

Economics Legislation Committee, 20/10/2016

Estimates, INDUSTRY, INNOVATION AND SCIENCE PORTFOLIO

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Questioner

CHAIR, Carr, Sen Kim, Whish-Wilson, Sen Peter, Roberts, Sen Malcolm, Macdonald, Sen Ian, Sinodinos, Sen Arthur

Responder

Sinodinos, Sen Arthur, Dr Finkel, Ms Beauchamp, Mr Calder

Office of the Chief Scientist

[14:03]

Senator Sinodinos: No, I do not have one. I would like to compliment you on your chairing of the committee so far.

CHAIR: Thank you very much! That is very kind. Chief Scientist, would you to make an opening statement?

Dr Finkel : No, I am happy.

Ms Beauchamp : Nor me.

CHAIR: If that is the case I might open the questioning to the panel

CHAIR: Terrific. Thank you, Senator. Senator Roberts.

Senator ROBERTS: Thank you. My question is to the Chief Scientist. Dr Finkel, I am sure you would know and agree that empirical evidence decides science, wouldn't you?

Dr Finkel : Empirical evidence is important.

Senator ROBERTS: So it decides the science?

Dr Finkel : I would say that science is complex. Especially today with the issues that we are tackling, many of which are decided through modelling and statistical approaches, it is not always simple to say here is a definitive piece of evidence one way or the other.

Senator ROBERTS: On what basis do you believe that carbon dioxide from human activity affects climate and needs to be curtailed? Dr Finkel : I think the principles that lead to that—not your final conclusion, but to the effect on climate are quite clear. Across all the countries of the planet we have been burning fossil fuels at a rapid rate. It is clear that by doing that we are emitting ever-increasing quantities of carbon dioxide into the atmosphere. The natural systems cannot absorb that. So there is a clear hypothesis. And then there is clear evidence.

The thing that I find most compelling is when you have got the combination of a hypothesis and evidence.

So, when it comes to carbon dioxide, it is clear what would be driving increases in carbon dioxide. Then you got out and measure it. And carbon dioxide goes up every year. Last year, carbon dioxide in the atmosphere went up 3.05 parts per million, which is more than any other time. So the carbon dioxide is going up. Does that create warming?

The theory that carbon dioxide in the atmosphere does trap heat—ultraviolet light comes through the atmosphere without interruption or almost without interruption, hits the ground, warms the ground, and you get an infrared radiation back from the ground which is then to some extent trapped by the carbon dioxide—goes back to 1896. A Swiss physical chemist, Svante Arrhenius, did the initial work on that. He subsequently got a Nobel prize for other work. He identified, back in 1896, that carbon dioxide in the atmosphere, for basic physical reasons, will trap heat.

You have the carbon dioxide. You have the physics that says carbon dioxide will trap heat coming off the ground being radiated from the surface and from the water as well. You have the clear physics. You have the hypothesis. Do you have the evidence? Yes. The temperature is going up and up and up. I think it was just yesterday I saw NASA declared the last 12 months have yet again been the hottest on record. So in both cases—carbon dioxide going up and it trapping heat—you have got evidence and theory. In the second case, which is that that trapped heat will lead to an increase in temperature, you have the theory and the evidence. So that is steps 1 and 2. The third step is the impact. The temperature is going up; what will that do to climate? That is where it gets very, very difficult. Now you are into the realm of modelling.

Senator ROBERTS: On whose data do you rely for your statement that the temperature is going up and up and up? You mentioned NASA.

Dr Finkel : Everybody's. NASA are very reliable. NASA has, over the years, taken the combination of thousands of terrestrial recording sites and their satellite recordings, and with great consistency they are seeing the temperature going up. And then you have that UK bureau of meteorology, the National Oceans and Atmospheric Organisation in America, our bureau and pretty much every organisation in the world.

Senator ROBERTS: Pretty much every organisation in the world?

Dr Finkel : Well, every major scientific organisation.

Senator ROBERTS: Every major scientific organisation in the world? Has anyone audited that data?

Dr Finkel : I have not been involved in any of those processes—

Senator ROBERTS: And how many different databases are there?

Dr Finkel : At some point, (a) you have to have confidence in your colleagues. But the Bureau of Meteorology was attacked in Australia a few years ago and went through an extensive audit of its terrestrial records.

