LEGISLATIVE ASSEMBLY OF THE NORTHERN TERRITORY
Sessional Committee on Environment and Sustainable Development

Committee Members:

Mr Peter Chandler, MLA	Member for Brennan
Mr Michael Gunner, MLA	Member for Fannie Bay
Ms Marion Scrymgour, MLA	Member for Arafura (Chair)
Mr Peter Styles, MLA	Member for Sanderson
Ms Lynne Walker, MLA	Member for Nhulunbuy (Deputy Chair)
Mr Gerry Wood, MLA	Member for Nelson

PUBLIC HEARING, WEDNESDAY 13 MAY 2009

Department of Natural Resources, Environment, the Arts and Sport

Withesses:

Ms Libby McAllister	Senior Policy Officer, Environment and Greenhouse Policy
Dr Peter Whitehead	Senior Policy Officer Savannah Burning and Land Clearing
Dr Robyn Delaney	Senior Scientist, Wildlife Management
Dr Anne Walters	Senior Scientist, Wildlife Management.

Madam Deputy CHAIR: I declare open this public meeting of the Sessional Committee on Environment and Sustainable Development. Our inquiry arises from a reference to the committee by the Honourable Alison Anderson MLA, Minister for Natural Resources, Environment and Heritage.

I welcome officers from the Department of Natural Resources, Environment, the Arts and Sport: Ms Libby McAllister, Senior Policy Officer, Environment and Greenhouse Policy; Dr Peter Whitehead, Senior Policy Officer, Savannah Burning and Land Clearing; Dr Robyn Delaney, Senior Scientist, Wildlife Management; and Dr Anne Walters, also a Senior Scientist for Wildlife Management. Thank you very much for appearing before us today.

Although the committee does not require you to give evidence under oath, these hearings are formal proceedings of the parliament and consequently they warrant the same respect as the House itself. I remind witnesses that giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament.

Whilst this meeting is public, witnesses have the right to request to be heard in private session. If you wish to be heard *in camera*, please advise the committee prior to commencing your answer.

I remind Members that personal opinions should not be sought from public servants who appear in a professional capacity.

Today's proceedings are being recorded by the Hansard Unit. To ensure the accurate transcription of the recording, I ask that officers and Members identify themselves prior to speaking and in the first instance I invite the officers of the department to state their full names and positions before commencing their briefing.

Ms McAllister, I understand that you are going to lead off today.

Ms McALLISTER: That is right. Should I use the microphone?

Madam Deputy CHAIR: The microphone where it is will be fine. It will pick up your voice.

Ms McALLISTER: Thank you for having us today. I will be outlining some points around climate change and agriculture in the Northern Territory. I have some materials to distribute to Members, which I could do now if that is appropriate.

Madam Deputy CHAIR: Thank you, yes.

Ms McALLISTER: After I speak, questions relating to climate change can be directed to me, but questions relating in particular land clearing and savannah burning will be taken by Peter Whitehead.

Robyn Delaney intends to give a short briefing afterwards and questions will be taken by both Robyn and Anne.

Ms McALLISTER: I will move through the paper relatively quickly and just make some points that are highlights of the paper.

In general, climate change can be considered from two perspectives, both the emissions perspective, so dealing with greenhouse gas emissions and how to produce those, and an impacts and adaptation perspective, which is dealing with the changing climate and how that affects our environment and society. So I will be dealing with impacts and adaptations first and then a bit about emissions from the agriculture sector.

The paper provides you with some information about projections for climate change in the Northern Territory and I will just run through some key aspects of that. Annual average temperatures are projected to increase, which is no surprise, by about 1°C in the Top End and a little bit more than that in Central Australia.

It is useful to note that increases in average temperatures can have greater impacts on the frequency and experience of extreme events. If you imagine a normal curve with the average temperature around the middle of the curve, if the average is moved slightly upwards, you can imagine that the frequency of extreme events such as days over 35°C and so on are increased as the frequency distribution moves along. I guess that is just an interesting aspect of annual temperature increase having implications for extreme temperature events.

In terms of rainfall, the projections are generally inconclusive at this stage in that projections provided range from a decrease in rainfall right through to an increase in rainfall. Both are regarded as possible in the projections. So it is difficult to say what is likely to happen with rainfall.

However, evapo-transpiration or evaporation from plants and the landscape is projected to increase along with temperatures, resulting in a nett decrease in available water in the environment. That is the general understanding of what is expected.

In terms of cyclones, the information that we have is that cyclone intensity is likely to increase however, increase in the frequency of cyclones has not been confirmed or is not projected at this stage. Related to cyclones is the issue of storm surges and there is a projection of an increase in storm surge and storm surge severity and sea levels are projected to rise by up to 59cm by 2100. It is interesting to note that that does not include a sea level rise attributable to melting of land based ice, including ice sheets in Antarctica and the Arctic. So that is generally regarded to be a bit conservative estimate of sea level rise.

Perhaps just another thing to point out is on page three of the written briefing, the Australian Government projections here show in the middle row for Darwin, the number of days over 35°C are projected to increase from 11 to potentially 44 in 2030 and between 89 and 227 by 2070, which I think we would all agree is a pretty significant increase from the current level of 11.

I might make a point about uncertainty in projections. The projections are based on modelling and one often hears that we wish we had more certainty in the projections so that adaptation planning could be more effective. In general, uncertainty is a characteristic of climate projections and some level of uncertainty is likely to remain at all times about these projections because we can't predict the future exactly and our understanding of climate systems is imperfect.

Related to the uncertainty issue, I suppose is the idea of risk and in general, management of climate change nationally and internationally. Management of the impacts of climate change has been approached from a risk management perspective and the risk management frameworks, including the Australian and New Zealand Standard are often applied and have been adapted to deal with climate risk for organisations and governments. So I suppose that puts some perspective around the comment at the top of page four that the impacts of climate change on agriculture in the Northern Territory are uncertain and they are likely to remain not 100% certain, but we do know some of the general issues that may arise with climate change. They are listed there; I will not go through them. Perhaps if Members have questions, we can discuss that.

Moving on to the second part of climate change and how it relates to agriculture, in the written briefing we have provided some information about emissions nationally and greenhouse gas emissions for the Northern Territory. You can see from the pie charts that the emissions profile for the Northern Territory is significantly different from the national profile. One particular way that it is quite different is in the proportion of emissions generated by savannah burning in the Northern Territory, which, on the last national greenhouse gas inventory, was estimated at around 36% of the Territory's emissions.

Agriculture, apart from savannah burning, generates around 19% of the Northern Territory's emissions on the latest available data, and the vast majority of that is from enteric fermentation or Methane from the gut of cattle. The other main area that it is from, apart from savannah burning, is from agricultural soils; disturbance of the soils releases greenhouse gases.

Although in the accounting for international purposes of greenhouse gases, deforestation is not included in the agriculture sector. A lot of the deforestation that occurs in the Northern Territory is related to agricultural activities, so it is worth noting that 6% of Northern Territory greenhouse gas emissions in 2006 were from deforestation.

In terms of opportunities to reduce greenhouse gas emissions from the agriculture sector in the Territory, there are a range of options and they are listed at the top of page nine, including the changes to pasture and livestock management to reduce their Methane emissions, which, as I mentioned, is a major source - changing tillage practices and altering crop management practices, also. In addition, changes to prescribed burning and reductions in land clearing are opportunities for reductions in emissions.

Perhaps I will wind up my opening comments there. Does anyone has any questions?

Madam Deputy CHAIR: Thank you, Libby. Do any Members have questions?

Mr WOOD: Could I just ask: how much work does the Northern Territory do in relation to these issues? Do we just keep an eye on what the Commonwealth is doing?

Ms McALLISTER: We do participate in national processes around investigation of policy measures for reducing greenhouse gas emissions from agriculture, through to their Natural Resource Management Ministerial Council.

A lot of the issues in a policy sense are to be resolved at the national and international levels, particularly with regard to the Article 3.4 items in the Kyoto Protocol, which are some interesting areas. In terms of research for understanding the methods, for instance, to reduce Methane emissions from the guts of cattle, that research is also really funded and carried out at a national level.

Dr WHITEHEAD: I think to add to that, in the Territory we are leading the way in research on savannah burning for obvious reasons, and that is that it is one of our principal sources of emissions and one that we can do something about so there is a lot of work being done on both improving the capacity to estimate emissions and to develop systems for reducing them through involving people in fire management in remote areas.

