

REPORT OF PROCEEDINGS BEFORE

**STANDING COMMITTEE ON NATURAL RESOURCE
MANAGEMENT**

TERMS OF REFERENCE A AND B

(ecologically sustainable land and water use in New South Wales)

At Sydney on Wednesday, 16 November 2005

The Committee met at 11.00 a.m.

PRESENT

The Hon. Richard Amery (Acting Chair)

The Hon. I.M. Armstrong

Mr G.J. Aplin

Mr G.F. Martin

CHAIR: I declare the meeting open at 11.03. I thank everybody for appearing before the Standing Committee on Natural Resource Management and of course we are looking forward to hearing the evidence of our two guests.

I am advised that you have been issued with copies of the Committee's terms of reference and also a copy of the Legislative Assembly Standing Orders 332, 333 and 334 that relate to the examination of witnesses. Is that correct?

Dr WILLIAMS: Yes, that is right.

CHAIR: We have before the Committee first up Dr John Williams, Scientific Services consultant and a member of the Wentworth Group of Concerned Scientists. Although there is no formal submission to the Committee, I understand there are some table documents and some previous papers.

Dr WILLIAMS: That is right.

JOHN WILLIAMS, Consultant, Wentworth Group of Concerned Scientists, 8 Harcourt Street, Weetangra, ACT, 2614, sworn and examined:

CHAIR: As I pointed out earlier on, you do not have a formal submission but I understand you would like to certainly make some introductory remarks to the Committee.

Dr WILLIAMS: I will. My remarks basically will follow the actual paper that I presented, an oration I presented when recently I was awarded the Farrer memorial medal for agricultural science. On 8 November I presented a paper called sustainable Agriculture in Australia - Some Ways Forward and I have copies of that, both a formal copy and a printed copy and I will use that as the basis of my introduction but I would very much welcome questioning on the issues that will arise.

The issue that I would like to address is that management of natural resources, in my view, is very much about having land uses that actually create wealth and at the same time do no harm to the environment. If we can build land uses that actually generate wealth for rural and regional communities but do not actually harm the environment, then we have actually got a very real win/win opportunity and it is my view that if we re-think our agriculture and our forestry and its interface of agri-forestry, there is great opportunity to actually achieve that, because creating a problem, having a degradation issue or a water quality decline and then spending money fixing it up - because the primary use of the land causes the problem - to me is a very wasteful way of going about it. What I am proposing, that I think in our natural resource management we need to have a great deal more emphasis on making sure we do not create the problem in the first place by having our land uses well matched to the capability of the land and climate.

That is very obvious and primary school but in so much of our natural resource effort, I do not believe that is where the issue has had its focus. Too often we focus on managing the symptom rather than recognising the cause and addressing it at its causal issue and in the document that I presented there in the short two pager, which was the substance of the Farrer oration, I spent sometime recognising that the nature of what the Australian continent is and particularly that it is a very demanding journey to build an agriculture that works for the climate and soils of the Gondwana landscape, which is Australia.

Our pioneers were confronted by an ancient landscape which was very dry, extremely variable climate that generated the droughts and flooding rains, and quite different from anything experienced in Europe and North America. These early farmers and pioneers and their descendants were challenged continuously to find new ways to harvest the water, nutrient and carbon as food and fibre from the ancient soils in a very flat continent vegetated by a great diversity of trees, woody shrubs and perennial grasses.

This background is important because over the millions of years the landscape had accumulated from the atmospheric deposition and weathering, enormous amounts of salt in the soils and groundwater. In addition to that, most of the rivers and groundwater systems, because of the flat nature of the Australian landscape, are very sluggish, with only small capacity to move water, salt and sediment from the continent. It is a flat landscape and so our groundwater systems and our river systems have limited energy to actually carry sediment and carry salt from the landscape to set up a balance between what is coming in and what is going out.

Consequently, a sustainable agriculture must be able to work in these conditions, that is, must be able to work in an old, flat, salty land, driven by a highly variable climate and modulated by a native vegetation that leaks water to the landscape's internal drainage system at rates approximately equal to the drainage rates from the landscape.

So what it is about is matching the movement of water and nutrient from our agricultural system to what the landscape can easily manage. The bottom line is that that is a pretty tough call but unfortunately farming systems based on annual crops and pastures do not work very well in such a landscape. These annual crops and pastures we now know leak far too much water past the root zone, so that much more water enters the landscape than can leave the landscape via the sluggish drainage system.

We know then that is the primary driver for salinisation, the groundwater rises as the landscapes fill, causing the salt stores to be moved to the valley floors, the rivers and wetlands. But equally important, the increased leaching associated with that water leakage drives the big issues of accelerated rates of soil acidification, as well as nutrient depletion and delivery of increased nutrient loading to our groundwater, our streams and our wetlands, which are primarily are major land degradation issues.

What we have, this irony in Australia, while are agricultural productivity itself, as you will well know, is constrained by lack of water and nutrient, yet many of the driving forces for our land degradation is excess water and loss of nutrient. So when you look at that situation you say to yourself, because of the leaky nature of the agricultural eco-system that we predominantly use, the way forward, to my mind, is to capture that water and nutrient and turn it into wealth, rather than leak it into the landscape and cause the degradation, whether it is acidification, stream eutrophication or erosion, sediment, delivery to streams or whatever, or salinisation.

