House of Commons
CANADA

Standing Committee on Environment and Sustainable Development

ENVI • NUMBER 003 • 2nd SESSION • 39th PARLIAMENT

EVIDENCE

Thursday, November 22, 2007

Chair

Mr. Bob Mills

Standing Committee on Environment and Sustainable Development

Thursday, November 22, 2007

● (1535)

[*English*]

The Clerk of the Committee (Mr. Normand Radford): Order, please.

Honourable members, since the chair is absent and the two vice-chairs are absent, we have to elect an acting chair for this meeting.

[*Translation*]

Does anyone wish to make a motion to that effect?

Mr. Godfrey.

[*English*]

Hon. John Godfrey (Don Valley West, Lib.): I would propose Mr. Cullen take the chair for today.

The Clerk: Moved by Mr. Godfrey that Mr. Cullen do take the chair of the committee.

(Motion agreed to)

The Acting Chair (Mr. Nathan Cullen (Skeena—Bulkley Valley, NDP)): I get to speak for 35 minutes now, apparently, according to the standing rules of the House.

Committee members, this was just talked about within the last five or ten minutes, so I haven't done any preparation for today's agenda. Just give us a minute to catch up and be ready, and we'll work together on today's agenda.

Thank you, everyone, and thank you to our witnesses.

There's some business we need to take care of before we call this meeting to order.

There are two motions in front of us. There's been some debate, I know, among committee members as to how to deal with these, some question as to calling them forward and as to whether they'll be withdrawn or debated.

Is it the committee's interest to have these motions in front of us now, before we go to witnesses?

We'll agree to this only if we can do this in a quick and orderly manner. I hesitate to waste any of the witnesses' time. If this is going to be a long and protracted debate, then we'll move it back. But let's give it an initial shot and see if we can get through the motion or motions quickly, and then move from there.

Is that agreed?

Some hon. members: Agreed.

The Acting Chair (Mr. Nathan Cullen): Okay, I recognize Mr. Godfrey.

Hon. John Godfrey: Let's first of all find out how many motions are still on the table. There is Mr. Warawa's, and is yours still on the table?

Mr. Jeff Watson (Essex, CPC): No, I'm deferring it, sorry.

Hon. John Godfrey: No, so we're dealing with one motion.

The Acting Chair (Mr. Nathan Cullen): Okay, just for clarity's sake, then, I'll have the clerk hand this out as a motion from Mr. Warawa. Let's deal with it now.

Mr. Warawa, are you prepared to speak to it?

Mr. Mark Warawa (Langley, CPC): Yes, thank you, Chair.

I talked to the minister and shared the agenda that we're looking at between now and the middle of December, when we break after our last meeting on December 13.

On November 29 the minister is coming. On December 4, at the following meeting, we had planned supplementary estimates. I've talked to the minister. He would also be available to come to that meeting. The suggestion is that on December 4 we have the supplementary estimates, as planned, and also the Environment Canada budget, and have the minister available at that meeting also, so the committee would have access to the minister at two meetings back to back. That's on December 4.

December 6, 11, and 13 would all be on Bill C-377, and you would get a flow of continuity; that, I think, would be helpful to the committee.

That's the motion.

The Acting Chair (Mr. Nathan Cullen): Thank you, Mr. Warawa.

I'm wondering if any committee members have any comments on this before we see a vote.

Fine, then I will call the vote on Mr. Warawa's motion.

(Motion agreed to) [See *Minutes of Proceedings*]

● (1540)

The Acting Chair (Mr. Nathan Cullen): It is carried unanimously. Thank you.

We'll now call the meeting to order.

Pursuant to Standing Order 108(2), the committee is commencing its study of the Intergovernmental Panel on Climate Change Report. We have a number of witnesses before us, as well as a witness by teleconference.

From Carleton University, we have someone familiar to us, Dr. Stone. Dr. Stone will be making a presentation of some 20 minutes.

We also have with us Mr. Gray and Mr. Zwiers, both from Environment Canada.

Have you a presentation for us, or are you here as support for any questions committee members might have?

Dr. Brian Gray (Assistant Deputy Minister, Science and Technology, Department of the Environment): We're here for the latter.

The Acting Chair (Mr. Nathan Cullen): Thank you, Mr. Gray.

As well, via teleconference we have Dr. Weaver.

Dr. Weaver, are you there with us?

Prof. Andrew Weaver (Professor and Canada Research Chair, Atmosphere Science, School of Earth and Ocean Sciences, University of Victoria): I am indeed.

The Acting Chair (Mr. Nathan Cullen): Wonderful. Let's proceed. The first round of questioning will be ten minutes per party, the second round five minutes, and we'll see how the flow goes.

Yes, Mr. Warawa.

Mr. Mark Warawa: I have a question through to you, Mr. Chair. If the first round is ten minutes, I look forward to your perspective, and now with your being chair you wouldn't have that opportunity. I'd be willing to split my time with you, if that's permitted. I have ten. I'll take five and you can take the second five, if it's okay with the committee. I think it would be healthy for you to have an opportunity to also question the witness.

The Acting Chair (Mr. Nathan Cullen): Christmas comes early. It's a generous offer. What I might suggest is that rather than preventing you from having your full time on such an important topic, if it's okay with the committee, I will take my normal sequence of time at the fourth round. Is that fair? Is that approved?

Some hon. members: Agreed.

Mr. Mark Warawa: That's fine.

