - We are not doing that at this stage. The focus of the work we are doing thus far is principally on providing the detail about what the environmental climate physical risks are. So we are not, for example, doing an economic analysis of the likely cost. We are not doing a social analysis of the likely consequences of social dislocation. We do not have the resources to do that at the moment. What we are doing is saying we can provide that information, we can overlay on that our knowledge of changing sea levels and the profiles of periodic, extreme events, very high tides and those sorts of things, to tell you which bits of the coast are going to be suffering most. The information exists about which ones of those have infrastructure on them. Then there is an obvious next step which is to ask what the economic and social costs are of those impacts.

Mr BOOTH - At this stage then there is no formal project to collate all this data and link it together with Sharples' information and your mapping to provide some meaning to it in terms of strategic planning. You are gathering information but is there a project that will impose this across the planning system or is it simply information-gathering, that a local planner may, for example, grab Sharples' stuff or he may grab your mapping work and be alerted to the fact that there could be issues or is there an overall strategic plan here? If not, should there be, in your view?

Prof. MAPSTONE - There is a bit of that sort of work but it is not comprehensive and it is not strategically built into this project. Again, it is partly an issue of resources and partly an issue of expertise. We do, for example, have a small project with the Department of Environment and Water on doing just that. John Hunter is closely involved in that, with folk from the department. They are saying, 'For selected areas what are the prospects for changing sea level rise in the future? What sort of planning guidelines might you need to be able to advise development in those areas?' The latter part of that 'What might your planning guidelines look like in the future?' is generic. We have some funding from the

Department of Climate Change to take some tools that John has developed largely in the CRC around Australia, which are about saying, 'If you are planning for development, here are some draft suggested tools that you could use to advise your planning and development guidelines for engineers to use and so on'. What we don't do thus far is to go to the next step and engage in how you might alter policy, for example, for implementing those sorts of guidelines or insisting on their use or whatever. In the climate futures for Tasmania work on the analysis of the data will, I expect, take into consideration some of the Sharples data and so on. It will be about defining, at the moment, the nature of the impacts that are likely and where they are likely to occur. It won't be about a strategic and comprehensive assessment of the planning and policy next steps. You asked me also whether I thought that was desirable and I would say it is highly desirable, but it's not just a research issue. I think to do that job properly requires a thorough integration and discourse between the planners, the regulators - government - and research because of the nature of those decisions. They are policy decision, not research decisions, in my opinion.

Mr GREEN - I suppose the next step could be to allow people to understand in a visual sense, to use, say, Google Earth or something like that to show and highlight areas that could be vulnerable into the future, which would set it out for lay people to understand.

Prof. MAPSTONE - I think it's an important point. One of the discussions we are having within the project at the moment is about the nature of the products that we would have come out of it so that people can understand what is important and what is not. That is a discussion we're having so I would take on board your suggestion. We do work closely with Geoscience Australia who have an outstanding capacity to do just that sort of thing with good visualisation expertise in-house. Hopefully some of that will be brought to bear not only on this coastal work but also on some of the other extreme-event work that we are doing in the project, but that is a work in progress at the moment.

The reason in part that it is a work in progress is that we are fairly mindful that, whilst we might have great ideas about what people need to know about climate change, they are not always the right ideas. One of the parts of this project is about talking to people in the community who are likely to be making decisions about where to plant an orchard, what varieties to plant or where to build a house, to find out also specifically what things drive those decisions. If it's a cherry orchard, for example, it is going to be related to chilling temperatures at night time. What we develop as products out of the project will be influenced by what it is that people say they really need to know and in what form they need to know it.

Ms THORP - So if the planning bodies ask you, 'Inform us, please, so we can modify our planning schemes appropriately', that is something you could do?

Prof. MAPSTONE - That's something we would love to do.

Ms THORP - Could you expand on that?

Prof. MAPSTONE - Simply that we already have had discussions with some of the State departments and with some of the local governments. It is important from our point of view for us to learn, to understand, what it is that planning engineers, planning regulators or policy developers need to know in order to advise the decisions that are made. When

I say we would love to, what we are keen to do is not to deliver just the research results but to deliver solutions to problems and the problems are defined by what people do with the information. That's the discussion we enjoy having.