The way forward, I think, is that we do not have enough effort, both in our scientific community and in our rural agricultural community on actually finding ways to avoid the problem in the first place by capturing the water and making sure we use it where it is and making sure we use the nutrient and turning it into productivity.

I think now we at least understand that that is the nature of the problem. That is documented in journal publications and in the literature and it is now starting to be recognised by our rural community and the very many innovative farmers that we have, are taking up that challenge of trying to solve that problem.

One of the simple instances is, take for example the very real step forward in conservation farming. That is where we basically reduce the flow of water over the surface or the flow of wind over the surface, whichever is the situation, by incorporating a lot more trash management and minimising the cultivation, but that water that used to move horizontally of course will move vertically unless it is used. So whilst you may go to conservation farming and that may solve the erosion problem, it may well exacerbate the acidification and the salinisation problem, if that water that once moved horizontally, moves vertically past the root zone, is not used by the crop and ends at the groundwater system and takes with it the nutrient that we need.

The way forward to me in natural resource management is building agriculture and forestry and a mix of those, that can actually capture that water, the nutrient and the carbon and turn it into wealth. When we look at a salted region in the mallee, at the bottom of that mallee hill, where it is, and at the top of the situation we have a grain crop growing, the water that should have been in the grain crop is down in the bottom and that is the problem.

How do we go forward? Well, the paper that I have tabled and the other literature that I have provided to your Committee, in my mind suggests that there are ways forward but it will require a re-thinking of our farming system and natural resource management I think needs to give a great deal more emphasis to the re-thinking of our farming system so we do generate wealth and don't cause the problem in the first place.

I have identified in the paper there are four main areas and I will finish, Mr Chairman, quickly now. We have got to look, I think, much more at developing wealth from tree crop systems and that may sound crazy but it is not if you actually do the thinking. It would include trees for fruits, nuts, oils, pharmaceuticals, I think the use of bush foods, acacias and other plants, and forestry products, such as obviously speciality timbers, charcoal and interfaced with biomass energy.

I think we have some examples of success of that in the oil mallee projects in Western Australia and South Australia where the mallee itself, you can take a serious drought, the mallee is not droughted, it is only the wheat that is droughted, the mallee is doing fine, it always has, but if you can turn that mallee into a mix of wood product, primarily charcoal and biomass energy, coupled with the agriculture in mallee cropping, you are starting to build a system that captures the nutrient and water and produces new alternatives for wealth generation.

The other way that I would say is where some good effort is at the moment, is mixing new farming systems of best current annual and perennial plants, the best agronomy, companion plantings, rotations and combinations and of course, the miracle plant that everyone looks to is of course lucerne, which actually is deep rooted and put into appropriate rotation can actually reduce that leakage and capture that water and turn it into biomass, which you can then turn into animal product, but the point is that rotations can be both spatially - in space - or they can be time and some of the innovative work that I would see happening is around the Narromine area by a group of farmers there who have experimented with what is called companion planting, where you actually take your winter growing crop, late spring crop like wheat or barley or whatever, but you actually seed it into an Australian native plant that is a C4, which is a plant that primarily grows through summer time and cannot, in the cool temperatures, grow much through the winter. So it does not compete with the crop but in the summer time you have got this mix, so if the climate varies, you can either decide to take the crop out or make it a forage crop or you actually use the Australian native as part of your grazing system.

So you are looking at a system that captures and manages the way the water and nutrient fluctuate in the system. There are some really innovative farmers who are experimenting with this and sometimes they incorporate a salt bush option into it. The second point I would say, there are some novel mixes and there is some good work being done.

The other thing that I feel is grossly neglected is the opportunities in plant breeding to actually modify the way our cereals, pulses, oil seeds and forages work, that can actually capture that extra water and nutrient.

One of the things, and it is a bit simplistic but I think it might be helpful to the Committee, when we developed our wheat industry, Farrer and the subsequent group, tended to take a spring wheat out of North America and India and make grow it in a winter wheat. So we took a wheat that is expecting rising solar radiation, rising soil temperature and we plant it in May when we have got decreasing soil temperature and decreasing radiation, so the bigger problem is always with you, to capture that water. That is just one example.

The genetics that we brought in the spring wheat, of course the rust resistance, of course was fundamental to building the industry, so it is one of these things that we have got a bucket full of genetics to solve one problem but some of that genetics is not helping us solve another. The CSIRO do feasibility studies on these issues and it shows that there is quite a capacity to look at our cropping systems and make them better.

Of course I think then, ability to look at our landscape and know where we are actually cropping and we are doing dough, and where we are not, and do some really serious re-organisation and assignment of land to cropping and to other uses.

That is the sustainable agriculture part of the landscape. But I think - I know I am taking longer than you probably want me to but this is important to me - the future, I think then requires us not only to do all that but it requires us to have a bigger vision for agriculture in the landscape. It is not just about producing food and fibre. That is terribly important but the future form of sustainable agriculture can be discerned to require a mosaic of new and old agricultural enterprises that yield the food and fibre, coupled with native eco-systems that provide a suite of eco-system services that are valued and paid for by the stakeholder and the beneficiary.

So that agriculture is about managing the natural resources of the landscape to provide eco-system services. What we are about is recognising that beyond the self interest of looking after the natural capital for your own productivity, there is a range of looking after the eco-system functionality that you and I depend on - the very oxygen we breathe is a simple one - and having the habitat and all those things in place. Where that is really beyond the expectation of a farmer and I think where society will have to increasingly pay for maintaining that mosaic, and that is happening and I think there is some good work on that, but it is recognising what is that level that is beyond the duty of care and where the public can help. But those are problems we do have to solve.