I guess another aspect that we are doing some work on that is additional work to what is being done nationally is to look at the distribution of carbon in trees across Northern Australia or the Northern Territory in particular and work out what might happen if the best soils for agriculture were cleared in terms of total emissions and emissions from particular locations. That work is being done with the Department of Regional Development, Primary Industries, Fisheries and Resources. It is in its early stages but we will have information to inform debate and policy development about the interaction between climate change and emissions mitigations and the development of agriculture in the Northern Territory.

Mr WOOD: Could I ask a general question, just before a more specific question, because you write in here about the effects of climate change on the environment in general, I suppose. How much natural change can the environment take? In other words, will it evolve so that the higher temperatures won't affect it? There's talk about coral, for instance, whether it would survive in waters that are warmer. Is there room for plants and animals to adapt simply because there will be enough time, you would think? Generations will come on and they will be able to adapt to those changes.

Ms McALLISTER: I think the general understanding is there is likely to be different capacity for different species and assemblages to adapt. The rate of climate change is understood to be quite high in an historical sense, so that reduces the likelihood of adaptation being possible. However, to the best of my knowledge, it is thought that there will be some adaptation by natural systems to the altered climate regime, but that we may end up with extinctions on the one hand and unique different ecosystems emerging on the other.

Mr WOOD: Agriculture specifically, you talk about the possibility of loss in production but we know that there are cattle that live in Scotland and there are cattle that live in the middle of Africa and obviously there have been species that can stand the higher temperatures. So would you imagine, although you're saying existing varieties of cattle today might loose production, I would imagine that like we have always done in Australia, we tend to sort of move with the changes and develop new varieties.

Ms McALLISTER: Yes, and I think that process of adaptation will occur. It is a matter of when people make the choice to start making those changes.

Madam Deputy CHAIR: Other questions. Member for Sanderson.

Mr STYLES: My question is for Dr Whitehead. In relation to the CO^2 that is stored in trees, what is a rough figure in relation to trees in what we call arid tropical land that we have out there and high density crops in relation to the ability to absorb and process CO^2? Because you are talking about storage of CO^2 and then there is the actual processing of carbon dioxide in the production of oxygen.

Is there much difference between - and I have heard some people claim that for instance they clear some mallee trees and put a wheat crop in, for instance, and the wheat crop will produce as much oxygen. Is that true or false? No one can really give me a definite answer on that.

Dr WHITEHEAD: I am not sure that I can give you a definitive answer, either. The volumes of Carbon stored in the natural environment in the Top End is up to a couple of hundred tonnes CO_2 equivalent per hectare, and down in the arid centre it would be in the tens of tonnes per hectare. When calculations are done of the extent to which clearing an area and replacing it with a crop are done, they take account of the improved pasture or the crop that is put in and there is usually still a nett deficit. But I am not aware of crops that would be planted at such density in our arid areas that would compensate for the removal of existing native vegetation. I guess there are also complications about the life cycle of whatever is put there. That crop is, by definition, removed quite quickly and eventually ends up as CO_2. So it may be that there is a temporary replacement, but there is likely to be a nett deficit, but there is more CO_2 reaching the atmosphere than would be if the system wasn't used for agriculture. The extent to which that is significant would depend on the particular system and the particular crop and it would be very difficult to generalise about it.

Mr STYLES: Thank you. Can I keep going, please, Madam Chair? I have got a few questions that I want to ask.

Madam Deputy CHAIR: You may, Member for Sanderson.

Mr STYLES: When you talk about tillage, are there any models in place as to how we might encourage people to change their practices? Are we actively out there currently trying to promote that?

Dr WHITEHEAD: Our agency does not do that sort of work, except through extension in relation to soil, mainly for soils, so zero tillage and those sorts of things have been considered. Certainly the Primary Industries people are actively promoting.

In areas like the Daly River where there is concern about the quality of management of agriculture and the effects on the environment, there are proposals, for instance, that have come from the Daly River Management Advisory Committee to have property management plans and they would be vehicles for encouraging this.

I think it was the Cattlemen's Association that did get funds from the NHT some time back, one of the Landcare programs I think, and looked at ways of promoting improved practice to minimise losses of carbon from soils and improving the condition of agricultural areas generally. So there is work being done from a variety of directions.

Mr WOOD: Some of the first no-till agriculture was in the Douglas-Daly years ago. In fact, it was promoted back in the days when they first opened up the Douglas Daly for the farmers that came in from Queensland that thought they were going to make their fortune. We actually developed equipment to plant through stubble. One of the problems now is because round-up has always been used as a means of reducing weeds without ploughing - in some cases in Queensland, some weeds were becoming resistant to round-up so there are some issues that are occurring now as time goes on. The Territory used to be, in that part of the world, was nearly a leader in no-till.

Dr WHITEHEAD: Yes.

Mr STYLES: Crop management and controlled burning, are we talking about early burning, late burning? Is that the sort of stuff that you are investigating at this point in time?

Dr WHITEHEAD: Yes, most of the emissions from the Territory are not from crops *per se*; they are from the natural bush. Certainly, the emphasis is on early burning. The strategy I guess has two elements: one is to burn early and produce less of the very potent greenhouse gases like Methane and nitrous oxide. Cooler burns tend to produce less of those because less woody vegetation is consumed. In addition, by burning earlier in a strategic way, you reduce the total area burnt and it is that effect that mostly reduces the emissions.

Mr STYLES: Is that also a strategy to reduce the amount of fuel? If you burn late, obviously you have got more fuel growing, so if you burn earlier, that obviously reduces the amount of fuel.

Dr WHITEHEAD: Yes. A smaller proportion of the fuel burns if you burn early and also less of the woody vegetation burns and there is less smouldering combustion, which produces more of the potent greenhouse gases. So yes, there is a presumption in all the models that have been developed for accounting for these emissions from savannah burning that assumes that the carbon dioxide itself that is released is being recovered in the next growing season. So that is not taken into account; it is only these other non-CO_2 greenhouse gases that are taken in to account.

Mr GUNNER: On that one Peter, would it still be there the next year? So if you burn off early one season, then obviously there is going to be fuel post-that, which will then be there the next burn-off season. So in some respects you might get a one-off benefit, but the fuel is not going anywhere. You might burn-off before it drops, but the next burn-off, a year later, it is going to be there.

Dr WHITEHEAD: It is a difficult question, this whole savannah burning thing. One of the key issues is that, yes, theoretically you would think that if the grass does not burn it will decompose and so the CO_2 will end up in the atmosphere anyway, and that is true. But there is also an issue of these more potent greenhouse gases and there is evidence that if the vegetation is left there to decompose, the gases produced, the methane in particular produced that way from termites, is actually absorbed by soil biota so much less of it reaches the atmosphere. So the decomposition pathway is a low emissions pathway; the fire pathway, if it is not managed, is a high-emissions pathway.

Mr GUNNER: Yes, so then the early versus late is of interest.

Dr WHITEHEAD: So we recognise that there is no change in the total fuel loads necessarily, but there is a difference in the way those fuels will break down and the extent to which they then reach the atmosphere.

Mr CHANDLER: Dr Whitehead, could you maybe explain a little bit more on the chequered process of burning? I have done a little bit of reading on this approach where they would use a chequer board approach to burning?

Dr WHITEHEAD: I have not heard it described as chequer board, but there is certainly a desire to produce patchy burns so that you burn it in such a way that the prospects of a wild fire coming through later are reduced. You structure those early burns so that you leave patches of different burning age in the landscape. Some animals and some systems like fire and others don't, and others do best if there is no fire at all. So the idea is to try and produce like a chequer board, I guess, of different burning ages in the landscape and that is good for biodiversity and it is probably good for some forms of production and it is good for reducing greenhouse gas emissions. So there are a lot of wins potentially, including employment of people in remote areas to do this work.

Mr WOOD: Doctor, the Kapalga experiments showed that if you left it for about 10 years and you got an accidental fire, there wasn't much left if that occurred, but the emissions from, say, that one big fire, would they be less than if you had a fire once every 10 years?

Dr WHITEHEAD: It would depend on the timing of the fire and the particular fuels, but in theory they probably would be less because you would have got some decomposition along these other pathways where not all of the potent greenhouse gases would have reached the atmosphere. It is hard to give an unequivocal answer.

Mr WOOD: The other thing is that Aboriginal people in Arnhem Land have an agreement with ConocoPhillips in relation to reduction of Carbon emissions and I gather the contract is basically saying we will not burn this area and that will make up for what has been put out in the middle of Darwin Harbour to produce LNG. Is that contract not to burn at all? That seems to me just about an impossible target, or is it to do what you were saying and have a mosaic type burning program throughout that land?