Mr. Ken Epp (Edmonton—Sherwood Park, CPC): I'll time you then.

The Acting Chair (Mr. Nathan Cullen): I'll pass you the clock.

Let's proceed. First, I believe Dr. Stone has a presentation for us.

Dr. Stone, when you're ready.

Prof. John Stone (Adjunct Research Professor, Department of Geography and Environmental Studies, Carleton University): Thank you very much, Mr. Chairman, members.

I was only asked yesterday afternoon if I would come to speak to you, and I am always delighted to do that. It didn't give me very much time to prepare a presentation specifically for you, I'm afraid. At lunchtime today I gave a lecture to the Ottawa chapter of the Canadian Meteorological and Oceanographic Society. If you would allow me, I would use some of that presentation to talk to you and to illustrate some of my points. It is much more scientific than I think appropriate for this audience, so I won't go through all of the diagrams in detail, but I urge you more to listen to what I'm going to say.

I think it's important for you all to understand what the IPCC is—that's the Intergovernmental Panel on Climate Change—and how it does its work. The IPCC was set up twenty years ago by the United Nations with the express purpose of providing to governments information on our state of knowledge of climate and climate change, and to do that in a balanced, authoritative, clear and accessible manner. It's important for you to understand that the IPCC does not do research; it assesses the products of research.

The assessments are written by scientists—Francis Zwiers here is one of the committee lead authors. They compose three massive volumes: one is on the science; one is on the impacts adaptation; the final one is on mitigation, on emission reductions and technology and economics. Each of those is then condensed into what is called a summary for policy-makers, and there are three of them. I have copies of them here with me today. They are actually now available on the IPCC website in all six UN languages. So I encourage you to see them.

The significance of the summary for policy-makers is the following. Although they are drafted by scientists, they're actually negotiated with governments. Nothing goes into them that the scientists do not believe is supportable. Therefore, they are scientifically rigorous documents. By having governments there, one ensures that the summaries for policy-makers are balanced and they're accessible, they're in a language that governments can understand, and they provide useful information. The key to it in the end is that when the summary for policy-makers is agreed to by governments, they're effectively owned by all governments. So these three summaries for policy-makers are owned by the Canadian government, the Government of the United States, the Government of Russia, the Government of Saudi Arabia, and the like. I think it's important for you to understand.

Now, there's a fourth volume, which is called a synthesis report, and we worked on that last week. It's also now available. The synthesis report contains several significant, clear, and I think important messages. I'll go through them, and this is my own interpretation, my own words.

The first message is that climate change is a reality and the evidence for that is now unequivocal.

The second message is that we human beings are the main cause of those changes in climate and that observed temperature increases since the middle of the 20th century are very likely due to human activities. When the IPCC uses the term “very likely”, it's a calibrated language, and it means it's stated with at least a 90% confidence. In science, if you get 90% confidence that's usually as good as it gets.

Furthermore, it concludes that we are already committed to some impacts because of what we've already done to the composition of the atmosphere, and therefore that some impacts are now inevitable. If we do not curtail growth of our emissions, those impacts are only likely to increase, and some of them may be abrupt and irreversible. Because of that, in my view, adaptation no longer is a policy option; it becomes a policy imperative.

The good news, according to the IPCC, is that we can actually do it. We can stabilize emissions at levels that will avoid dangerous anthropogenic influence with the climate system. In fact, we have the technologies already that we can start to implement. For that to happen, it's important that governments give clear encouragement, that there are clear policies, that there are clear and acceptable incentives.

● (1545)

The final point in my view as an old policy wonk is that climate change really has to be seen in the context of development. It is an environmental issue—that's how it was first defined—but it also can be defined as a development issue, as an energy issue, as a security issue. The broader one understands how one frames the issue, then in my view the broader the coalition of interest that one can bring together to solve it.

This diagram in front of you shows the temperature record over the last 150 years. Accompanied by it is the text above, the exact language from the *Summary for Policymakers* of working group one. As I said earlier, it just concludes that "warming of the climate system is unequivocal". What you can see from this diagram is a series of black dots, and that's the global mean temperature for every year, going back to about 1850. The interesting point is if you try to draw a straight line through the last 150 years, you will get the red curve. If you try to do it for the last 100 years, you will get the purple curve, for the last 50 years you will get the orange curve, and for the last 25 you'll get the yellow curve. What I'm sure is evident to you is that the closer one gets to the present, the steeper that curve is. In other words, the closer one comes to the present, the rate of temperature increase seems to be increasing.

There is similar evidence of an acceleration of the increase from sea level rise and from Arctic sea ice extent, and several other indicators. For example, global sea level rise in the years between 1961 and 2003 rose at about 1.8 millimetres per year, but over the last 10 years, from 1993 to 2003, that rate was actually double.

Satellite information shows quite unequivocally that the average Arctic sea ice extent has shrunk, particularly in the summer, by as much as 7.5% per decade to a level this year that is lower than we've ever seen it before. There's also evidence from mid-latitude westerly winds, the sorts of winds that struck Vancouver and Stanley Park a couple of years ago and Halifax the year before, that have strengthened in both hemispheres. The evidence on tropical cyclones and hurricanes is much more subtle, but there is strong evidence that the strongest of the hurricanes have increased in frequency over recent years.

So if there indeed is evidence that the climate has changed, one needs to ask if it's due to natural or to human causes. The answer is clearly the latter; it is due to human causes.