Mr BOOTH - A debate will be had in Parliament about legislation that may or may not be needed to impose these things in the regulatory regime, but without the information and advice from people such as yourself then it is very difficult for legislators to bring in appropriate legislation or to act in an appropriate time frame to take account of this information that you're now gathering that seems to indicate, from what this committee has heard, and certainly global science says it, that there is a tsunami coming. It is not good enough for us to just know that it is coming, we need to know that it is coming and that we should be doing something about it from a precautionary point of view. What do you think should be happening at a research level and a policy-development level to connect that with the people who are making the law to make sure that we are reacting in time?

Prof. MAPSTONE - We've made a statement about what we think needs to be happening on the research side of business by the actions we have taken thus far. We do think that getting information at a local scale is pretty important and I think we're well under way towards doing that. In terms of then informing what you do about the problem, I go back to the comment that clearly there has to be an identification of where the problem is going to manifest most severely. That is in part some of the work you suggested earlier, which is taking the next steps after finding out the digital elevation data and sediment type, and asking, 'Where are the communities at risk? What is the infrastructure at risk in those areas? What's the vulnerability of that infrastructure to these changing circumstances?' That has to be a discussion with people who know that field with people who know the sea-level-rise field. Then the step to what prospectively one does about planning for the future, I think that is a discussion also between those who know the science - the John Hunters, Chris Sharples of the world and others - and those who know the nuances of planning, development, regulation and policy formulation. I think it's in that discussion that the solutions become clearest and we can say what we think needs to happen. I could say, 'Yes, we should have a policy as a community that takes into account sea level rise and how it affects coastal developments'. The implementation of that policy is not an area of my expertise, it is an area of your expertise so it has to be in the discussion.

I do think that it is clear from our perspective that our existing way of approaching risk in planning and development activities is already out of step with what is happening in the world and it will become more so. Regarding the one-in-a-hundred-year event around which we build so much, built into that statement is an assumption that things are going to stay pretty much the same - that is, that the frequency with which you get an extraordinarily high tide backed up with a bit of storm surge and a lot of rain came around once in 100 years in the past and it will still come around with the same sort of frequency in the future. What we now know, however, is that the future will be different because the underlying sea level on which those extremes occur is constantly coming up and up at an accelerating rate. As John said, one in 100 years now will be one in 50 years shortly, one in 20 years not long after that, and every year shortly after that. Where we now use a planning framework that says, 'We assume, in this planning framework, that everything is going to stay the same', in the future we have to use a planning framework that, for example, says, 'I am going to build an asset which we expect to last

for 50 years. I am going to built it in 2010, what's the risk to that asset in 2010 and what will the risk look like in 2060?' Then there is a choice to be made about whether you overbuild it for the 2010 conditions, knowing that by 2060 it will still be doing okay or do you build it just to deal with the risk in 2010, knowing that in 2060 it is probably going to be compromised?

Mr BOOTH - Or do you build it at all?

Prof. MAPSTONE - Or do you build it at all.

Ms THORP - I suppose these kinds of considerations would be really important for a new billion-dollar hospital, wouldn't they?

Prof. MAPSTONE - Well, they would. I think these sorts of considerations would be important for any built infrastructure, whether it is a housing development or an individual house, a hospital, roads or sewerage works. I think the goalposts are changing rather more rapidly than we would like. One of the issues that we have come up against in speaking with planners in this small project I referred to earlier, which John is involved with, is that it's not always an easy discussion to have because it's not just a straightforward problem of, 'Sea level rise will be this much higher in the future' - 10 to 20 cms higher in the future - the problem is that it's a constantly changing set of reference points. Whereas in planning it seems that there is an overwhelming desire for certainty, constancy - we all know what the rules are and we all know how to apply them - here we are saying that the rules are going to have to keep changing to keep up with the circumstances in which you are building.

Ms THORP - Unless you take it to the extreme and plan for potentials that you haven't even imagined.

Prof. MAPSTONE - If you were very risk-averse you might say, 'We're going to get the best available information about what we think we're in for in the next 100 years, say, and then we're going to add a margin of error on that'. That would probably be a pretty difficult choice to make in lots of development applications, I would imagine, but it's one option.

Ms THORP - One of the comments where you say, 'Brave decision, Minister'.