I think we see future agriculture about managing the natural resources and I will just conclude, agriculture will broaden its perceptive to be seen by society as the custodian and manager of the life support systems for the society as a whole.

CHAIR: I just have to apologise and break in and say you have been very comprehensive. As a matter of fact, as you have a copy of our indicative questions, I must say that you have gone through quite a few of those aspects but there are some points that we would like to ask you a few questions on when we come back from the division.

(Short adjournment)

Dr WILLIAMS: Just to round off what I was saying, Mr Chairman, there were a couple of important statements there. I think the key function of agriculture in the future will be to manage the landscape, its rivers, wetlands and estuaries in ways that produce the services for urban societies, because they are the people who are on the land and they know it better than anybody else.

I think there was a reasonably important reason, that it is going to catch us anyhow. The agricultural community, as you know, continues to be caught with declining terms of trade and on my judgment can no longer be expected to produce cheap, clean food and fibre, as well as provide a free service to maintain all the eco-system functions in the landscape that provide the services essential to urban society. That is an important position for me.

You have got these declining terms of trade and I do not think that will be reversed greatly. It may be moderated in some industries in the next twenty years, but looking at the global food demand issues and all that sort of thing, I do not think that is going to change greatly and therefore, expecting this part of the community to not only work with those hard conditions in its own right, but at the same time provide a whole lot of services which we take for granted. I think that sense of equity across our society has got to be addressed. That is another driver, I think, that will make quite an important part of getting a landscape where the land use is valued by what the farming communities and grazing communities do and provide the services that we all benefit from.

CHAIR: I must say, your opening presentation there was obviously done with the benefit of having our indicative questions already presented to you and I know that you have previously touched on every aspect of the questions that we want answered so that we can prepare our report. I would like to start off with the first question, which says could you provide the farming systems and land use practices that are unsustainable in the Australia context now? Coming back to your first opening comments about annual crops and pastures - I know you went onto some solutions later in your presentation and I do not want to get into the issue of pointing the finger or blame and saying this should be cropped or that sort of crop should be banned from our State or our country, but just asking you from your own point of view, do you think if we were to head down this sustainable agricultural natural resource based concept, which is very much part of your submission, what crops are you looking at now that you think are unsustainable if we are to be successful in this area?

Dr WILLIAMS: The way I would put it is a sort of test or criteria on the lack of sustainability. If the cropping pasture system cannot cope with the climate variability, which is part of the game, without seriously damaging the social fabric or the environmental fabric, then it is not sustainable, and I think the way to do that is to make sure we are using land within its capability.

I think one of the things that probably will come out of the Natural Resources Commission's target will be the use of land within its capability, where you take into consideration the climate and the soils and the way that is being managed and is it being used.

New South Wales has made some good progress in modernising the land capability concept. To really be an important means, I think of driving us to recognise those land uses that sit outside of sustainability and in my judgment some of those will be in our marginal cropping regions where we have actually exploited a wet series of years and we are going to return to the dryer circumstances. One way of doing that is actually through the tools we have today, we can actually model the yield with 150 years of rainfall and work out the probability of a viable crop and feed that into an economic analysis.

Is it economic when you know at Walgett you have the likelihood of getting an economic crop three years in ten if you look at a period of rainfall of 100 years, and so that we can drive the movement towards sustainability from economic grounds, as well as is it sustainable in terms of being able to go through those sorts of fluctuations in climate - which you cannot resort to drought - I mean the drought is part of the game and sustainability is about living with it.

That measure is rarely applied and I think if that measure is applied, along with the economic measure, I think we will start to sort out the cropping systems that are outside the paddock.

Mr MARTIN: In relation to sustainable crops, we hear a lot and rhetoric about we are growing rice in an apparent area where we should not be and the same criticism is a generalised criticism of cotton, because of the huge amount of water and so on. Are they fair criticisms, are they the sorts of things you are talking about?

Dr WILLIAMS: I think sometimes those two get targeted unfairly, that is my honest opinion, because I think if you actually go through and say how many dollars - and you have got to look at the value add and the wealth generation right along the food chain - I think if you only look at it at the farm gate, it depends what the industry does with that raw commodity and how much wealth does it generate for the Australian community in terms of dollars per megalitre of water when you do that and if rice, for example, has a very high value add, it does, because Sunrise are turning out TV dinners and that sort of stuff where the rice is coming in at \$7,000 or \$8,000 a kilo.

If you convert that to water, you are saying, is that a good use of water? Well, if it makes more wealth and well being then that is what we should be judging it on.

Taking cotton, how it does, then you need to do the same sorts of sums. So I think it is a pity to target crops and industries without making sure we do those sums. If in fact we cannot manage the cotton industry without damaging the Darling forever, and we seem to be damaging the Darling with the extraction patterns for cotton, particularly in some of the headwater extractions that do not seem to me to be sustainable in terms of providing sufficient flow, then that is the question we have to face.

The other thing about rice that is unfair is that in fact rice is usually two crops, because you actually use the water to grow the rice crop, but that same water is used to grow a subsequent crop.

So, no, I do not pick those two. I think, to me, having systems of cropping and grazing that cannot cope with the aridity and variability of our climate and end up with serious wind erosion and serious water erosion and loss of soil property and placing families in awful trauma every few years, is where we should focus our attention.