The right-hand side of this diagram shows some of the evidence that has been brought to bear to support that conclusion. I'm not going to go into detail, but basically the black line you see is the observations you saw in the previous diagram, and the blue line is the result of output from the climate models, if you force the climate system over the last 100 years only with natural forcing, which means changes in the solar variability, and volcanos, and the like. The orange graph on the upper part of that diagram shows you what would happen if you added anthropogenic forcing, which is primarily that due to greenhouse gases and aerosols. Although at the beginning of the century the fit using only natural forcing is not bad, as you come to the present date the fit gets worse and worse. In fact, you cannot fit the observed lines without evoking the forcing of greenhouse gases.

On the left-hand side is a rather complicated diagram, but in short what it shows is that the forcing due to solar variability is in the order of one-tenth of that due to natural anthropogenic forcing. This is, again, a complicated diagram, and I apologize for it, and I'm not going to go through all of it.

● (1550)

On the left-hand side there are some model runs done with lots of computer models of the climate. It shows that with all of the IPCC's emission scenarios, in the next two or three decades there's almost the same warming regardless of what scenario you use, basically due to what we've already done to the composition of the atmosphere, and that is that you're going to get a warming of about one degree by the year 2025.

If you go out to the end of the century the choice of scenarios does make a difference, and the warming is between 2°C and 3°C. To put that into context, the warming in the last century was 0.6°C. The 3°C rate is therefore a fivefold increase over what we saw in the last century.

There are other results that show what would happen if you could freeze the concentrations at certain levels. The climate system, because of inertia, because of its memories, keeps on growing in temperature and the sea level keeps on rising for several centuries afterwards. In fact, if you could freeze the concentrations in the atmosphere at today's level—which of course is entirely hypothetical, you can't do it in reality—then over the next two to three decades you will have an increase of 0.1°C per decade. That's because of the climate system inertia.

There's also inertia, of course, because of our technological and socio-economic systems. We can't go out and overnight have everybody drive a Prius or change all the coal-fired power plants to renewable energies. That also has an inertia, and it means that we are more likely to see a 0.2°C increase in each of the next two or three decades, about which we could do nothing. In other words, what it says is that in fact that part of history has already been written.

I'm not alone in this concern. The chairman of the IPCC at the press conference in Valencia on Saturday was quoted as saying "What we do in the next two to three years will determine our future. This is the defining moment."

I'm not going to go into all of this diagram, but what you see there is a diagram from the third IPCC assessment, and it talks about several different reasons for concern, which range from threatened ecosystems to the possibility of rather large discontinuities in geophysical systems.

The synthesis report looked at these and concluded that the five reasons for concern that were identified in the third assessment remain a viable framework for considering vulnerabilities, and—this is important—that these reasons are assessed in the fourth assessment to be stronger than in the third assessment. That's due to increased confidence that temperature increases greater than 2°C are likely to lead to significant threats to many ecosystems and have consequences for biodiversity, and there is increasing evidence from some of the extreme events we've seen that there is indeed a greater vulnerability. There is greater evidence that specific groups, such as the poor and the elderly, are much more vulnerable than we anticipated in the third assessment report.

And all of that allows some scientists to draw the diagram on the right-hand side—you won't see that in the third assessment, and you shouldn't take it too literally. But it's, again, an illustration, a schematic that shows the reasons for concern have become stronger.

The IPCC also looked at regions and sectors that are going to be impacted in the future and drew diagrams. You can't see these that well; you can see them better in the material on the web. There's one here, which is for sectors; you can see it for water ecosystems and the like. There's also a table, which is in the synthesis report, on the threats to geographical regions.

It also was able to identify regions that are particularly vulnerable, and I will mention them. There are four. The first is the arctic, because of high rates of projected warming on the natural systems. There's Africa, because of current low adaptive capacity as well as the large projected climate change impacts. There are the small islands, due to the high exposure of their populations and the infrastructure that's at risk from sea level rise and increased storm surges. And there are Asian mega-deltas, due to the large populations there that are exposed not only to sea level rise, but to increasing storm surges.

● (1555)

This slide gets back to the root causes of what I term the threat of climate change, and that's what has happened to the composition of the atmosphere. We now know that we have taken the composition of the atmosphere into areas we have not experienced for the last six or seven ice ages, going back at least 650,000 years if not a million years. We have therefore taken the atmosphere into uncharted territory. That is why, in my view, climate change should be viewed as a threat.

There is indication from recent publications that the rate at which CO_2 is building up in the atmosphere has increased, and the emission of greenhouse gas is now higher than any of the plausible emission scenarios that the IPCC had previously developed. This diagram shows in brief that in order to stabilize emissions we will have to peak global emissions at a certain level and then come down. The rate at which one does that depends on the stabilization level one chooses. That's of course not entirely a scientific decision; it's much more of a political decision. It depends on what you think is at risk and what you value.

The economic results depend on whether you look from the top down or the bottom up. If you look from the bottom up, you're essentially looking at various technologies and trying to estimate what they can achieve. If you look down, then you use these equilibrium economic models and understand what the economic system can tolerate.

But it's estimated that if you want to achieve no more than a doubling of CO_2 in the atmosphere, the cost will be between a 3% decrease in global GDP and a small increase compared to the baseline. Baselines, of course, are rather difficult to estimate, but at worst the impact on the average annual reduction in GDP until the middle of this century will be in the order of 0.1%. I'm not an economist, but I think that is usually regarded as a rounding error by most economists.