Dr WHITEHEAD: Yes, the latter to get areas of different ages of burns but also to protect some systems from fires so that they are a very rare event in those parts of the landscape, like *Allosyncarpia* forests and other rainforest elements within the escarpment but, no, it is certainly not about no burning. In fact, it is about the skilful use of old ways of burning, labour intensive ways of burning, and in some places it will involve more burning than currently occurs perhaps; more frequent but controlled burns so that you don't get the massive wild fires that go through the whole area.

Mr WOOD: So how do you physically measure how much Carbon is saved so ConocoPhillips have got something they can base their contract on, in regards to emissions based on some scientific data?

Dr WHITEHEAD: Well, there has been a whole range of things done, but the basic information set is every year, a set of maps of areas burned, the time they were burnt and an application to that information of a series formulae about the amount of gases emitted, if they are burned early versus if they are burned late, and a calculation is generated every year. It is a very considered process. The data are good and it is accepted under the old greenhouse-friendly arrangement by the Australian Government as providing an adequate basis for measuring these sorts of things. But there is work being done to improve it. It is predominately based on satellite measures of the areas burned each year.

Mr WOOD: Could it be applied to agriculture? One of the theories is - I shouldn't say 'theory'; I have been to the Cattlemen's Conference recently about the amount of Methane that come out both ends of cows. Until we actually produce a cow that either produces less Methane and nitrous oxide, or we change the way the bacteria operate in the gut of the cow, could the Cattlemen's Association have an agreement perhaps also with Aboriginal people who are not using their land for agriculture for a similar scheme to what is happening with ConocoPhillips?

Dr WHITEHEAD: In theory that is what the WALFA type projects, the ConocoPhillips type projects are aimed at: developing mechanisms where Aboriginal people or other land holders for that matter, including pastoralists, can sell credits that they generate by reducing the amount of emissions. They can do this accounting, using the satellite imagery annually, and compare their current performance in reducing emissions with a base line. I think the base line for WALFA we are using at the moment, it is a 10 year period until 2004, and they compare the average over that period with what they are achieving now and they are achieving reductions of about 150 000 tonnes a year.

Mr WOOD: So if I looked at that chart you had on page six, which mentions NT emissions, it says 'stationary energy'. I would imagine most of it would be LNG and then it would be natural gas and then would be diesel. Then agriculture, which is 19%, and that would be mainly cattle. If most of our LNG can be offset by a burning process in Arnhem Land, do you think there is a possibility that the agricultural offset could be balanced with the same sort of contract that ConocoPhillips have got?

Dr WHITEHEAD: No. The quanta are wrong in that even though the number for savannah burning is large, the extent of which you can reduce it is limited. If you are going to use these methods of early burning, you are still doing some burning, there are still some emissions.

Mr WOOD: Yes, so you are still adding to the system.

Dr WHITEHEAD: But it does appear that you could perhaps generate maybe saving of a half a million tonnes per year if we extended this work to other places that are currently in the pipeline in planning, but that is still quite a small proportion of the total emissions in the Territory and certainly will be outweighed by emissions from the existing Wickham Point facility and proposed facilities. It is a useful contribution, but it is by no means the answer to either the problems of emissions from industrial sources or agricultural; it is just a useful contribution and it is in an area where we can do something about, whereas it is quite hard to reduce the emissions in other areas without damaging the economy. Whereas this fire stuff is something you can do with a contribution to the economy rather than curtailing it.

Mr WOOD: Will the Carbon tax apply to savannah burning?

Dr WHITEHEAD: That is a good question. They've said no at the present, but because it is not a covered sector under the CPRS, the Carbon Pollution Reduction Scheme, in theory it can be used to generate these offsets we talked about earlier, which could be potentially sold into the CPRS. That is what I meant by generating a benefit to the economy, that Aboriginal people would be able to sell these products of reduced emissions, but there is some doubt about the extent to which offsets of that type and any other type will be recognised by the Commonwealth and there is debate going on with them in a variety of situations presently about how offsets will be treated.

Mr CHANDLER: I have four questions, the first one is that there are not many issues that I face politically that cause such polarised views in the community as climate change. I note in here, and this is in regard to rainfall, projections of minus 7% to 6% positive. It is perhaps because of the information that is coming out in the community with these; it is akin to an each-way bet that if you did nothing, we would perhaps be all right, and if we did a lot, we may be all right. So that is a difficult sell to the community.

I suppose my question is not asking for an opinion, perhaps some advice on what to tell people in regard to climate change because, as I said, for everything I have read one way, I can find an equally compelling argument the other way which leaves you sitting somewhere in between asking is this going to be something that really has a huge effect, or as Gerry Wood alluded to earlier, we will be able to manage it through a natural evolution and that could be technology changes, could be finding improvements to maybe what a cow eats to reduce the Methane. So as technology evolves, is this something we will just be able to manage or would we need to do something, I suppose, more proactive? So it is probably a piece of advice on what to tell people when you have got this information coming out that is showing both.

Ms McALLISTER: I think probably the best comment about that is to say that as a government, we rely on the projections from the Inter-governmental Panel on Climate Change, which is an international assemblage of over 2000 scientists who have agreed that climate change is real and is overwhelming caused by human activity and has produced a range of scenarios and projections for the future. I take your point about the rainfall projections for the Northern Territory being ambivalent. However, I suppose the projections are always improving as the modelling improves and I guess it is a matter of, with rainfall in particular, that is an area of uncertainty that we hope will be clarified over time. The temperature projections and other projections are clearer in terms of the direction of change and I think we can start to see a picture of the future that is reasonably clear, at least in terms of the direction of change and that can help us to prepare to adapt and begin to adapt.

Mr CHANDLER: Probably just supplementary on that, I remember speaking to a Commonwealth officer recently in regard to climate change and part of their modelling predicted that temperatures in the Top End could actually reduce because not that it is less hot, but more days of cloud cover could actually reduce the temperature.

Mr GUNNER: Just around the similar issue around the volatility of projections, I found the days over 35°C interesting, so currently 11 days over 35°C a year and by 2030 it is going to be 44 days or the best case scenario of 28 days, which is still more than double.

I guess my question there is around the modelling or formula you use and the data you put in to it. It is the case that in six months time, if you plug the data in, does it change dramatically? Is that something we see, depending on what day you prese enter on the calculator, how volatile are those projections or is it pretty consistent; it comes out at 44 most times?

Ms McALLISTER: These have been generated using global climate models, which are quite complex but I would image quite stable. As I understand it, probably somewhere in the order of 10 to 20 different models are applied in order to generate these projections. These were prepared over a period of around four years by a scientist from the Bureau of Meteorology and the CSIRO and released in 2007 as a major new set of projections for Australia and including new projections for the Northern Territory. So I think those figures would be reasonably robust.

Madam Deputy CHAIR: Member for Sanderson and then I think we probably need to keep moving. We have four witnesses to hear from.

Mr CHANDLER: It is so interesting though!

Mr WOOD: I have miles of questions, Madam Chair!

Mr STYLES: Tropical cyclones, the total number may decrease and we are going to increase intensity. Does that mean we are going to go from Category 5 being the most intense – are we going to Category 6 and 7 now? Is that what the projections are telling us?

Ms McALLISTER: I don't think I can answer about the categorisation system that the Bureau of Meteorology uses or about the categories.

Mr STYLES: When they say Category 5, we all get a little bit panicky. If someone says that there is going to be an increased intensity in these tropical cyclones, it certainly indicates to me that we are going to have slightly more powerful cyclones and maybe fewer of them, but if they are going to be more powerful, the supplementary question to that is: do you guys actually get to talk to the Counter-Disaster Committee and people like that in relation to design of housing, cyclone shelters? You are talking to them? I can be confident that you guys have got all that under control.

Ms McALLISTER: We work closely with the Department of the Chief Minister which has whole-of-government leadership on climate change policy and also with the Northern Territory Emergency Services so they are fully aware of the projections, and also with the Department of Planning and Infrastructure.

Madam Deputy CHAIR: I think that is an important question, but I am just wondering if within the context of our Terms of Reference within agriculture, we might just be straying off the track a bit there. Are there any other specific questions around climate change from members before I invite Dr Whitehead to speak?

Mr GUNNER: Just about the sea level rise. You mentioned in the report 80% loss of biodiversity in the Kakadu wetlands. I was wondering to what extent we had done modelling around how the sea rise will affect the coastline, tidal rivers and so on. It would be salt encroachment, too, I imagine, towards just the height of water.

Ms McALLISTER: I might give this answer a shot, but you might have something to add, Peter.

There is work going on in our department around salt water intrusion in to the Mary River system and also our department is working with the Commonwealth Department of Climate Change on a project, a case study of the South Alligator River system and impacts of climate change on that system. That is a project associated with the NT Governmental Coastal Advisory Group so there is some work going on there. Are you aware of any other projects?