CHAIR: It is not what we know but how we know.

Dr WILLIAMS: No. I hope that answers the question.

CHAIR: No, it does. As a matter of fact, I think a lot of people are going to be very happy with that comment about those two particular products, which are generally the target of well meaning but perhaps--

Dr WILLIAMS: Misguided in my judgment.

CHAIR: Whilst Mr Martin is asking questions, I might just ask if you could just look at questions 12 and 13.

Mr MARTIN: In relation to the implications to rural economies and societies of developing this new rural landscape, are there any comments on that? What will be the implications really?

Dr WILLIAMS: I think if we place a solution in the hands of the people in the community, and that is why I am a strong believer that the movement towards catchment management authorities and regional people - because one shoe does not fit all and so we need to recognise that. So rural communities to find their own futures and to have incentives to do that, by providing for them clear ideas of what the outcomes are that we want from matters of society and for them. I think the issue of providing incentives to work towards maintaining the eco-system services and work towards those new systems that not only provide a better income stream and can cope with the climate change. Like, for example, I have got farmer friends in south western Queensland in this current drought who did very well out of it, because they said, well, I haven't drawn on my traditional grazing enterprise very much in the last three years because I have drawn on my forestry enterprise, because they thought ahead and they have got a whole suite of forestry harvests that they have put in. Okay, the trees will grow, it is a thirty year time frame but if you think about it, once you get the sequence and rotation up, in those dry years, some of those beautiful timbers we can produce in our dryland forestry are generating that income stream for that family when grazing sheep is not on in the current season.

I think it is not a matter of banning and pushing people around, it is a matter of giving incentives to find solutions towards sustainability.

Mr APLIN: You stated in your article Farming Without Harming that we are now producing commodities with ever declining terms of trade. Could you expand on that, explaining what the implications of this are for sustainable agricultural systems?

Dr WILLIAMS: I think it is really important to recognise that the costs of production of agricultural enterprise is continuing to rise in real terms and the real term prices for the base commodities like wheat and sorghum is in real terms, genuinely declining. They tend to be declining at about 2 per cent per year and it is our actual efficiencies in the cropping industry of about that 2 per cent that is enabling us to stay in business. So we are getting gains of efficiency equal to those

declining terms of trade. We are getting that in the cropping industry but we are not getting it in the animal industry, and people get trapped in the situation, they have got very, very asset rich and cash poor, and then to expect those very same people to address many of the impending natural resource management problems caught in this vice, is not only, I think, socially inequitable, but it is cruel and I think we need to look at it differently and recognise that we have got to get out of that cost price problem by looking at either recognising that the many other services those people are providing to us as a whole, through habitat management - and there is some really good work in Victoria on habitat, carbon sequestration, all these other products that are possible to generate that need to be paved forward, at the same time making the switch to those things that are a better financial outcome.

It is that very difficult situation Australian farming is in and the really important thing is to recognise that it is going to be impacted by firstly, oil prices, because our agriculture is very dependent on oil in terms of obviously diesel, but that is just a minor one, the big one is nitrogen fertiliser, basically mostly come out of the petroleum industry as you know, and then the plastics that are fundamental to our agriculture. There is probably nothing more fundamental to agriculture's benefit than the plastic pipe. Those cost structures I think will be increasingly putting pressure on the system and yet we are expecting for natural resources to succeed for those cost pressures to manage to provide the services that we all take for granted. That is what I mean.

Mr MARTIN: In terms of world commodity prices for agriculture products, you do not see any golden rainbow for us there?

Dr WILLIAMS: I do not find any economists and I have tried to - I have another piece of work I did for an international look around the world to find where commodities - not the commodities that we are in anyhow. There are some that we might but not the big bulk, carbohydrate, dominant commodities, but the opportunity - that is why these other industries are attractive to me - that they are essentially Australian. I mean, who else is going to produce wattle seed that is in the gourmet condiment industry? You might say that is just condiment, it doesn't really matter, but if your margins are high and the product is easy to transport and you are the only place who can produce it because it is Australian and has a flavour, a difference, it is product differentiation, all that sort of stuff, that is what I mean.

I do not have all the solutions, goodness no, but I think if we can paint some vision like that, others will.

The Hon. IAN ARMSTRONG: I suppose it is fair to say that there has never been much money in putting seeds in the ground and stripping the results and selling off the results. It is only basically as to how well you buy and how well you sell.

Dr WILLIAMS: That is right.

The Hon. IAN ARMSTRONG: Over the years we have seen a number of these embryonic industries started with great enthusiasm, some succeed, the majority do not and many of them, of course, have been established out of the obvious market - you talk about wattle seed and I know that there were a couple of the environmental fellows about fifteen years ago, one guy who had a place across in Darling Harbour, whose name I cannot think of - he had a long pony tail - very, very good marketer, but eventually it got him too.

Dr WILLIAMS: I would endorse what you say, that unless you have got a market, you have got a market pull, it is hard to get going, but wattle seed does have a market.

The Hon. IAN ARMSTRONG: A profitable market?

Dr WILLIAMS: Yes.

The Hon. IAN ARMSTRONG: Domestic or export?

Dr WILLIAMS: Export mainly.

The Hon. IAN ARMSTRONG: Has it got quantities?

Dr WILLIAMS: It is about 15,000 tonnes. That is not a lot but it is viable. It is currently coming out of South Australia and south western Victoria in the mallee country. No, you are right, unless you get the market drivers, but Macarthur had the same problem with wool.