The Acting Chair (Mr. Nathan Cullen): Dr. Stone, you have just a few more minutes.

Prof. John Stone: Yes. I've almost finished.

The IPCC fourth assessment gives a lot of information on what countries can do to reduce emissions. Perhaps most interestingly, it seems that after conservation—which everybody understands because it's the lowest-hanging fruit—looking at making buildings more energy-efficient can produce tremendous reductions in emissions at fairly low cost.

I should say a few words about adaptation. Because the impacts are now inevitable, adaptation is becoming more and more an imperative. We have a lot of experience in adapting to today's climate variability; however, the IPCC's conclusion is that many more additional adaptation measures will be required in order to avoid some of the worst impacts. That's regardless of the scale of mitigation over the next two to three decades.

Finally, the point I made at the beginning from the working group two report is that if there are benefits in looking at climate change in terms of development, there's growing evidence that decisions regarding macro-economic policy, agricultural policy, multilateral development, bank lending, insurance practices, electricity market reforms, energy security, and forest conservation—which are often treated as being apart from climate policy—can significantly reduce emissions.

Vulnerability to climate change can be exacerbated by other stresses, and if we look at them and tackle some of these non-climate stresses, such as poverty, unequal access to resources, food insecurity, trends in economic globalization, conflict, and disease, they can also reduce vulnerability and increase our capacity to address the threat of climate change.

In my view, adaptive capacity is intimately connected to social and economic development. Of course development is not even, but the problem is that climate change is likely to increase the disparity between the rich and the poor.

Thank you, Mr. Chairman.

● (1600)

The Acting Chair (Mr. Nathan Cullen): Thank you, Dr. Stone. That was very interesting.

As I introduce Dr. Weaver, I'm not sure how the congratulations are in order, but congratulations on your contribution to the IPCC's winning the recent Nobel Peace Prize.

Dr. Weaver, are you ready to go?

Prof. Andrew Weaver: Yes.

I did not prepare a presentation. I was asked to be on the committee and I said I would be prepared to answer questions that were posed to me, so I don't have a formal presentation.

The Acting Chair (Mr. Nathan Cullen): Wonderful. Thanks very much.

We'll move to questions, then, and I'll start with Mr. Godfrey for ten minutes.

Hon. John Godfrey: We'll figure out a protocol for bringing Dr. Weaver in, and between Dr. Stone and Dr. Weaver they can sort out who answers what.

Since the third assessment report, what have been the biggest breakthroughs, if you like, or what are the biggest scientific understandings that have developed from the third to the fourth report? What are the things that strike you the most?

Maybe I'll start with Dr. Weaver just to give him a chance to get in, and then perhaps Dr. Stone.

Prof. Andrew Weaver: Personally, I think the sheer amount of evidence being built that has been added to our body of knowledge over time has just allowed a much stronger statement.

In terms of key advances in the report, I think Francis Zwiers, who is at the table there, as the lead author of the climate change detection attribution chapter, would be able to attest to the fact that there is a lot more knowledge and a lot more evidence now that we've seen a signal of climate change emerging from the background of natural variability, and there are much stronger attribution statements that can be made where evidence and observations are beginning to really stand out. There is just so much more evidence available now.

Hon. John Godfrey: Based on this report, what are the most pressing areas that need further research where we need to move from likely to highly likely, or the various gradations of certainties that characterize the various reports? Where are the most pressing challenges right now for the next research?

Prof. Andrew Weaver: I can add a little bit there, and maybe John could pick up after.

To me, there are two key areas. Area number one is the area of impacts and adaptation. It's really a new field in terms of trying to understand, taking the scale of projections that are done on core scales by the big climate models and trying to bring them down to the scale that affects everyday people—the scale of subcontinents and regions.

The second area is the fundamental physics still involved in the climate projections. When you try to do impact and adaptation studies, they're only as good as the information you get. And as you start to try to provide higher and higher resolution information, you're going to have to start to resolve more and more physical processes. These include, and do not exclude, things like permafrost and the carbon that is contained in the frozen soils of our north. There are no climate models out there that incorporate frozen soils and the bio-geochemistry of those frozen soils into a potential positive feedback to warming that may or may not occur. These are the kinds of areas that need to be continued.

Maybe John could add on that.

● (1605)

Prof. John Stone: Thank you, Andrew.

Yes, there are two big scientific unknowns, and Andrew mentioned them. One is the carbon cycle, which will actually tell you how emissions translate into atmospheric concentrations. The other one is how do ice sheets behave? Both of them will have feedbacks on the climate system. Both of them could lead to an acceleration of the climate system.

My hope is that with the fourth assessment we've been able to put a line under the scientific debate about whether climate change is real or not. I think we have to move from science that's been useful in defining the problem to science that's going to be useful in defining the solutions.

This doesn't mean to say that we have done all the science necessary, and there are many reasons for that. Let me just add one. That is because we don't know yet what we've missed. There may be some things in the climate system that we've missed up to now. We won't know them until we do the research, and we don't really want those sorts of surprises.

But I think Andrew is right. We've got to understand better how we adapt, and that's not just a matter for the natural scientists. Surely we do need better regional scale climate models, but we need to know how societies work, how societies have adapted to today's variability, and how they can adapt to the increasing variability in the future.

Thank you.