Dr WHITEHEAD: I am not aware of additional projects *per se*, but there is a review going on. There is work that is being done by NRETAS and its predecessors in the Mary River, looking at the extent to which you can intervene to prevent inundation of flood plains and how durable that is and whether it is cost effective. There were studies of cost-benefit done some years back, and it was found that those interventions were paying their way in terms of increased production and other benefits in protection of wildlife and so on.

In terms of agriculture, the threat to the flood-plains is significant. I looked at some earlier discussions about this issue and there was reference there to the live cattle trade and the use of the flood plains for fattening, and that would be at risk because these areas can go under with relatively minor rises in sea levels. We are not absolutely sure yet about whether you can duplicate the sort of work that has been done on the Mary River in other places. Does that answer your question?

Mr GUNNER: Yes, I was curious about that and to what extent we might in the future go in to some mapping stuff. I know, for example in Darwin, you have your Primary and Secondary Storm Surge Zones and I do not think that map has been updated for a while, I don't know about that, but to what extent we might go in to that in the future for planning purposes, for people who are planning ahead.

The other question I had was around temperature rises. We talked about temperature rises in Darwin. Do we know to what extent the sea might increase in temperature and therefore the impacts on fish stocks or anything like that?

Ms McALLISTER: There has been some work done on that at a national level. A recent report about fisheries impacts nationally had a small amount of information about Territory impacts, but I think it would be fair to say that there is limited information about that at this stage.

Mr GUNNER: And Professor Ross Garnaut said that kangaroos are better than cows. I was wondering what is the actual difference between what a cow does and what a kangaroo does?

Mr STYLES: I worry, Michael about this question. One hops, one walks!

Mr GUNNER: He was quite serious in some respects, saying that cows produce Methane and it is bad, but I am sure there must be some sort of measurable difference. Do we know what the difference is? You obviously can't put a kangaroo in the back of a truck, so it is much more difficult to make it an industry, but I was just curious what the - - -

Mr WOOD: You can put them in dead.

Mr GUNNER: Put them in dead, yes. So the live kangaroo export is difficult?

Ms McALLISTER: I don't have an answer for that.

Mr GUNNER: Well a live kangaroo is difficult because they are hard to round up and put in the back of a truck. But I was just wondering, because he came out and said in many respects, kangaroos are better than cows.

Dr WHITEHEAD: The difference is mostly in the methane emissions and the kangaroo has a different physiology and has a simpler, although relatively complex, digestive system and produces different end products. I am no physiologist of gut fermentation, but I think there is quite a difference, and perhaps an order of magnitude difference in the amount of global warming relevant gas that kangaroos emit.

Madam Deputy CHAIR: Interesting question, Member for Fannie Bay!

Mr CHANDLER: Madam Chair, I had three questions but I am going to keep it to one given the time. The Indian Ocean: I have read an article recently that over the years, Australian scientists have done a lot of modelling with the Pacific Ocean and it is only recently that they have realised, from what I have read, that the Indian Ocean has such an impact on the Australian climate and that only now they are starting to do more research on the Indian Ocean. Is there anything you can tell me about that?

Ms McALLISTER: I am aware of the Indian Ocean Climate Initiative, which was funded by the WA Government and possibly the Australian Government also, that has been looking at exactly what you are talking about, the impact of Indian Ocean dynamics on the Australian climate, particularly on the WA coast.

Our department has been in initial discussions with the WA Government, Queensland Government and the Australian Government about working together to establish some kind of Northern Australian climate science initiative that might build on the work of the Indian Ocean Climate Initiative to develop some more climate information for the Northern Territory and improve our understanding of what might happen here under climate change scenarios.

Mr CHANDLER: Watch this space.

Ms McALLISTER: Yes.

Mr STYLES: Temperature rises and animal fertility, has any modelling being done on it? Horses are about the only one I know about in relation to the optimum temperature for ovulation and things. Is that going to become problem when we start looking at these figures in 2030 in relation to obviously the ability to reproduce and food production and export?

Ms McALLISTER: I do not know a lot about that, but I would imagine that that could be an issue. Certainly, in native animals that is known to affect sex determination in reptiles. I do not have a lot of detail about that, but I would imagine that would be possible.

Madam Deputy CHAIR: If any other witnesses on the panel would like to answer, please feel free to chip in.

Ms McALLISTER: Do!

Dr DELANEY: I was just going to say, to reiterate what Libby said, that some animals, particularly reptiles, have temperature-determined sex; sex is determined by temperature. For example, with salt water crocodiles, that may then affect the sex-ratio that we have and way down the track, because they are a very long-lived species, that may affect the population and the dynamics there if we end up with, for example, a preponderance of males or *vice versa*.

Dr WHITEHEAD: In regard to domestic stock, I am certain Primary Industries would have information on that and be doing work on understanding the potential implications of it.

Mr WOOD: Just getting back to land clearing, in relation to what it is used for, we have got to eat and the population is increasing yet there is a move these days to say: 'Oh, well, we plant trees.' Now it is very hard to eat trees. So where do we find this balance now? We have got land in the Territory that is obviously suitable for agriculture. We have got other sources of carbon, which we cannot eat but we need, like stationary energy and transport, but should we be putting our efforts in to trying to reduce our carbon emissions from stationary energy and transport rather than trying to reduce the amount of land that is cleared for agriculture, which we need otherwise we will all die? Where is the balance here? There is a move, like at Douglas Daly now, to use up agricultural land for forestry. Where are we going in this area?

Dr WHITEHEAD: I can not express a personal opinion about the balance.

Mr WOOD: No, no. It's advice.

Dr WHITEHEAD: In terms of government policy on land clearing, I have never heard any suggestion that the intent is to prevent development for agriculture. It is to encourage development in ways that maximise the social benefits, economic and otherwise, and to minimise the adverse effects like pollution, including greenhouse gas emissions. That is why we are doing the sort of work we are with Primary Industries; it is to look at strategies for identifying places where agricultural development is a good idea, it can work for economic development plus minimise the problems with additions to greenhouse gas emissions.

Even though land clearing is not covered under the Carbon Pollution Reduction Scheme, it is included under the total cap that Australia has now committed to meet under Kyoto. If we increase the level of greenhouse gas emissions from land clearing - then someone is going to have to pay for that because if we push ourselves above the limit agreed internationally, then the Australian Government will have to go and buy credits from someone else to cover that carbon price. If they try to deal with that by making the CPRS cap stronger, then other industries will pay for that. So one way or another, someone pays for the greenhouse gas emissions connected with agricultural development. I guess the question of balance is about ensuring that you take all the costs into account, including the greenhouse gas costs. When you look at the benefits and costs of a given agricultural development and take account of all that in planning.

I do not think there is any suggestion that development or agriculture is ruled out by the concerns about global warming and the emissions. Rather, it has got to be done very well to make sure that the benefits outweigh the costs.

Mr WOOD: Even if we feed other parts of the world? We might clear land simply to export to other places that cannot grow their own food, which is why they buy it. Does that come in to it or if there is a cap on it we say: 'We either pay for it, or we just stop production'? I just think this thing is very complicated and may have long term economic effects on a country like Australia.

Dr WHITEHEAD: When I was talking about cost and benefits, I was talking about localised cost and benefits regardless of how the product was used. I do not know that we would get in to arguments about where the food ultimately went. It would be more about whether that particular use of the land was good for the Territory in terms of the costs and benefits - taking everything in to account, though; the environmental costs as well as the economic benefits.

Mr WOOD: What I was trying to compare it with, ConocoPhillips send their gas to Japan. Japan has a plus, we have a minus because they get clean energy. With agriculture, a large amount of our crops are exported so that country did not have to do the production, it did not have to do the land clearing; it just bought the food. I am just wondering is that taken into account with Kyoto or are we penalised for doing what we are doing?

Dr WHITEHEAD: I cannot claim to have thought through the way the costs of things like the carbon price we are going to put on everything, including agriculture, will flow through to markets and how that would pan out in terms of fairness,. I do not know the answer to that question.

Mr WOOD: With live cattle exports, which in the Territory is our major exporter, there was talk at the Cattlemen's Association conference and also I think it was mentioned in the paper, we are looking at $25 per head because that is the sort of price we are going to pay for the amount of carbon this animal would produce and we would have to add that on to the cost of sending it overseas. The fellow overseas is probably only going to keep it for a little while and then it is going to be meat. So we have done all the hard work. Are we going to get penalised $25 and the bloke overseas does not have that penalty? I just wonder whether some of these things are taken in to account, or do we penalise our own industry and find we are not competitive any more?