The Hon. IAN ARMSTRONG: They have still got it with wool and they have still got it with wheat and they fight like Kilkenny cats.

Dr WILLIAMS: There is no doubt about it, you are right, you have got to crack the market.

The Hon. IAN ARMSTRONG: The only reason beef is going well at the moment is because of mad cow disease. The only reason the pigs are going well is because of Singapore disease. So you really make your profit at somebody else's expense in agriculture.

Dr WILLIAMS: Well, you make it through the capital gain of your asset, your land. I mean if you take the land value asset increase out of Australian agriculture it is a pretty tough game, a 2 per cent sort of margin. Why agriculture comes out okay is because of the capital asset.

The Hon. IAN ARMSTRONG: In your presentations the marketing has played an important part of your thinking.

Dr WILLIAMS: My word.

The Hon. IAN ARMSTRONG: Being able to identify markets?

Dr WILLIAMS: Yes and particularly the one with which I have had the most to do and it is probably the most progressed of the radical is the oil mallee project and getting a sense where you have got a market for energy and to get some, in Western Australia, major energy companies seriously in the bio-energy side of it.

The Hon. IAN ARMSTRONG: What about flavours, as in marketing of flavours?

Dr WILLIAMS: Very important. Marketing of flavours is really where it is going, the Australian flavour in things, like the Red Ochre Restaurant chains in California and elsewhere are all using those flavours.

The Hon. IAN ARMSTRONG: We have really only got two producers in New South Wales, one in Griffith and one in Cowra doing it.

Dr WILLIAMS: Yes., that is the problem, yes, but then take our native flower industry. Okay, the Israelis have made a bigger one in the same time frame than we did, but that was little and now it is an industry that is growing, particularly in Western Australia, exporting native flowers. You go to the markets and that sort of thing, but I have seen enterprises in Western Australia where we have got wheat and lucerne rotations alongside grevillea and other protea that are growing in the same field.

It is a hard call. We have got to find a better future.

Mr MARTIN: In talking about this vision for sustainable landscape, have you locked that into what is also a sustainable population for our continent?

Dr WILLIAMS: Well, I have not been able to get to that stage but I think to me, as our oil prices change, I think that is going to be more and more important to have, clusters of communities that can actually sustain themselves. To me the opportunity in some of these industries for regional energy generation is increasingly important. For example, if we could crack the enzyme from wood to alcohol - we can go some way - the University of New South Wales is so close in doing that - you would then have just as a bi-product from your forestry industries and agri-forestry, a product where

you have generated alcohol which feeds beautifully, it is an alcohol, it feeds into a fuel industry.

In many of these things I think you have got to start thinking about how these industries not only will solve the natural resource problem, but are linked to managing the quality of life and wealth generation in the communities and some of these things have good potential.

CHAIR: Any other comments from the Committee members?

Mr APLIN: The Committee understands that you have inspected Peter Andrews natural farming system. Could you describe to the Committee how the system works and what you see is the principle behind the idea.

Dr WILLIAMS: I think Peter is one of these innovative people who can read the Australian landscape. What Peter has done is recognised that most of our valleys in eastern Australia have a feature about them, before we impacted on them badly, of what we call a chain of ponds. The stream is a chain of ponds and then wetland and pond and so on, and often there is an interface with the geological structure.

It is pretty common if you drive through eastern Australia. What we did when we came there, we often wanted to drain the swamp and we actively got in and put a drain in it and took the water out or we actually over-grazed the bottom of the valley and we ended up with an erosion gully. The erosion gully basically drained that landscape, so under the system that was there before we interfered with it, we had these chain of ponds where we had fresh water sitting in the bottom of a valley in the swamp - or what we might call a wetland today - and that fresh water sat on top of any saline increase from the landscape - which was natural anyhow and often the swamp was part of the landscape's ability to get salt out of it without damaging it, because you could either dilute it down and it would wash out - and that was very common in northern New South Wales and southern New South Wales salinity issues. We have tended to get a one minded solution.

What Peter is doing is trying to reconstruct the flow of water in the landscape to more be like what it was before and that means it is very much a rehabilitation of the stream and retains the water in the landscape and uses it there as a place for deep rooted perennial pastures.

We have done enough work on it to say that there are, in the early stages if you capture that flood water and put it into the flood plane aqua duct, then what you are doing is putting fresh water on top of salt, so it sits there quite happily in the saturated soil. There will be an impact on the hydrograph, the relationship between time and the flow of the river. Many of our gully systems goes like that, a very peaky sort of thing.

If you go to valleys that have not been damaged, they are a much slower manageable flow regime and what Peter is doing is putting it back into that hydrograph than the other one. So there will be some immediate impacts downstream but over time they will become quite minor.

We do need to do more work on it and there will be some catchments where the process I have described is not the process. I am more and more impressed with the number that are. But there are some problems because you immediately run into conflict with people saying rising water table is a bad thing - but it is a fresh water table. Other people say but to get the cycling of carbon working you use a pioneer plant. What is a pioneer plant? A weed. So suddenly you have got a problem. What do you do to try and get the stream to start to accumulate and slow the gradient down, instead of a stream having a gradient like that, it has a gradient like that with little steps in it, and you have to introduce some obstruction in the stream. Okay, immediately you have got all the traditional analysis of water resources on your back.

I tried to get a robust scientific analysis of it out to give some credibility to it. It is not without its problems but I think it is the sort of thing of putting the landscape back into the way it works best. Sorry, I took longer than I meant to.