Hon. John Godfrey: If there are these pressing areas, and they obviously have a huge impact on Canada, particularly in the north, what has been the story—maybe I'll go to Dr. Weaver here—on new federal funding over the last two years to support these areas of research in any of the things you've talked about? Whether it's impact and adaptation, the permafrost, ice sheets or carbon cycle, has there been new funding forthcoming over the last couple of years to do these things?

Prof. Andrew Weaver: I'm actually on record saying that in fact the existing funding has been cut. The Canadian Climate Impacts and Adaptation Research Network was cut. The Canadian Foundation for Climate and Atmospheric Sciences has repeatedly tried to make appointments to actually be able to say what they're doing. They are not even acknowledged by ministry officials.

NSERC, our national funding organization, has had the climate and atmospheric sciences taken out as a strategic area. In fact, in Canada right now, today, there is less climate-related funding than ever in my history as a scientist in Canada. I say this, having worked through several governments. Whether it be Mulroney through Chrétien through others, there's always been a strong level of support for the basic science of atmospheric and climate science.

I think it's not only true in our area, it's more generally true that there has been a real lack of willingness to understand the need for scientific research in this area.

Hon. John Godfrey: Do you have any idea why that would be so?

Prof. Andrew Weaver: You're asking me to speculate. I cannot speculate, with my expertise. This is not my expertise. I would suspect that often people don't understand what the research is doing. There's probably a perception that this was put forward by a previous administration and we're a new government, so we're going to do things differently.

Sometimes you throw the baby out with the bathwater when you blindly cut everything that has been done before. So I would have thought some caution would have been a better way to approach. That's probably what's going on. There's still time to fix all that, and hopefully we'll see change in the future.

Hon. John Godfrey: John.

Prof. John Stone: Let me say something that is somewhat ancillary to that.

Canada and Canadian scientists have made remarkable contributions to the IPCC over the twenty years of its existence. We've produced some of the best model results, we've done some of the best process studies, we've collected some of the best data. That has really served Canada extraordinarily well in the past, and I think it would be to our interest to ensure that science is funded appropriately so that Canada's science can still hold its head high in these negotiations on an issue that simply will not go away.

The Acting Chair (Mr. Nathan Cullen): You have a little less than a few minutes, Mr. Godfrey.

● (1610)

Prof. Andrew Weaver: Could I add to that?

Again, I want to emphasize the non-partisan nature of the science. Coming back to what really got the whole climate research network going in Canada, it came out of the green plan done by the Mulroney government back in the late 1980s. It was not a Liberal plan; it was dealing with the issue of the time. It was followed through by successive Liberal governments, expanded upon, modified, but it was fundamentally there. What has happened in the last year and a half is that these have all been cut.

Again, it's a non-partisan issue of funding basic research that has essentially been cut in a very partisan fashion in the last year.

Hon. John Godfrey: Thank you.

I guess the question is, given the direction of the fourth report, is this a time when changes to Canada's shorelines and landscapes and weather patterns in fact would suggest that we need more rather than less research, the kinds of things that are being alluded to both on a regional basis in the report and more generally across the planet?

Prof. Andrew Weaver: Yes. That's an easy answer.

Hon. John Godfrey: Easy answer, okay.

John, did you want to add?

Prof. John Stone: As I said, a lot of the impacts are now inevitable, but how we respond will require more information, more knowledge, the sorts of things that we can get through systematic observations and good solid research. I think it's in our national interest to ensure that we've got the science necessary so we can make the best policy decisions.

Hon. John Godfrey: Fortunately, we have the minister appearing before us to discuss things like cuts to research, so we'll be able to follow up on those questions on your behalf. Thank you.

The Acting Chair (Mr. Nathan Cullen): Thank you, Mr. Godfrey.

[*Translation*]

Mr. Lussier.

Mr. Marcel Lussier (Brossard—La Prairie, BQ): Thank you, Mr. Chairman.

Dr. Stone, in one of your documents, in the chart in Figure SPM-2, you link greenhouse gases with aerosols and other products affecting the ozone layer. This is the first time I have seen a connection between the warming caused by greenhouse gases and products that have a cooling effect on the air and that attack the ozone.

Has this theory or equation been around for a number of years or is it recent?

Prof. John Stone: Allow me to answer in English.

[*English*]

As I understand it, your question is on the role of ozone in the climate system.

[*Translation*]

Mr. Marcel Lussier: Not quite. Certain particles are said to have the effect of cooling the air, whereas others warm it. How long have these two phenomena been linked?

[*English*]

Prof. John Stone: We've known the physics for quite a long time. That is simple molecular spectroscopy, but you have to be careful to distinguish between tropospheric ozone, which is at the ground and is associated with smog, and stratospheric ozone, which is much higher up.

Ozone itself is a greenhouse gas. It can absorb radiation. If you have a reduction of ozone in the stratosphere because of the ozone-depleting chemicals, such as the CFCs reducing the amount of ozone in the stratosphere, then you're removing that potential warming. It's getting colder. The same way, if you have pretty small events on the ground, you are in fact adding more greenhouse gas at the surface and warming up the surface much more.

I hope, Andrew and Francis, I've done justice to that. They are more active scientists than I am.

Prof. Andrew Weaver: I think so. I didn't see the figures, so it's quite difficult for me to comment.

The Acting Chair (Mr. Nathan Cullen): Mr. Zwiers, would you like to comment on this?

Prof. John Stone: I am waiting for the graphic.