Dr WHITEHEAD: I am not aware of modelling having been done to look at those sorts of issues, but there would be imports that we'd make from those other countries that would face the same problem in that their costs would be increased in producing whatever it is they produce. So there is an incentive for everyone to reduce the amount of carbon they use in producing whatever it is they produce, and hopefully the mechanisms they have thought about in terms of carbon markets is the most efficient way of spreading the cost so that they maximise benefits for everyone, rather than having winners and losers. But I have never seen anyone sit down and work through all that detail on balance of trade and balance of carbon costs and carbon trade.

Madam Deputy CHAIR: Can I just say, Members, we are one hour in to a two hour hearing and I appreciate that these questions are important, but we still have evidence from three witnesses. So with your agreement, I would like to move forward and ask Dr Whitehead to deliver his evidence.

Dr WHITEHEAD: Sorry, I did not plan to say anything in addition to what Libby had already said; I was just adding support.

Madam Deputy CHAIR: That is fine then. Dr Delaney, Dr Walters, do we have evidence being presented from you this afternoon or are you happy to work through a question and answer arrangement?

Dr DELANEY: I just had a brief presentation and then we are more than happy to take questions.

Madam Deputy CHAIR: That is fine, thank you, and by the same token, Members are welcome to go back to ask Dr Whitehead any further questions. I might have just cut you off, sorry.

Dr DELANEY: I have been asked to speak particularly on the licensing requirements and the sustainable farming of native and introduced flora and fauna and feral animal programs in general terms.

Native wildlife in the Territory is protected under the *Territory Parks and Wildlife Conservation Act* and so the Department is the regulatory authority to permit any take or interfere or keeping of any of those. So it is any dealings, basically, with native wildlife and that includes both commercial and non-commercial, and obviously in this context, we are largely concerned with the commercial use of wildlife.

There is an exception in the Act to that regulation, and that is where Aboriginal people are allowed to use wildlife for traditional purposes other than the purpose of sale, so without commercial use, without needing a permit. That is the exception.

Under the permit system, take for sustainable use is allowed. The department requires a suite of information in order to make sure that it is sustainable rather than, if you like, a straight 'mining operation'. So information on whether the take is sustainable such as information about survival in the wild, the conservation of biological diversity of habitat, management of threatening processes, etcetera.

One of the things about the *Territory Parks and Wildlife Conservation Act* is that it actually does not recognise different types of commercial use so the permitting system for a person to have one of something that may be a pet, for example, versus a commercial trader who may have hundreds or thousands of a particular species, it is the same permitting arrangements. Certainly we have had some feedback from industry in terms of the crocodile industry, in particular, that sometimes that this does not work particularly well for them insofar as when they are dealing with organisations such as banks and trying to develop an industry, but that is a limitation of our Act. We are anticipating addressing that when the Act gets revised or Divisions 5 and 6 of the Act get revised.

Again, we manage a lot of the sustainable use side of it through conditions on those permits, so we have broad powers to impose conditions to ensure that the wildlife is sustainable in the wild and the harvest is sustainable.

There are three broad commercial uses for wildlife. There is harvest for consumption, magpie geese being an obvious case in point. Harvest for aesthetic or companionship reason so the flower trade and cycads sometimes for essential oils and the pet trade, the companionship side of it. For example, there is an enterprise out in Maningrida where they are harvesting reptiles for that pet trade. Then there is what you could call harvest and mainstream production, which are things like crocodile eggs or crocodiles, timber for didgeridoos, forestry, bush tucker.

There are no real constraints, and I probably should have said that at the beginning. Our Act does not put any impediments or obstructions to the sustainable use of wildlife, and in fact it is actually addressed in the Act and it is addressed through all these permits that I have been talking about, the take, interfere and keep permits, in particular, but some of these types of harvest are constrained potentially by other Acts, such as the *Food Act* for example, or whether a wildlife species is gazetted as a game animal under the *Meat Industries Act,* for example, as to how it can be dealt with.

Because some of the Terms of Reference are looking at the potential for remote and Indigenous employment, as far as the wildlife harvest goes or sustainable use of wildlife goes, it is probably one of the only plausible industries that could be sustainable in the long term in remote and Indigenous parts of the Territory and there is potential there for, and there currently is in some cases, Indigenous employment, for example, in harvest of crocodiles or reptiles for the pet trade. So captive breeding programs on country and in some cases there is also a role there where people are managing the country or the habitat. For example, we have been told by some organisations of where they are managing some of their weeds such as Mimosa, in order to create more habitats for other animals such as crocodiles for egg harvesting or for Magpie Geese.

Some of the issues, and I guess there is a suite of wildlife harvest industries or sustainable use industries, but effectively, I think most of them are emerging or potential industries. They are certainly not as well established as the pastoral industry or many of the other agricultural industries in the Territory. The obvious ones that most people are aware of are things like the salt water crocodile egg harvest and the crocodile farms, but there is also the pet industry, which I mentioned earlier, there is some bush tucker harvest, there is didgeridoo harvest, some timber harvest and then there are some others where there is potential, I guess, and there have been some trials, such as cycad leaves, Kakadu plums, and there is talk occasionally of looking at harvesting native bamboo.

Some of the issues for developing these sustainable wildlife enterprises or sustainable use of wildlife industries is, I guess, that there are real issues to do with the tyranny of distance and logistics in remote areas, and it is not just getting the product from some remote area into a port such as Darwin, but it is also sometimes about actually getting infrastructure out there or food to feed those particular animals out there, to say nothing about the fact that sometimes roads are closed, etcetera. So there is the tyranny of distance and logistics.

The other thing is that they are emerging industries and they are unproven and there is very few of these industries nationwide and because they are unproven, there is a lot of work in order to make sure that they are viable. That is also another layer of issues for wildlife harvest.

Certainly with some industries that are trying to get up and running or that there is talk of, there is sometimes broad public perceptions about the ethics or the moral issues about hunting or taking wildlife.

Lastly, there are also issues to do with monitoring and how you monitor the take and whether it is sustainable or not and given, again, the distances and the remoteness that is often involved.

So that is really giving you a broad overview of the native wildlife, but there are also introduced animals, feral animals and plants, although we are just talking about the feral animal side of it. I guess one of the key things is that under our Act that the principles of management for feral animals are in real opposition or conflict with the idea of sustainable use of feral animals.

Really, with feral animals we need to be talking about commercial use of those animals, insofar as any economic use of those animals should be contributing to defined management goals; they are not an end in themselves, they are really a tool to help in pest mitigation. But whereas the sustainable use of wildlife is a *bona fide* management tool for native wildlife, and I guess in the long term the industries surrounding crocodiles in the Territory is an example of that whereby 30 years ago, it was on the threatened list and it has since been brought back such that they are very, very common and there are viable industries associated with those species.

The other side of the feral animal issues are obviously the impacts that they have on agriculture and I am just going to speak very briefly about that and I guess if you have any questions, then to address them to Anne or myself, but more particularly to Dr. Walters. The Department does have some management programs to deal with feral animals in pastoral and agricultural lands. The VRD, for example, is a control area for horses and donkeys. I think I might just leave it at that, actually, rather than talking about stuff which is not necessarily my expertise, but is Anne's.

Madam Deputy CHAIR: Do members have any questions for Robyn?

Mr STYLES: Dr Delaney, the sustainable harvest of wildlife, is that the same as the sustainable use of wildlife?

Dr DELANEY: Yes.

Mr STYLES: Synonymous?

Dr DELANEY: Yes, we talk about 'harvest' as in 'take' so it is to be used sustainably, yes.

Mr STYLES: Are we progressing towards putting a dollar value on native wildlife? Sorry, can I just rephrase that, perhaps? For instance, say you have someone who has a property somewhere south of Darwin and instead of clearing it to raise cattle - they might do that on half and the half they will use for sustainable harvesting of wildlife in that area, be it birds or goanna or whatever. So therefore, the person who owns that land will see a value in actually keeping the natural habitat because they can actually gain a living from whatever they can sustainably harvest given that someone in government will put strict numbers on how much you can do, etcetera.

Dr DELANEY: Effectively, that is what has happened over time with the salt water crocodile and there is no reason why that cannot happen with other species. As you pointed out, our role is to ensure that it is sustainable, that the numbers are there and it is sustainable in the long term, but there is no reason why that cannot happen. As I said, the crocodile side of it is a case in point Quite a few Aboriginal communities are certainly managing their country – this is in remote areas, for example - to maximise the number of crocodile nests and my understanding is the same is true in some cases for pastoral properties, for example those wetland areas.