CHAIR: No, that is all right. I was going to say not only your answers but your opening comments certainly covered so much of the indicative questions that we had actually previously sent to you. Unless there are any other questions from the Committee members, we will be sending you a copy of the Hansard for your correction and also if you could look at that in conjunction with the questions that we have previously sent to you and if you would like to add any aspects to it, because I think I speak on behalf of all of the Committee, we found your very objective report refreshing. There has been no blame game here, no industry has been picked out and it was a combination, I think, of very much a technical presentation recognising the real world situation in agriculture.

Dr WILLIAMS: I probably would like to try and help contribute to question 16 because that to me is what stands in the way, how do we make progress.

CHAIR: You did make some reference to the bigger vision in your opening submission.

Dr WILLIAMS: Thank you for receiving me and I have left a copy of the paper which was my opening statement and I do welcome and wish you well in your endeavour. It is such an important topic.

CHAIR: Your evidence has been very helpful. Thank you very much for that. You are very welcome to stay for the next presentation.

(The witness withdrew)

CHAIR: Thank you for appearing before the Committee and we are looking forward to hearing your evidence. I am advised that you have been issued with a copy of the Committee's terms of reference and also a copy of the Legislative Assembly Standing orders 332, 333 and 334 that relate to examination of witnesses. Is that correct?

Prof. EAMUS: That is correct.

DEREK EAMUS, Professor of Environmental Sciences, University of Technology, Sydney, PO Box 123 Sydney, NSW 2007, sworn and examined:

CHAIR: I understand there is no formal submission, although we do invite you at the end, as I have previously indicated, when going through the indicative questions as they were referred to you, when you are proof reading the Hansard that will be sent to you, we certainly invite you to either clarify or expand or make any corrections or make any other comments that you believe would be helpful to the questions. We certainly invite you to make some opening comments.

Professor EAMUS: I just want to make six or seven simple points, which hopefully we can then discuss. The first one I want to make is I believe eco-system services are a key methodology for linking the monetary economy, the science of ecology and resource management, and also the community at large, including all stakeholders. In that I include industry as a stakeholder.

The second point I want to make is I believe that there is no systematic inventory of eco-system services in New South Wales or even across the country as a whole.

The third point I would make is I do wonder whether the political will may be lagging behind the public will to embrace the change that we need in order to move forward towards sustainable development and that we need the long term vision and will to manage the long term needs for ecological sustainable development.

The fourth point I would make is I think there is a need and definitely a scope for the New South Wales government to put together a trans-disciplinary team with the sole objective of defining eco-system services for New South Wales and that team would include - and I think it is very important that we include - economists, ecologists, resource managers, sociologists, community stakeholders and industry representatives and in that way I think we will be able to formalise a best practice approach to the quantification of eco-system services across New South Wales. I think that would be useful.

The fifth point I would like to make is I think a negotiated settlement is the only way in which we can move forward and negotiated settlements must involve the community values and community stakeholders, resource managers - in which I include State government departments and industry and the scientific community and economists.

The sixth point I would make is a philosophical point, and suggest that water is not the resource, indeed, water, soil and such-like I do not believe are the resources we should be managing. We should be managing landscapes and eco-systems, because that is the basis of everything that we base our economy on.

The seventh point is I think eco-system services can provide, when done properly, a legally defined and legally defensible approach to the management of resources.

I just thought I would start with those if that is okay.

CHAIR: I would not mind asking you to expand on one, particularly number three, the political will. I would not mind asking you to expand on that one. It has always been a dilemma for us, I mean around this table here there are politicians with different roles to play and different political parties and management. I think everybody believes that we should be heading in a certain direction. I think, to be fair, we have done and I think around the country but you always come up with the issue of just how you implement the next stage, whether it is a tough decision, whether it is

about water management, whether it is about land caring. There are topical debates going on. I would not mind you just expanding on that point for me before I ask some of the other Committee members to ask you some questions.

I think it is a fair point, by the way, I am not challenging the point you are making. I just want to see to what degree you see this as holding back the progress in this area.

Professor EAMUS: I think society in Australia in the last ten years - possibly longer but I have only been here for fifteen - has undergone quite a significant change in its understanding of the relationship between, for example climate and productivity or for example, the relationship between an agricultural productivity system and the long term sustainability and I think the Australian community has embraced the need for that change and is one step ahead of the political will. I understand why that might be.

One example - I don't know whether this is appropriate but I tend to do this - the idea that the population of Sydney is not willing to take on recycled water I think is not borne out by community values. They understand that for example in London, each glass of water you drink has been drunk by seven other people and I do not think the people of Sydney are at all different from the people in London and that they are quite willing to see that that is quite doable. I do think community values are maybe one step ahead of the political will to make those sorts of steps. That is just one example.

CHAIR: That is a fair point. There has been some recycling going on but often to do with the grey water area. The actual drinking one where I think there has been a lot of public comment. That is a very interesting statistic, in London each glass of water drunk has been consumed by seven people before. Is that the statistic?

Professor EAMUS: Yes, that is it, yes. Another example would be, if I may, the idea of a decentralised system for water. I think people are very keen to see a decentralised distribution system for water and are willing to embrace the idea of putting in water tanks and having a localised system but at the moment we seem to be locked in quite to a centralised processing and distribution system. It is just an example of where I feel community values might be one step ahead.

CHAIR: A fair point.