Dr. Francis Zwiers (Director, Climate Research, Atmospheric Science and Technology, Science and Technology Branch, Department of the Environment): It's the graphic that indicates the forcing effects of different greenhouse gases in the atmosphere, so it shows, for example, that the effect of carbon dioxide increases has been to warm, that there is a net warming contribution from ozone, that our level of scientific understanding of that contribution is medium. There are different gradations, levels of understanding: very high, in the case of carbon dioxide, medium in the case of ozone. And there are different contributions, as Dr. Stone has explained, depending upon whether there is an ozone reduction in the stratosphere, which is estimated to have resulted in a small net cooling, and increases in ozone concentrations in the lower part of the atmosphere, which has resulted in a somewhat larger net warming. So the overall effect of the change in distribution of ozone in the atmosphere is to warm, but with cooling high in the atmosphere and warming near the surface.

● (1615)

[*Translation*]

Mr. Marcel Lussier: Thank you.

In the same document, on page 14, the chart shows us a number of models, A1, A2 and B1, for example, but have other intermediate models been studied?

[*English*]

Prof. John Stone: I will try to answer that.

The A1, A2, B1, B2 and the like do not refer to models. They refer to IPCC emission scenarios. Some have low emissions. Some have much larger. But the modellers, the Francis Zwiers and Andrew Weavers of the world, will then take those scenarios that are projections—there is nothing absolute in them, but they're all plausible—and go from the emissions to the concentrations in the atmosphere and then insert those concentrations into their models to see what the models project for that sort of scenario.

[*Translation*]

Mr. Marcel Lussier: Thank you.

Dr. Stone, you mentioned that greenhouse gas production could be stabilized and that, for that purpose, we had at our disposal all the technologies for reducing the quantities of those gases. Does that mean there is no more room for research and development?

[*English*]

Prof. John Stone: Yes, of course. As I've said, there is no silver bullet. There is no one technology that will get you there. You're going to have to use a portfolio of technologies.

What I was intimating was a result of the work of a scientist at Princeton, Robert Socolow, who showed quite convincingly that we actually have technologies today that, if fully implemented, would allow us to maintain emissions at the same level as they are today for the next 50 years.

Of course that's not the end of the story. One always needs to have research into new technologies because there are always better ways of doing things, technologies that are much more efficient, technologies that have other ancillary benefits, and the like.

My belief is that we have the technologies now to start. They're not going to be sufficient, and yes, we need to continue to do the research for the new technologies that are going to follow from them.

[*Translation*]

Mr. Marcel Lussier: Among the technologies we have, which ones do you think we could implement tomorrow or very soon, and which are the most promising? Is it electric cars, carbon sequestration? Which do you think are priorities?

[*English*]

Prof. John Stone: This is my own assessment, which is a personal one, and I think I already mentioned it: the lowest hanging fruit is simply energy conservation, that is, making do with less energy. There are many ways in which one can achieve that. We have technologies that we know can reduce fuel use in motor cars and technologies that we know can reduce energy needs of houses, and the like. And these are technologies that are available.

The problem, in my view, is that even if you're convinced of them and you want to install them or buy them, it's not always easy to find out where to get them or to find the technicians and engineers who know how to install them. But more importantly, there are not sufficient incentives, from whatever level of government, to encourage people to actually go out there and buy them and implement them and use them.

So it's not just having the technologies there somewhere. There needs to be what we call an enabling environment that allows for individuals, for companies, and for governments to pick them up and use them.

Prof. Andrew Weaver: Could I add to that?

[*Translation*]

Mr. Marcel Lussier: Yes.

[*English*]

Prof. Andrew Weaver: Thank you.

Eventually, society will have to go to carbon neutrality if we wish to stabilize the greenhouse gases that are all in the atmosphere. The reason, of course, is that the natural removal mechanisms operate on a much longer time scale than the mechanisms for putting them into the atmosphere. So conservation and measures like that assist you in initially getting towards the path of turning the corner. Unfortunately, conservation measures by themselves are not sufficient to actually move down the path toward decarbonization, which must occur this century.

What is required is real legislation, legislation with teeth, using the powers the government has at hand. They can use taxation or just law. For example, in the province of British Columbia it is now illegal—or it will be introduced shortly—to get electricity through the combustion of coal without having 100% capture of emissions. I recognize the difficulty with national energy policies, but such a policy should be in place in Canada.

In terms of transportation, we are driving around cars that basically have technology that is more than 100 years old. The only reason we have such technology is not because we don't know how to make better cars. It's simply because we're afraid of change, and we're sustaining an end-use marketplace for a commodity that has a lot of vested interest in ensuring that the marketplace is sustained. What I mean by that is that if you had stringent tailpipe emission standards, again, as is happening in B.C. and California, and if you actually got people to buy in, you could see change. There's no reason why most of the cars on our roads are not electric.

We should have the widespread introduction of things like nuclear power in areas that don't have access to renewables like wind and hydro.

So there are many things in place. What we need is legislation. We need government regulation, and we need people to take the bull by the horns on this issue, because nobody, frankly, is doing anything in Ottawa. And that's not the case with this government only; it's been over the last decade.

● (1620)

[*Translation*]

Mr. Marcel Lussier: Mr. Weaver, is nuclear energy clean energy?