Mr GREEN - That's exactly right. I am sure, as a result of our deliberations today, there will be lots written about Lauderdale over the next few days. Lauderdale residents will be saying, 'Do you know what you're doing to the value of my house? It's collapsing as a result of your frightening the living daylight out of everybody'. If you went and asked those people and said, 'In 50 years' time your flood events will go up three times' - or five times, or whatever it is - they would say, 'Yes, I'm happy with that. I love living in Lauderdale'. I found that is a problem even in a more staid environment when you're talking about dam safety - when we were trying to legislate for dam safety for one-in-100-year events and one-in-1000 year events. People said, 'You've got to be joking. You're going to make me spend all of this money to get these assessments done for a one-in-100-year event?' We almost need advice on how you sensibly convince people to move with change. Change is a terrible thing to have to face up to. How do you convince people? That is what I was saying about Google Earth, time frames and

allowing people to understand that we're not all going to get washed away tomorrow, as often is the case.

You see images on the TV just about every day or night - I have ever since black and white TV first came about - where houses are floating down rivers and houses are falling into the sea. Things have happened over time for various reasons and we need to be in a position where we can allow people to understand what the future possibly holds and make sensible planning decisions obviously for that, but at the same time allow people to move with change as opposed to trying to impose change on them from a straight up and down 'hereby decreed by Parliament' effectively.

Prof. MAPSTONE - I think you're right, but I think the same philosophical position applies within the bureaucracy, within government, as well as within the community. Just having the same discussion with the town planners and engineers, for example, is an important first step because one of the things that is surprising, but has become clear to us, is that a lot of people who are in the business of managing assets or developments and so on, whether it's in local government, State government or industry, haven't really come to grips with this prospect and have not really thought through the problem. Part of that is our problem because, as a science community, we tend to have been talking about climate change in terms of the fact that by 2100 something will have happened, we find that most people switch off.

Mr GREEN - That's the point I was trying to make - as a result of the work that we are doing here, recommendations on how we take people with us in understanding what the change will be. The other extreme of that is what has happened with cyclones - the fact that hundreds of thousands of people are being drowned and dying in low-lying areas will obviously become more prevalent as a result of the storm events in Third World countries - Malaysia and places such as that where they are really struggling to feed people, let alone worry about planning decisions like we are talking about now.

Prof. MAPSTONE - It is a difficult discussion to have as well because, as you rightly pointed out, ever since we can all remember we have been seeing catastrophes on the television or hearing about them on the radio. They may become more frequent but 'it's a one-in-100-year event' is a probabilistic statement and we don't know whether that one-in-100-year event will occur next year or in 50 years' time.

Mr GREEN - Apparently that rainstorm we had in Burnie the other day was a one-in-100-year event.

Prof. MAPSTONE - It is very unusual but there is also no reason that it's not going to happen again next year. I think that's something that isn't in the public consciousness about the nature of these events. I think there is a challenge there. I think the suggestion of providing some visual cues for people to respond to is very useful. It generally is much clearer for people to be able to see what is coming rather than hear a bunch of numbers. This is a change that is happening in the science area now - and I think you will see it in the next IPCC reports and so on - there is an increasing focus in the near term rather than the long term to bring the 2100 statements back to 'in the next two or three decades these things are likely to become a reality and these will affect you in these ways'.

In the sea level rise area and the area that you are considering I think the focus on those extreme events is probably the right one in terms of conveying the most likely consequences of changing sea level. The change in mean sea level isn't very exciting, it is a few centimetres every couple of decades so people tend to say, 'Who cares?' These are the sorts of things that John Hunter is doing, for example. They look at what that does to the risks that we cater for in our planning and development activities, the extreme events, then it starts to become more obvious that this is going to bite us sooner than 2100; it is going to bite us, in some cases, in the next couple of decades - perhaps even in the next decade. I think combining that with the sorts of coastal vulnerability assessments is a good step to be saying, 'There are some places where you probably don't have a problem but there are some places where we need to start thinking about what our actions will be now because we will have a problem soon'.

Mr BOOTH - In your understanding, is there a risk analysis going on? We have talked quite a bit about risks to human-built infrastructure, but what about environmental risks? We have heard about the potential for inundation of marsh lands, for example, and the habitat for migratory species and shore birds and all those ecologically important areas, which are critical not just obviously for the fact that there is a shore bird but also that they represent a lot more than a bird; they represent a whole ecosystem that collapses as a result of loss of that habitat. Is there any forward planning going on there, given that most of those marsh lands are now corralled by roads or they are up against hard rock or whatever and there is nowhere for them to go? Is there any strategic planning, in your understanding, to allow for those things to retreat, to move road infrastructure to make sure that over a long time span we are providing for habitat? We have talked about moving human habitat, but what about areas of extreme environmental vulnerability?