Senator ROBERTS: I would question the use of the word 'extensive'. So perhaps you could give me a comment—that in order to justify cutting the human production of carbon dioxide, we would need to, first of all, show that temperatures are warming, they are warming

unusually and they would have to continue warming, and that warming is ongoing. Would you agree?

Dr Finkel : Absolutely. And I think that we have shown that, Senator.

Senator ROBERTS: I am not asking whether or not it is shown. I am just asking—this is the logic I want to get through first. Assuming that the temperatures are rising unusually and that they continue to rise, the second thing that we would have to prove empirically is that the level of carbon dioxide in the atmosphere drives the temperature.

Dr Finkel : I do not think you have to prove that. The sequence that I outlined already contains that level of thinking. Carbon dioxide has been going up measurably since this side of the industrial age.

Senator ROBERTS: We will get to that in a minute.

Dr Finkel : Temperatures have been going up subsequent to that.

Senator ROBERTS: So you agreeing then that to prove that human activity needs to be curtailed, or the production of carbon dioxide from humans needs to be curtailed, we first have to prove the temperature is rising unusually and is continuing to rise—we agree. The second thing we would have to prove is that the level of carbon dioxide in the atmosphere drives the temperature—which you just said. Then the third thing we would need to prove is that the level of carbon dioxide in the atmosphere is determined by human production of carbon dioxide.

Dr Finkel : I cannot agree with you, Senator. You have put three consequential steps in there. I think it is two. The first is that human activity is leading to an increase of carbon dioxide in the atmosphere. The second is that as a result of that, through simple physics that was proven in the 1890s, you will get a subsequent temperature rise. So I only see it as two steps, Senator.

Senator ROBERTS: All right. That is two steps. The fourth step—or your third step—would be that warming is detrimental to the planet and to civilisation.

Dr Finkel : Exactly what the impact of global warming will be is determined—well, we have models to try to predict what that will be. And that is difficult. There are a lot of models, and it is not as easy to predict what will be the consequence of the warming as it is to say how fast a mass will move if you apply a certain force. But the models do predict significant climate change?

Senator ROBERTS: So you are relying on the models for that last part?

Dr Finkel : Absolutely.

Senator ROBERTS: Absolutely relying on the models. Would you be able—take it on notice—to provide me with a summary of the logic that you have just outlined and the empirical evidence at each stage, or, failing the empirical evidence, the models at each stage.

Dr Finkel : I could certainly give it a try on notice.

Senator ROBERTS: Thank you very much. I would appreciate that. It does not have to be long. I just want to check the logic and I just want to check the data sources.

Dr Finkel : I am with you, Senator; I prefer it short.

Senator ROBERTS: Like me: short and simple. Wonderful!

CHAIR: Thank you, Senator Roberts. I have a quick question for you, Dr Finkel. In the interest of time, I am hoping we can keep it brief. I just want you to give us a little bit of an update of the sorts of things that are going on in your office at the moment—what sort of activities your office is doing.

Dr Finkel : In the area of STEM education, we have a couple of programs that we are looking at—one very actively involved in—to do with schools education. One is to take to the next stage a project that I inherited. My predecessor Ian Chubb, working with Roslyn Prinsley in my office, developed a compilation of all the extracurricular activities that we could find in Australia that are really stimulating for students' interests. But a compilation like that is permanently out of date on the day you publish it. So we are converting that into a digital online portal that can be maintained by the providers and be easily accessed by parents, students and teachers. Without going into too much detail, we are looking at a program that will help principals in schools to develop a science and mathematics plan for progress that is individualised to their school.

In science, a lot of the work that we have been doing is captured by the work that you have perhaps seen through the communique from the Commonwealth Science Council, where we are meeting with the Prime Minister; the Minister for Industry, Innovation and Science; the health minister and the education minister and 10 external industry and academic leaders. We have covered off on four significant topics and discussed with the Minister for Industry, Innovation and Science a science policy statement that may be put out that is looking at teacher professional development training and preservice subject-specific training.

As a deep consideration of the Research Infrastructure Roadmap that I am leading with a taskforce from the Department of Education, and of tremendous exciting interest, is a program of foresighting reports that are otherwise perhaps called 'horizon scanning' reports that are looking at what are the big issues coming from over the horizon that potentially will have enormous impact in Australia. With sufficient lead time, the government can have an opportunity to think about its policies and the ways it will take advantage of the opportunities that those new science areas represent.

CHAIR: Terrific. Thank you very much for that. I realise you are on a very tight time frame, but I am going to call back to Senator Carr now for a few follow-up questions.