[*English*]

Prof. Andrew Weaver: The quick answer is yes. There are two differences between nuclear and carbon. First of all, you have to realize that people have concerns about nuclear energy because of the waste. It's a very important concern. The time scale for the reduction of that waste is on the order of thousands of years. It's no different from the time scale associated with the natural processes that draw down carbon dioxide. The carbon dioxide we put in today, as we saturate the system, will last thousands of years.

So there's a difference, but there's a fundamental difference between the two problems. Nuclear power gives you energy locally, and the waste byproduct of it is local. It's a local storage issue. Carbon burning, through coal and things like that, uses the atmosphere as a dumping ground, a trash can, which then distributes the waste globally. So your problem is global with the burning of coal, and it's local with the creation of energy from nuclear.

Generally, the problem with what we've done is that society has treated the atmosphere as a trash that we can put anything into at no cost. This is why many people fought for the introduction of a carbon tax, because it recognizes that if you go to the dump and throw your waste away, you have to pay a cost for that waste. The atmosphere is a dumping ground that has no cost associated with it, and that has to change.

The Acting Chair (Mr. Nathan Cullen): Thank you, Dr. Weaver.

Merci, Monsieur Lussier.

I'll start the clock on my own questions, and trust our able clerk to be a third-party control.

My first question goes back to you, Dr. Weaver. With respect to the numbers being presented in this fourth report by the IPCC, I'm wondering if you're sensing a certain numbing within the public about what is being described in these reports. I'm referencing this in regard to the first, second, and other reports by the IPCC, in terms of the reaction within both the media and the general public.

Do you feel that is the direction we are headed in, that people are getting more accustomed and in a sense are adapting their expectations to what the greenhouse gas reality is for the planet?

Prof. Andrew Weaver: I think it depends on where you are. Again, I'm in the province of British Columbia, and in the province of British Columbia, where I encounter people the most, I get a real sense that people want to do something but they don't know what to do as individuals. And that's one of the things that's so empowering about global warming: everybody can contribute.

So I guess they're looking for guidance. There is some numbing there. People have no idea of the extent to which the scientific community was stunned by the recent sea ice retreat in September of this year; it was far beyond the most dramatic projection from the most dramatic model in the most dramatic scenario.

So there is some sense it's coming, but it's not there within the scientific....

The Acting Chair (Mr. Nathan Cullen): Dr. Stone, I want to go back to a comment you made in your presentation about how these reports are drafted. There have been some who have attempted to discredit the work of the IPCC by suggesting that it's just a small group of scientists and that there's.... You mention in your presentation a certain endorsement of it from government. I want to better understand that relationship between the scientists who write and contribute to the reports, compile the information, and the role of governments in allowing them out. I'm imagining that official Ottawa or Washington didn't sign off on this.

So perhaps you can illuminate me a little bit better on what the process is like with this interface between government and science.

● (1625)

Prof. John Stone: Thank you, Mr. Chairman.

Could you allow me just to add a little bit to an answer from the previous question?

The Acting Chair (Mr. Nathan Cullen): Absolutely.

Prof. John Stone: It's not my assessment that the public in general is becoming inured to this. Certainly that's not the case in Europe, and certainly not if you go to Africa. In fact, it's quite the opposite.

I think science and the scientists have done a marvellous job raising awareness of this issue and putting it on the public policy agenda. And I think the scientists have provided a lot of information.

The problem seems to be that although people are often aware of it and know it, it's been difficult for them to internalize it and realize that in fact this is not an abstract problem, but they're in fact part of the problem and can be part of the solution. I think that's where we're going to have to work hard in the future.

Now, on the process of the IPCC, as I said, behind each of these reports there is a 600-page scientific document. It's more like a graduate textbook. It's really not accessible to many policy-makers, so the IPCC has developed this idea of producing summaries for policy-makers. I think this is unique within the UN intergovernmental process.

The summaries are drafted by the scientists, and then they're presented to governments. There are several review stages, involving both governments and experts, to make sure that what's written is accurate and useful and, more than anything else, is balanced.

Then we come to a plenary session of the IPCC, where many of these summaries for policy-makers are worked on; in fact, it's a form of negotiation. We start with what the scientists have written, and then governments will ask questions or suggest slightly different interpretations of what's been drafted. Of course different governments look at science in different ways; that's to be understood. But my assessment is that most governments, with occasional lapses, have actually been very constructive in this process.

I really am sorry if I embarrass Dr. Gray here, but certainly in Valencia last week the Canadian delegation was extraordinarily constructive and very helpful in the process.

But the end point is that when the gavel comes down on the final words of this document, then all the governments who are present in the room at the plenary session essentially own the document; they buy into it and say yes, this is accurate, valuable, usable, and we pay attention to it.

The Acting Chair (Mr. Nathan Cullen): It's interesting to me, because there's been somewhat of a turn. The current Minister of the Environment has talked lots about believing in the science. You talked in your presentation, Dr. Stone, about moving from the science identifying the problem to starting to talk about the policy implications, and I only wish we could get him onto that second belief cycle.

Dr. Weaver, in terms of the question of adaptation—which I think has been a long-overdue conversation, particularly for a country like Canada—just speak economically for a moment. You've done some of this already, but can you give an assessment of the basic funding available for Canada in understanding the implications of climate change to our economy? What research have you seen done? What support have you seen from the federal government to understand a critical question like this?

Prof. Andrew Weaver: There was a Canadian Climate Impacts and Adaptation Research Network. It was a very young organization that was just getting going, and their goal was to look specifically at this question—to look at the impacts of climate change, assess the vulnerabilities of communities, and define methods of adaptation.