Prof. MAPSTONE - I am not aware of any strategic planning to respond to those sorts of issues. I think there has been relatively recent but growing recognition that those issues exist, and in particular the interaction between the natural habitats and the built environment. The natural habitat, if it wasn't constrained, would probably adjust. Sea level has come and gone in the past and habitats move accordingly. I think that that problem is very much in the same sort of category of the situation with built infrastructure in that we don't already have available a risk assessment or a vulnerability assessment in detail, beyond the work that Chris Sharples has done, about where such habitats are most threatened or most constrained by built infrastructure or likely to be okay.

The Department of Climate Change has commissioned a couple of studies, which you probably know about, to look at coastal vulnerability in various forms around Australia. My understanding of that is that it is most likely to be of similar sort to Chris' report. They are also in the process of commissioning six case studies to look at things at a regional scale in somewhat more detail and to try to get at least a first cut on the social and economic issues associated with coastal impacts of climate change. One of them is for east coast Tasmania, one of them is for New South Wales and one each for Queensland, South Australia and the North-West Shelf. I don't know of anywhere yet where there has been either a strategic assessment of the consequences for natural habitats or a strategic plan begun for what we're going to do about allowing those habitats to respond in whatever way they will.

Mr BOOTH - Would you agree that is a deficiency? I suppose I am suggesting that it seems to me to be a serious deficiency in terms of our forward planning.

Ms THORP - Or something we could encourage.

Mr BOOTH - Obviously if we value wetlands, salt marshes, migratory species, wading birds and their part in the environmental ecology, then part of what we need to be doing is equally making sure that as those shorelines retreat in those vulnerable areas as identified, we provide for sufficient land area or habitat area for those ecologies to survive.

Prof. MAPSTONE - I think that it is clearly an issue. I think we do tend to focus a bit on the built infrastructure because it's our communities that are in the front line there, but I think, as we discussed earlier, if we are faced with moving a road or not developing something or moving some infrastructure to cater to impacts of sea level rise on that piece of built infrastructure then it would seem sensible to also consider whether there are other reasons you might want to move the road further than you would need to just to protect the road. It might be to allow, for example, the salt marsh or the coastal wet land to migrate inland if it needs to.

Mr BOOTH - We did touch on that but what I am thinking of is beyond that. It appears that there may be a much more serious issue that we, as politicians, have not thought about and I am asking whether you have taken that into account. You or John might have mentioned the disappearing of an island that is based on a high mountain with a lot of flood plain that they grow all their food on; well, it is the same thing for the wading birds, the same effect.

Prof. MAPSTONE - I am not aware of any detailed assessments of those sorts of effects beyond what you have already seen in the Sharples Report and elsewhere. I think it is a deficiency but one of the things we are finding now - and I was speaking to some people on the mainland earlier about perhaps trying to coordinate Australia's research expertise on coastal processes and sea level rise impacts on the coast and so on better than we currently do - is that people are waking up to a whole range of issues - environmental, human, economic and infrastructure - related to this business of sea level rise. The calls on us for information over the last two years in that area are far and above calls on us for information in any other areas in which we do research, and they are growing quickly. I think there is a capacity issue for us as a community to provide that information at the sort of scales that people need the information to respond. They do not need to know about global sea level, what they need to know about is what is happening on my beach or for my runway or for my port.

Ms THORP - From your experience are built man-made, if you like, engineering solutions available for all the problems?

Prof. MAPSTONE - I think increasingly we are finding that internationally there are various examples that some solutions will work. If you consider Holland, for example, which has been living below sea level for yonks, the dykes seem to do a pretty good job. But in the UK they have tried building walls in some communities and it just proves prohibitive and not particularly effective in protecting those communities.

There are places where you would probably want to choose carefully where you would put a lot of money into a technological solution to a problem and there are places where you would have to say, 'It's not going to be feasible or desirable or affordable', because I do not really think that we as a community can afford to provide engineering solutions everywhere. We cannot build seawalls everywhere, for example, and nor would we probably want to.

Ms THORP - I ask the question because I can imagine, hypothetically, a situation where members of the community will expect exactly that, once they become aware of their vulnerability, whether it be Lauderdale or anywhere else.