Mr WOOD: Just starting at the end of that conversation about the management of problem feral animals. I know you say that they are prohibited – well, they do have management programs in agricultural areas but I suppose the difficulty is in areas where I live, which is a mixed bag between hobby farmers and people just using the land for residential use, is that you have feral animals mixing with rural dwellers who have their own pets and all those sorts of things, yet we do not seem to have a management system which will allow us to control feral animals, and I am talking mainly wild dogs here. It seems to be if we do not do something, we are never going to do anything because they are a real issue as that rural area moves further out in to the bush. Is there any plan to try and tackle that particular problem?

Dr WALTERS: I will answer those from the wild dog perspective because I guess feral animals can vary in their impacts and I guess you were talking specifically about dogs.

With wild dogs, I am sure that you have heard that the department has recognised that there have been limitations in the past in terms of controlling dogs. Previously, Parks and Wildlife has been the only authority in the Northern Territory that has been able to manage feral dogs for using 1080. We are moving now in to a system where pastoralists can get authorisations if they undertake certain training and get authorisation through DRDPIFR and then apply for a permit through us to undertake management. The reasoning behind that is that our department is looking at protecting dingoes, so ensuring that populations of dingoes remain intact, but it also enables pastoralists now to act in areas where there are primarily feral dogs as opposed to dingoes that are impacting, say, agriculture or social enjoyment.

Mr WOOD: Just through you Madam Chair, we have this interface, you might say, between what you call the pastoral land and the city. Generally speaking, it is called Litchfield Shire. I get the phone calls and pictures of other animals being absolutely slaughtered by wild dogs that have come in from the bush and know that there is some food in the area. Yet we are not allowed to use baits. Traps are practically impossible - that is why these dogs are a pest because they are very cunning – and it is very difficult to shoot in a relatively built-up area. Has the department looked at this particular issue and tried to investigate whether baits could be used in a very controlled environment within those areas? I haven't seen any improvement over the years in trying to come up with a solution.

Dr WALTERS: It is a really contentious issue because, as you know, we do want to protect dingoes from hybridisation with wild dogs, which is primarily our role, but also protect native species against predation by feral dogs. I understand that within small areas in the past within municipal boundaries, bating has not been allowed to occur. Like I mentioned, DRDPIFR is the authorising body for the use of 1080 within town boundaries and I understand that we have been working closely with them as well as the Litchfield Shire to enable people to bait within town boundaries provided that it is not within certain proximities to water sources and that sort of thing.

Mr WOOD: That might be hard! Is there a change also in 1080 now, the dry baits instead of fresh meat?

Dr WALTERS: When I was speaking before about pastoralists being able to use 1080 baits, it is actually the dry baits. Our Department will still continue to go out and inject fresh meat baits. So at the moment pastoralists can not handle liquid 1080, but my understanding is that DRDPIFR are also developing a course at the moment that will enable pastoralists to inject 1080 in to fresh meat baits in the future. Currently it is restricted to dry, manufactured baits.

Mr CHANDLER: Madam Chair, if I could just add to that? The Churchill Fellowship tour that I did took me to Vancouver where I spent time with the Stanley Park Ecology Society and learnt a great deal about their Coyote Management Program, and they used the term 'urban coyote' hence in my report I referred to the wild dog as an 'urban dingo'; just because I understood that, like you mentioned. One of their biggest problems they found in Vancouver was the good nature of people keeping things like bird aviaries and bird feeding stations in their back yards, which would attract coyotes not so much for the bird feed, but for what the bird feed was attracting and it could be opossums and racoons and other things that the coyotes would come in for. So part of the program was an education program for the average person not to feed their animals or leave their animal feed out. You know, put your dog food out and then 10 minutes later come and take the plate away rather than leave it out all night which then attracts other animals to come in the yards.

This has certainly worked very well over there and I just wondered whether, in addition to working with local councils attacking these urban wild dog issues, some kind of education program could be thought of to educate the public on some of these pretty standard things to do. The average person does not know that what they do in their own back yards can actually attract some of these hybrid dogs, if you like, in to the back yards in the first place.

Dr WALTERS: Yes, that is a really good point and I think just about all of the management programs that we implement have a fairly significant education component. I guess when we are talking about pest animals, we are not always just talking about invasive species, but also native species that interact with people and that can be considered a nuisance. Some of the things that you are talking about we certainly have to do, not only with invasive species but also with our nuisance wildlife such as possums and bush turkeys and those sorts of things that come in to people's yards.

I think one of the things that we really need to remember about a lot of these pest species is that they are pests because they prefer areas with people. So they actually want to be around people and that is particularly the case with invasive species. So what you will find is invasive ants tend to be closely associated with people and that is primarily because we provide the best habitat for regular food source, also a means for them to distribute to other areas. So they move in vehicles, or soil from plants and all of that sort of thing so we actually provide a means for these species to move around so that therefore they are still associated with people. But, yes, I think that your point is a good one; education is a significant component of a lot of the work that we do.

Mr WOOD: I might ask Dr Delaney a question. In relation to the sustainable use of wildlife, does this include fish or does that come in to the other Department?

Dr DELANEY: Do you want to go there, Peter?

Mr WOOD: He has got Savannah Burning and Land Clearing.

Dr DELANEY: Under our Act, fish are actually specifically excluded, so no.

Mr WOOD: What I suppose I was getting at - I know some people who have difficulties trying to advance sustainable harvesting of fish, but you take someone like Billy Boustead up on the mouth of the Howard River, he is very successfully breeding clown fish and these are very valuable fish, thanks to Walt Disney, and he exports these to the United States straight out of Darwin. What sort of emphasis have we placed on trying to develop the opportunities to breed our wildlife - not so much to collect them from the wild, not to harvest them - but to be able to bring species and actually breed them ourselves to export them without affecting the wild population? Say black cockatoos, quolls or things like that, is that easy to do or is it something the government would rather not have? That is a policy question, sorry.

Dr DELANEY: Yes, I am just ignoring the last bit, if that is all right. What you are talking about is something that sits across at least two Departments and we are responsible for the wildlife side of it, but DRDIFR is responsible in general once these things become farm animals. Sometimes there is a little overlap and we have to work out where the boundaries are and who is doing what and work together. Having said that, though, there are species where there is a market for them, and reptiles is a classic case in point. Where some species, because they are seen as beautiful or rare or they have some attributes that make them valuable on the market, for example snakes are a really obvious one, because there is a big snake market.

Mr WOOD: There is a certain one in South Australia still, is there, or has it come back? An albino python.

Dr DELANEY: My understanding is that one is back, but that is not something I know a great deal about.

Mr WOOD: Sorry, I should not have raised that with you.

Dr DELANEY: No, but there is a market for that. So some of the discussions that we have been having with, for example, relevant people about the Oenpelli Python is that if it comes in from the wild then we need to learn about the captive husbandry of that – how do they breed and how fast do they grow and all those things, so it makes it easy and then eventually it is about setting up a captive industry. Our role in that is actually facilitating to make sure that the right permits and things are in place. In some cases it may be about some stuff to do with the husbandry, but then it is actually about the business plan.

Mr WOOD: We have got quolls, which are an endangered species. There was a family in Howard Springs, at the time the cane toads first came in to the Territory, who wanted to breed those quolls and my understanding was that it was very difficult to get that up and running, yet at the same time quolls were slowly just falling off the map. Now we send them off to an island where they never were before, but anyway that is another issue. If I want to breed quolls and sell them in the open market, is that a difficult thing to do? I know what the husbandry required is and I say to you: 'I know how it is done. Here is how it is done', can I do it or do I have to go through a lot of steps before I get there?

Dr DELANEY: I don't think you need to go through so many steps. As I was saying earlier, from the Departments' point of view because we are primarily tasked, if you like, with conservation some of which is about conservation through sustainable use, so from our point of view, it is about making sure that that harvest from the wild is sustainable. One of the things that we do, for example, and it would be the same in this particular case but the more frequent one is where we are working with Aboriginal corporations, for example, and they want to harvest wildlife for whatever reason, to set up an industry, we work with them and say: 'This is a new enterprise. You are going to need a business plan anyway if you are setting up your business appropriately. Involve us in the right places in that and it makes it easier to go through those steps, so that when we get to the permitting stage, we can already tell that this is a sustainable harvest. You are not taking out too high a proportion of the wild population such that it is unsustainable'.

Mr WOOD: If I take X number of black cockatoos and I bring them to an enclosed area and breed them from there, is that difficult?

Dr DELANEY: Under the legislation there is no issue with that because if they have been legally taken from the wild, then it is really about permit returns and our permits returns ask simplistically: how many animals did you start with, how many animals did you buy or sell, how many died and how many have you got at the end? So that is just a straight accounting to make sure that there are no illegalities happening. So it is quite a straight forward process and I don't know about the particular case that you were talking about.