Mr MARTIN: At the Australian Water Summit earlier in the year, I think you said - let me know if the quote is wrong - that lack of understanding of the economic value of the eco-system services is causing long term impoverishment of both the economy and ecology and development of countries. Could you expand on that and particularly some instances of where it is.

Professor EAMUS: Businesses have tended to look at short term profits - and that might be five or ten years, I do not mean six months or one year - maybe fifteen years - and they have seen a pathway to generate the income over that fifteen years let us say. What they have not considered is the longer term erosion of the base resources. The classic example, I imagine, must be salinity, where changes in landscape hydrology, because we have removed trees from the landscape, changes in landscape hydrology have given rise to dry land salinity, which has had a major impact on infrastructure, railway sleepers, foundations of buildings, foundations of roads, but also the quality of the land and we are seeing a loss of agriculturally productive land.

There would be an example, I think, of where if we had valued eco-system services and the landscape as a whole, rather than looking at the profit generated, for example, to crop A, B or C, then we would maybe have made different decisions.

There is an example where I think if we had understood the value of eco-system services we would have changed the decisions we have made.

Mr MARTIN: For instance, in terms of the cost of dealing with loss of nutrients. When you think about it, it is hard to quantify isn't it?

Professor EAMUS: Well, it is not terribly hard, we just have not done it in Australia but if I can just refer - I don't keep these numbers terribly well in my head - but globally nutrient recycling, for example, globally was valued by a study at \$17 trillion per year. You can scale that down to Australia but it is still going to be a big number and a big fraction of Australia's GDP.

If we were to understand and put a dollar value, for example loss of nutrients through soil erosion, then I think we would suddenly start changing the decisions we make and about deciding what is a profitable approach to agriculture or forestry or whatever, because we would understand that we have to look at the whole costs, not just the profit from the crop. When you lose the nutrients over fifty years you can see that that is actually far in excess of the dollar value of the crop over fifty years.

Mr MARTIN: So it is possible to equate this in balance sheet terms or to write it into the balance sheet?

Professor EAMUS: I am glad you have said that because that is my fundamental point. My first point that I said was eco-system services are a key methodology for linking the monetary economy - and that is what we have to influence. There are no two ways about that. We have to influence the monetary economy. To do that we have to put dollar values - no matter how crude they are - to these eco-system services. This provides us a language with ecologists, the resource managers, to engage with industry, the community in a language which is common and the language that is common to everybody are dollars.

CHAIR: I might just take up the first question on the questions that have been circulated. You make some reference to it. Just for the record, would you tell the Committee simply what is meant or what you actually mean by eco-system services and provide examples of how it would work in practice. Would they provide a way to evaluate the economic benefits often serving natural eco-systems.

Professor EAMUS: Eco-system services can be defined as those processes and those attributes of an eco-system that have a direct benefit to humans. There are many eco-system services and I will just list a few, because it is surprising what services really are eco-system services, ie, what services do have direct benefit to humans. I will just go through a few. Soil formation, erosion control, the regulation of water flow, water purification, climate regulation, carbon sequestration, pollination by insects, waste disposal and treatment, food, timber, textiles, genetic resources, nutrient recycling, pollution interception. They are the range of eco-system services and many of those are not immediately apparent until you sit down and try and think about them.

CHAIR: I am just trying to get your interpretation or definition of that. I will just ask Mr Aplin to ask the next question.

Mr APLIN: You mentioned in your opening remark some of the personnel and organizations that could be involved, but what institutional arrangements or other changes would need to occur to have eco-system services to become part of the natural resources management decision making process?

Professor EAMUS: To be perfectly honest, I don't have a very good answer for that. What institutional changes - I am not sure I understand the question. Institutional as in legislation, business?

Mr APLIN: You refer to some of the government departments, so in identifying them what outcomes would you expect?

Professor EAMUS: Okay, now I think I understand, thank you. One of the things I think that would be extremely useful institutional change would be to actually put together within departments of natural resources for example, teams which really did comprise serious economists, serious ecologists and land resource managers, with sociologists and community stakeholders.

When you put those four groups of people around the table, they can seriously look at the decisions and the management processes, the legislation and policies that are then going to drive resource management across New South Wales. I think at the moment we tend to have silos of economists over here, ecologists over there, sociologists over there and there is no coming together to address resource management at an eco-system or landscape scale.

Mr APLIN: A holistic approach.

Professor EAMUS: Yes, it is a bit of a woolly phrase but it is bringing in the serious economists and ecologists and sociologists, because you need all three disciplines to come up with an assessment of eco-system services, which you then inform policy.

Mr APLIN: What do you see as the relationship between groundwater dependent eco-systems and a sustainable landscape?

Professor EAMUS: Well, groundwater dependent eco-systems, there are a large range of them across Australia, mound springs coming out of the Great Artesian Basin would be a classic groundwater dependent eco-system. When you pump the Artesian Basin too far mound springs drop off, there is no pressure. A lot of rivers which are reliant on base flow in dry periods are groundwater dependent eco-systems.

You could almost use those as the canary in the mine shaft. You do not want to see them fall over but if you watch them you can see the early changes that indicate that what we are doing is having a negative impact.

Groundwater dependent eco-systems do have financial value. They have cultural value, they have recreational and spiritual value and economic value. So it is worth using those as the canary in the mine shaft.