Mr GREEN - Yes, like the bloke with two shacks close to -

Ms THORP - Eggs and Bacon Bay.

Mr GREEN - Yes, he came to tell us that we have to protect the heritage of his shacks and build a big stone wall there. Something that has annoyed me over time has been how the farming community in the north-west of Tasmania has built drains and seawalls adjacent to some sensitive coastal areas which has changed those coastal areas, not for ever, because I am sure that those seawalls themselves will not be able to stand it, but certainly they have made a huge difference to the environment of what was relatively cheap work for them with an excavator to dig a ditch and place dirt to stop the inundation of their pastures and which has had a dramatic effect on some of the coastal landscapes up there, which I disagree with totally.

Prof. MAPSTONE - There is another issue that goes with the engineering solution and that is that most of the coastline exists in response to long-term environmental processes - ocean, geology and sediments and all the rest of it. When you go sticking a groyne out or a wall up, or whatever it is, you tend to interfere with those processes and sometimes the consequences are not obvious when you do it. You take, for example, the north coast of New South Wales and the Gold Coast where there are a lot of breakwaters and groynes out off the beach, what that has done has interrupted the northward travel of sediment. You get the southern ends of the beaches being denuded of sediment and sediment building up against walls or getting put offshore and not coming back onto the beach. It was probably not anticipated at the time that those walls were put in. The other thing is that, taking a fairly simple example, if we were to say that the solution is to put a wall up to stop the sea getting over the beach and into front yards then the consequence would probably be that you have a rock wall in front of your house and not a beach. Most people have built in those places because they want a beach there. If you allow the sediment to redistribute as sea level rises without interference you may well still have a beach, it will just be in a different place.

Mr BOOTH - Or you might find the block next door disappears because you've protected yours with a rock wall and the properties on either side disappear.

Ms THORP - Roches Beach is a classic example of that.

Prof. MAPSTONE - There are all sorts of knock-on effects that come from these things which are often difficult to anticipate and often less desirable than saying, 'We just have to let this go'.

Mr GREEN - Goodness knows what effects the Sorell Causeway is having.

Ms THORP - Exactly. This is more anecdotal than hard questioning, but there was a lot of pressure on the South Arm peninsula area to put an artificial reef off Goats Beach to provide a regular bank to produce waves on a regular basis.

Laughter.

Ms THORP - The consequences for interrupting that long shore drift right through all the way to Seven Mile Beach was real and couldn't be discounted.

CHAIR - Thank you, Professor Mapstone. I apologise for missing part of your briefing. I am sure it has been very interesting. Are there any final questions from the committee?

Ms THORP - Professor Mapstone, you know what our terms of reference are. What do you think the most useful thing would be to come out of this committee?

Prof. MAPSTONE - I guess two things. One is the recognition of the nature of the problem and the fact that it is not a long way off in the future and it's not measured in terms of a few centimetres of sea level rise. So a recognition of the nature of the beast that you have to deal with. The second thing would be some resolution to take steps to deal with that from a policy and planning perspective. From your end of business of government some commitment to actions that will allow you to lead the community through those changes. That might be changing planning guidelines, it might be changing regulatory environments. I don't know, it's your business.

Ms THORP - Auditing infrastructure, risk analysis.

Mr BOOTH - And I guess taking action to prevent as much as possible carbon emissions and accelerating climate change, which is a very long-term position because this stuff is happening any way.

Prof. MAPSTONE - I think those things are important. Going back to the terms of reference, those things are probably not going to change the sorts of issues you will have to deal with on the coast because of sea level rise in your lifetime or my lifetime. They will change the longer-term prospects for things getting even worse, but in the shorter term a recognition that there will be consequences locally not too far down the track where there will need to be some leadership for the community in how to deal with these. It will be through recognising that some places get sacrificed, recognising that some buildings that people want to put up really shouldn't be put up, recognition that perhaps the way we build has to change. For the terms of reference those are much more proximal issues. I don't think they discount the need to do the forward-looking things such as limiting emissions and so forth.

CHAIR - I think you have probably encapsulated it quite well and that is the sort of drift that we have been getting, even though we have only had a few people give evidence so far. That is something for the committee to deliberate on in the future.

On behalf of the committee I would like to thank you very much for your time and giving your expertise to us. We thank you very much for that. We hope we will get a report out which has some significance and relevance to Tasmania.

THE WITNESS WITHDREW.