Mr WOOD: They have packed up and gone interstate since that happened, but I thought there was an opportunity at the time with the cane toad coming and perhaps there could have been a bit more encouragement for people to take on breeding some of those species which we knew were going to come under threat, like the sand goannas on the Daly River or even some of the snakes, as much as I might not feel like wanting to conserve King Browns, but some of those snakes were certainly under threat. I don't know if they still are but I didn't know whether there was room for private people to be encouraged to try to breed those animals and whether it was looked at.

Dr WHITEHEAD: I was not around at the time.

Dr DELANEY: I was looking at you because I was not around at the time, either.

Mr CHANDLER: Could I ask a question on current permits? Can you please give me a better understanding of the current permit system when it comes to wild animals? If an animal is perhaps injured and it is taken to a carer, the carer cares for that animal but then does not choose to put it back in to the wild and wants to keep it, are they able to, under their permit system, allowed to keep those animals?

Dr WALTERS: No. A carer needs a permit to care for an animal. So if an injured animal was taken to them, they need a permit. The permit used to last for 12 months; it is three years now. It has been extended recently. After that time, there is an expectation that that animal is released in to the wild. So the idea with the caring system is that animals are rehabilitated and released in to the wild. The idea is not that the animals are rehabilitated to be pets for people. That is not what the system is about.

Mr CHANDLER: The reason for the question is I am just worrying that there could be a loop hole where someone may have an arrangement, they may even be the prime carer or even in the case of the veterinarian that is giving care and rehabilitating that pet and then under a permit they may have, then choose to keep it. Say they want to set up a pet park, if you like, or a sanctuary of some type, somewhere in the chain at some stage they have been given that animal to care for, but instead of going back to the wild, it then goes to their menagerie for later commercial purposes. Is it possible for them to do that under a permit arrangement?

Dr DELANEY: Generally speaking, when permits are given out, I guess what we ask is for people to be pretty honest and up-front about what their ultimate purpose is. In some cases animals do get transferred from the Carer's Permit on to a Keep Permit. The standing condition that gets attached to that is that it is then not to be used for commercial purposes. But as I said, if people know what they want to do, then it is easier as far as just the regulatory side of it for us to know about that up-front and then be able to deal with it or advise about that up-front.

Dr WALTERS: A condition of the permit is that people put in returns every year. We do regulate that.

Mr CHANDLER: I was trying to think of something like maybe an eagle that was caught, it had a broken wing and could never successfully be returned to the wild because it would not survive. In those circumstances, it either gets euthanased or it could be kept in a wildlife park or some type of sanctuary. That is fair, that would be something you would consider?

Dr WALTERS: That certainly does get considered and that happens. In the case, for example, the Territory Wildlife Park is just one that I am aware of. I am not aware of others, but I am not saying it does not happen elsewhere. Sometimes, if these animals come in because they are injured and they will not be able to be released - because it is about quality of life for the animal - so as long as they will have a quality of life, then this will be useful for our collection. It is not about going out and hunting one of those things down; it is actually just about making use of other circumstances.

Mr GUNNER: I just want to build on an earlier question around sea levels. I will use the Top End as an example. Sea levels are rising, salt water is intruding and so on. Are we going to be able to flag at an early stage areas of possible competition between, say, the preservation of wildlife and the agriculture industry? Before 2030, are we going to be able to point to a map and say: 'That bit of land is important for the preservation of wildlife'. Part of what we are doing is looking at constraints on the system and sustainability. So for planning purposes, is it going to be easy for us at some stage soon, to say: 'No, we need that bit of land for the Quoll'.

Dr WHITEHEAD: There have been a couple of exercises done in NRETAS that relate to special places that need protection and they include floodplain areas so that there is a good set of data available to make decisions about areas that you might give priority to protecting the wildlife. I am not sure that the same work is being done for primary industries; you would need to talk to people in primary industries about that. But in theory, the same sorts of models you would use to predict the effects of sea level rises, the areas inundated and so on could be used for that purpose as well.

There may be conflict with the way you might protect a site for production when it is different from what you might do to protect it for wildlife. I don't think there is anything being done to look at that particular issue yet, but we would be in a reasonable position to at least have the debate about that from the information that is available, except the floodplains are very low-relief systems and the difference between the bit that has got sea on it and the bit that has got fresh water on it is often only tens of centimetres. We do not have good digital elevation models, good mapping of the rises and falls to know exactly what is going to happen. There is a bit of guess work involved in that and there are proposals, I think, to improve the digital elevation models for the coast, which will be necessary to do that better, and that information will also be used for the sorts of issues that were raised earlier about storm surge and protection of the urban centres and storm surge maps and the like.

Mr GUNNER: We are largely talking about the Territory today, which is great, it is where we are living, but part of our Terms of Reference is to compare best practice here with other areas of similar geography and climate. What, in your opinion, would be the other areas in Australia or the world that would have a similar geography and climate that should be considered?

Dr WHITEHEAD: In terms of floodplains, I think there are areas - - -

Mr WOOD: It's unique!

Mr GUNNER: It could be the whole Territory, it could be the desert, it could be the Top End. We have got a pretty broad scope for best practice elsewhere.

Mr STYLES: Florida?

Mr GUNNER: Do you want to go?

Dr WHITEHEAD: When the work was being done on the Mary River to look at interventions that might be possible to deal with the salt water intrusion there and the costs and benefits of that, there were consultations with people from Louisiana, I think, and some from Florida. So yes, there are models in the US about how to intensively manage floodplain environments mostly for production of various sorts of fish and crustacea and some wildlife efforts, too, with Alligators and the like.

So I guess there are not any models that are directly comparable to our situation, but there are people around who have done this sort of control over the flooding regimes on floodplains that can be subject to intrusion from the sea for a hundred years probably, but certainly many decades. There have already been efforts to learn from them and that could be cranked up again if it was determined from the work studies that have been done in Kakadu and so on that if there is any real prospect of being able to intervene in a cost effective way. I think there is a long way to go, though, before you would start looking at specific models.

Dr DELANEY: If I can add as well that one of the things more broadly than that wetlands and sea level rise is one of the general things that seems to be coming out, from the literature at least that I have read, is that people are suggesting that you need to manage or look after or conserve larger blocks of land that are smaller just because that actually gives everything a bit more movement, whether that be altitude or temperature with sea level rises or whatever else.

Mr GUNNER: The corridor sort of stuff as well.

Dr DELANEY: Yes.

Mr CHANDLER: Could I just ask one question on that? Say from about 1970, is there anywhere we can go and have a look at a graph to see what the mean sea level was in 1970 compared to 2009?

Ms McALLISTER: I think on page three of the handout I have provided the www.climatechangeinaustralia.gov.au website would be a good place to look. The information provided there provides observed changes. So there will be a chapter of the huge report that they prepared and it would be about observed changes.

Mr STYLES: Or Google.

Mr WOOD: Through the Chair, I was on what was called the Planning Authority in those days and Earl James was on it and he said that they had something to do with a range of buoys or markers that float out there somewhere and they have been measuring the rise in the water. Back then, he said that the amount it was rising in the Territory was very, very small; they were not even sure whether it was due to a tilt in the continental shelf. I do remember going to a big discussion at the Holiday Inn on the Esplanade and there was a big range of speakers on the salt water intrusion into the Mary River from people like Alex Julius on one side to other people who were the pastoralists. So the debate has been around for quite a while, and I am not sure whether it is still open. Is it happening or is it not happening or is it something that has been happening for a long time? I don't know.

Mr CHANDLER: This comes in to an argument where there are these polarised views sometimes. We talk about 59cm here. We know how long it takes to fill up a dam when it is first constructed. We know through big massive rainfalls that even some years we don't fill the Darwin River Dam. I suppose then when you put that on a global scale and you think of how much water in the ocean, that's a hell of a lot. Even a centimetre of water across that whole planet is a dramatic amount of water and in the average person's eye, they cannot even comprehend that kind of amount of water. So to get a 59cm rise is, again, very hard to sell to the average person that it is going to happen.

Mr WOOD: I think the debate at that time was to do with whether it was going to affect the barramundi. That is why you had your Alex Juliuses in because they put the barrages across and there has been a lot of work done on barrages over many years. They have been there quite a while now. So there has been some work done in relation to the salt water intrusion and I don't know what kind of studies have been done to see whether that has been effective or not.

Mr CHANDLER: You can go to the dykes in Holland or perhaps Vienna, Venice.

Mr WOOD: The windmills of the Mary River. I can see it now.

Madam Deputy CHAIR: Any further questions?

Mr STYLES: My question is for the Wildlife Management people. My understanding is camels are currently declared a pest, as donkeys are, is that correct?