CHAIR: You made some comments there which provoked a couple of other questions. The idea of bringing these players - you say that they are all in silos around - we have catchment management authorities, the Murray/Darling basin for example dealing with an aspect of it, the Wentworth Group is a scientific group. How do you see their roles as being different to the role that you envisage that we should be progressing to. Is it the connection between those authorities and the final legislators?

Professor EAMUS: I think that is right, I think it is the disjunction between the line of accountability between the policy formulators and the people out who are operationalising those policies. We need the feedback loop. But you are right, the catchment management authorities are a very good step forward. The Wentworth Group are very important and influential, so it is not that it is not happening, because it is, but it could be happening in a more systematic way and a more pervasive way.

CHAIR: I just want to clarify that in connection to the final outcome.

Mr MARTIN: Just going back to the eco-systems and talking about the dollar values, through that process somewhere do we start talking about sustainable populations as well, particularly in relation to our landscape?

Professor EAMUS: We do and I think one of the useful concepts in relation to the population debate is the ecological footprint. The idea that you can take a household, a town, a city, a continent, whatever scale you want, you can ask the question, what is the ecological footprint of a household or a city, how many resources are required to keep that going, and then you can ask the question, well, if we work out the ecological footprint and it turns out to be far larger than we have available, then that will inform the population debate, because if the ecological footprint of 50 million people was ten times the resource base that we have, then that tells you something. It could be that

for 50 million people, the ecological footprint could be smaller than the resource base we have, and that tells you something.

I am not pre-supposing what the answer is or what the population that is sustainable is, I am just saying there is a methodology for coming up with an estimate that has some rationality behind it.

CHAIR: Any other questions by the Committee members?

Mr APLIN: If I could just follow up that question. It is somewhat related and also relates to the previous witness here. Well known scientists are arguing for a number of radical changes to the way in which the Australian agricultural landscape is managed, calling for a re-design of the agricultural systems that acknowledge the operation of the Australian environment. Would you agree with that?

Professor EAMUS: Totally. Would you like me to expand?

Mr APLIN: Yes.

Professor EAMUS: I do agree and like John, the previous witness, there is no purpose in apportioning blame. We can go around in many loops and circles and that is not useful. What we need to do is to look at what options there are for changing our agricultural systems. Having decided what the options are, do an eco-system service analysis for the different options, do a cost benefit analysis - which is one of the great things about eco-system services, is it allows you to do an economic cost benefit analysis and then use the instruments of whatever you want to use, to change the agricultural structure to achieve the outcome that we want, which is, sustainable.

At the moment we are not doing an eco-system service analysis and therefore we are allowing agricultural productivity systems to evolve, which is very short term vision and very short term profit driven.

Mr APLIN: It also relates then to the question previously about institutional arrangements, because quite clearly that answer implies that they are directly involved.

Professor EAMUS: Yes.

CHAIR: Unless there are any other questions - I know we have some indicative questions, which I would not mind you making some responses to but could I just jump you right back to the start, point seven, eco-systems - I just made a pretty rough contemporaneous note there - legal definition or legally defined. Could you give us that seventh point again and expand on it, because it seems to suggest, by virtue of the first question we asked you today, what is meant by an eco-system - is there a legal definition of that? So we all know if we are talking about cheese or chalk.

Professor EAMUS: There is not one but I think there can be one. I think one of the things that I have gleaned from, for example, the National water initiative, one of the impediments appears to me - and I am not terribly knowledgeable - was that there was a requirement for a legally defensible statement as to volume flows, allocation of dams and rivers, allocations to irrigators and account from year to year variability, and that when licences are being given out, they can be challenged in Court for the volumes, so I got the impression that it was important that decisions made by State government departments about issuing of licences and volumes and such like, could be challenged in Court and therefore have to have a good scientific robust underpinning.

I think eco-system services could provide that in the same way that we saw it in, for example, water trading rights. My main point is not the legally defined part, my main point is a defensible approach and that you could stand up in Court when challenged when making policy decisions and defend it with a very solid underpinning of science. That is what I was trying to say.

CHAIR: Are there any other points that we need to tease out at this stage?

Mr APLIN: I do not think so.

CHAIR: Thank you very much. You have certainly given us some strong points to deliberate on, particularly I think your opening seven point method was very helpful, but also just to reiterate what I said earlier on, that we will be asking you to expand maybe on any other aspects we have not touched on in the other questions, anything you would like to elaborate on and of course you will be asked to check your own evidence at a later date.

Professor EAMUS: I do not know whether this is done appropriately or not but I have the Turner review I wrote that came out this year and it is on eco-system services and it runs through what they are, why they are important and how we might deal with it. Is that something I can put on the table here and say here is a copy?

Mr MARTIN: It is tabled and will be part of our report.

CHAIR: On that issue about the definition, are you aware - is it an unfair question - has any other country in the world or any other State in Australia, has anyone ever tackled the idea of such a definition that we could work off? If you are not aware of that it is maybe an unfair question. I think your point is we should actually come up with a definition.

Professor EAMUS: There are several definitions in the scientific literature and I allude to those. America has gone quite a long way down this path. There is a group in the CSIRO who are developing some good thinking on this and I can go and find the details later but they are moving forward on this.

CHAIR: Thank you. That gives us a line of inquiry. Thank you very much and a very thought provoking submission. As I say, it does not end today, we ask you to think about any other comments you would like to make in answering those sort of questions that have been previously sent to you. We appreciate your time and also the quality of your evidence.

(The witness withdrew)

(The Committee adjourned at 12.20 p.m.)