Dr DELANEY: Yes.

Mr STYLES: Through commercial culling, and as you said earlier it is a tool to help in the Pest Mitigation Program, when they get down to some level, a figure that someone else will determine, is it possible that these people might be able to herd these and use them for commercial purposes? Do you think we will change that? I am not in to herding quolls or anything because that is a bit hard, but herding camels, is that something that we can do in Central Australia? Is it sustainable?

Dr WALTERS: I guess when we talk about feral animal management, we are talking of a really large area, often difficult terrain and inaccessible. So I tend to err or the side of caution, that would be my view, and say that it is going to be quite difficult to herd large numbers of feral animals. The controversial issue with feral animal management and this perceived commercial use of feral animals is that you are going to get to a certain level in the population, like you were saying, and then there is going to actually be a push for people to keep feral animals out there. So in terms of the impacts on the environment, if you look at the fact that feral animals do cause significant impacts, negative impacts on the environment, to actually have a system where we are leading feral animals out there is counter-productive and it is difficult to support under the *Territory Parks and Wildlife Conservation Act* which states that these feral animals, our role is to remove feral animals and to protect our environment.

Mr STYLES: So down to zero?

Dr DELANEY: The chances of getting them down to zero are probably zero. As much as we would all like that, under the Act and the management of feral animals, it is actually about reducing the environmental impact of those species to acceptable levels, which would generally be to below sustainable levels for that population. I guess the other side of it is that if they are actually a stock animal, which means fences and all the rest of it in the way that cattle are, then that is actually a different proposition. They are animals that are being legitimately herded and looked after and managed just like cattle are.

Mr STYLES: That is more what I was talking about.

Dr DELANEY: That is not to say that they do not have impacts on the environment or anything else.

Dr WALTERS: It's contained.

Dr DELANEY: Yes. It is actually about a stock animal rather than a feral animal *per se* in those cases. However, camels in Central Australia, which are now, I think, over a million is the current estimate and they are literally feral animals; they are not being used as stock at this stage.

Mr CHANDLER: Just on crocodile management, I note that you call it an emerging industry and it should be viable. I suppose my point is that as far as the industry is concerned, my understanding is that skin is the biggest product that the commercial enterprises are looking at, but there are also industries out there that try to use the entire carcass if you like, from skin, meat, bones, teeth or taxidermy. I will try and bring both questions together: is there anything being done to manage perhaps what may become international pressures from welfare agencies in regard to crocodile management? We talk about crocodile safaris and things like that, we could see pressures from HSUS, WWF, those types of agencies. Is there anything being done to maybe manage some of that impact? I know when the media gets involved in anything we seem to want to do, they can twist and turn it to whatever they want and it may be seen as negative.

Dr DELANEY: Sure. I think there was a whole suite of ideas in there so please get back to me if I don't answer all of them. The reason I call it an emerging industry is that in part because people like Professor Graeme Webb call it that and he is in the industry and he is the Chair of the Crocodile Specialist Group for CITES, but that is certainly a longer standing industry and it has been going for over 20 years now. Yes, skins are the most valuable side of it. All the other bits and pieces tend to get used, but they are, if you like, by-products. They are the cheaper end of the market. There is currently, and you are no doubt aware of this, a new draft management program for the salt water crocodile out there for public consultation. Because it is a species that is listed under CITES (the Convention on International Trade of Endangered Species), and we want to export the product, therefore it has to go through the Australian Government so it is out for public consultation on their web site as well. We would expect, and now doubt we are already getting, and when I see 'we', I mean both governments are getting submissions from organisations like the Humane Society of the United States and the World Wildlife Fund. Some of those are very strongly opposed to use, in particular to safari hunting; others aren't necessarily. My understanding of WWF, for example, is that they are actually not opposed to it because they see that in other parts of the world, such as bits of Africa, safari hunting is actually sustainable, but not only that, it is actually a viable way of bringing income in to areas that otherwise do not have ways of doing it. So it is viable and important income there and it is helping to conserve the species.

There was another point, I think?

Mr CHANDLER: That will do; that is good. I am very happy with that.

Madam Deputy CHAIR: I have a question for you, Dr Delaney, and it is around this issue of land management and harvesting. Coming from the East Arnhem region, as I do, there is an abundance of everything. I guess what I want to know is if we can understand how closely we are working with Indigenous people, tapping in to traditional knowledge and culture to work with them around those knowledge bases that already exist as opposed to working with modern Western science when we have a certain body of knowledge that already exists, if that makes sense. Whilst recognising, of course, that out in that region, we do have that tyranny of distance which certainly limits economic opportunities that might come out of either land management or harvesting. Are we working closely with Indigenous people in that area?

Dr DELANEY: I think we are working closely. I think our limitations are the usual limitations of staffing and resources and the obvious limitations that we have. But that is a whole-of-government policy to do that and certainly from where we sit, that is an important part of what we are about. Some Indigenous groups are certainly much further along those particular paths than others. So, for example, the Tiwi Land Council and Bawinanga Aboriginal Corporation in Maningrida have some very strong enterprises built up around wildlife harvest, the sustainable use of wildlife, and others are trying to get there. I had a call this morning from someone out in East Arnhem Land way who was actually saying: 'How do we move this and what do we do?' Our role, I guess, is to try and point them in the right direction because a lot of it is actually about business enterprise development and that is not our expertise or role. So we try and help them to go to the right places in that sense, in different departments for example, and then to help through that permitting process so that where we have got the right information, we know that is going to work.

Madam Deputy CHAIR: I guess the other thing I was asking was the opportunity for employment is to be able to tap in to that traditional knowledge base and to assist research with the work that your area does.

Dr DELANEY: Yes, and in tapping in to Indigenous knowledge, a lot of our role is about managing that harvest on the permitting side of it. Then it is also about making sure that it is sustainable such as for species that are being used a lot, therefore there is a need for management programs. Some of that is actually therefore about acknowledging it and, as you say, in a lot of those areas there is a lot of wildlife out there and so while we may not have that knowledge and therefore use it *per se*, I think we are very aware that Traditional Owners have a lot of that knowledge and it is about them making sure it works for them.

One of the issues that comes up regularly for us, and you just reminded me that it did again this morning, is that with a lot of this sustainable harvest and the permitting system is that on Aboriginal lands, Land Councils such as the NLC are the sign-off body under the Aboriginal Land Rights Act. Our role is not to ensure that the right land holders have given their permission; that is the Land Council's role. That side of it is sometimes an issue as far as getting things through a process, particularly with some harvesting such as crocodile eggs where there is a defined season, there is a defined ceiling, there are a lot of people wanting more eggs than are available across the entire Territory so there is a lot of pressure on that and on Indigenous lands; NLC sign-of is critical because we cannot issue permits without landholder sign-off and we rely on NLC for that and they have to make sure through anthropologists etcetera, their processes, that the right people have been consulted and that actually is quite time consuming for them.

Madam Deputy CHAIR: In some ways it could be a hindrance or perhaps more red tape.

Dr DELANEY: That is what we hear from stakeholders, that they have some concerns sometimes in that respect, but by the same token, it is very important that the right land holders have given their permission.

Madam Deputy CHAIR: Of course.

Mr WOOD: I will quote you a case very close to my heart where they gave the wrong Traditional Owner the right to harvest eggs, and now have apologised that they did not check properly.

Dr DELANEY: Is this last year?

Mr WOOD: The person has been collecting them for some time in the Finnis-[inaudible] area; not his country. So sometimes the system falls down there as well, unfortunately.

Madam Deputy CHAIR: And sometimes there is also dispute between Traditional Owners as to who is actually the custodian.

Mr WOOD: In this case they actually apologised; they had made the wrong decision. Anyway that is another issue, but it does show that there are some issues.

Dr DELANEY: Yes, and the complexities to do with it, I think, is part of the problem and it gets to those other complexities of untried or just emerging industries, tyrannies of distance and processes and how it works.

Madam Deputy CHAIR: Thank you for that. Members, were there any other questions? Did anybody want to go back to the climate change issue?

Mr WOOD: We could be here until 9 o'clock. There is plenty of food for thought, Madam Chair, in this little document here.

Madam Deputy CHAIR: Then on behalf of the committee, I thank officers from the Department of Natural Resources, Environment, the Arts and Sport for their time and their briefing today. I would also like to thank you for your patience given the fact that this hearing has been re-scheduled a couple of times, so thank you for your patience. A transcript of today's proceedings will be forwarded to you in due course so that you have the opportunity to look at it and correct it before it becomes a public document.

I declare this meeting of the Sessional Committee on Environment and Sustainable Development closed.