Historically the impacts in adaptation follow the science. That is one of the reasons it was such a young community: the assessments they were doing were based on earlier models, earlier reproductions, when the state of the science was still emerging in terms of the representation of some of the physical processes.

Now this IPCC scientific process is gone. We've got volumes of information out there, and essentially it's being canned in Canada. It was closed because.... The words were something like “It's fulfilled its federal mandate”. That was unbeknownst to anybody who was actually part of that network. I wasn't, so I'm not complaining about losing funding. I was not formally part of that, but it was unbeknownst to anyone who was in the impacts and adaptation research network that the federal mandate had ended because, quite frankly, it had only just started.

So there is no funding right now looking at these, at least within the university sector. I'm sure that within some government ministries there will be people who are looking at it, but I suspect they're scrambling as well.

● (1630)

The Acting Chair (Mr. Nathan Cullen): A number of representatives of Canadian municipalities were here in Ottawa this week. Some of the questions being raised by those municipalities, particularly those on the coasts or living in the far north, were around their ability to understand what needs to be done in terms of adapting their planning and their infrastructure to a climate change reality.

Prof. Andrew Weaver: Absolutely. Take the simplest thing, the storm drain system in a community. It's designed for a flood event once in a hundred years. As that once-in-a-hundred-years flood event becomes once in 75 years and perhaps even once in 50 years, the infrastructure starts to adapt.

There are Canadian standards for everything. All these standards are based historically on a normal climate, which up until recently was 1961 to 1990 average conditions. The reality is that's not normal any more, and it's going to change in the future, so you really need to be getting a handle on it.

I get personally consulted all the time by engineers trying to look at storm drain systems and watershed availability management. They are asking me just as a random person for my input into this. I'm one person; I have no time. What they should be doing is to be able to have access to a research consortium out there, or to people who can deliver the information they require in their planning. It's just not there in Canada; it was just getting under way when it was closed.

The Acting Chair (Mr. Nathan Cullen): Go ahead, Mr. Stone.

Prof. John Stone: Thank you, Mr. Chairman. I have a couple of small points.

This document, the summary for policy-makers of working group two, which looks at impacts, adaptation, and vulnerability, also contains something called the technical summary. In there is a condensation of the anticipated impacts in North America. It was written by two outstanding scientists, one of them a Canadian lady, Linda Mortsch, and I encourage you to read it. You get some sense of where Canada is vulnerable.

One of the loud messages is actually in water, particularly for those who depend on water from, for example, the Rockies, where there's going to be more precipitation that falls as rain in the winter than as snow, you're going to have less snowpack, and we're going to have melting of the glaciers. It's going to put a threat to water availability in the prairies.

I'll be very quick with the second point I want to make. As I mentioned already, we need to understand better what the impacts will be, but we also need to understand how we can adapt. That's a social and human science question. There's no use just having the natural sciences, important though that is; we also have to understand how society will behave and can behave.

The Acting Chair (Mr. Nathan Cullen): I was talking this past year with residents in Calgary and other communities in Alberta, and they are very concerned with the amount and quality of water coming off the Rockies.

Mr. Warawa, would you like to begin questioning?

Mr. Mark Warawa: Thank you, Chair. You're doing a good job.

I too have a copy of the summary for policy-makers. I appreciate it. I also want to again congratulate each of you on the success and the recognition that you've received globally. It's well deserved.

I found the summary very interesting. It was broken into four categories. The first, observing the changes in the climate and the effects, recognized that there is an urgent situation that requires a policy imperative, and Dr. Stone, you've talked to that. As a government we strongly agree and recognize that this is a tremendous issue we need to deal with, not only here in Canada, but globally. The second chapter was on causals; the third, on projected climate change and its impacts; the fourth, on adaptation and mitigation measures.

I want to go to Dr. Weaver. I'm from British Columbia

Prof. Andrew Weaver: Whereabouts?

● (1635)

Mr. Mark Warawa: I'm from Langley.

Dr. Weaver, you talked about the loss of funding. You're the Canada research chair on climate modelling and analysis at the University of Victoria. Was your funding affected?

Prof. Andrew Weaver: I did not receive funding, so no, it was not. I did not receive funding from that organization.

Mr. Mark Warawa: My background is in risk management. When you see a problem, you look for the causes of the problem and fix it. I like to use analogies. If I had a leaking roof, I would look to see where the leak is coming from. I would see if it's something that needs to be fixed by something I can do, or if I need a professional. Basically I would fix it so that I don't have further damage.

My background was working with engineers and police and finding out where vehicle crashes were happening. It would often require professionals to take a look to show the reasons and the causes of a problem we were having at a specific intersection, and if we do this, it will likely solve the problem. Of course, we would try that and do those improvements and hopefully we wouldn't have the crashes.

I'd like to focus, and I encourage members at the committee to focus, on the solutions. I think all around the table we acknowledge that there is an urgent situation. We need to address this. Rather than getting into the specific technologies at this point, I'd like to get that in the second half of my questioning time.

How important is it for us to deal with this globally and for every major emitter to participate in reducing greenhouse gas emissions?

When I was at the Globe G8+5 conference in Berlin, and some of the people here at the committee were there with me, we heard from a legislator from India. He shared that there are a thousand villages there that have no electrical power. The quick and easy way for them to provide electrical power to improve the quality of life for those thousand villages is to burn coal, which causes not only pollutants to enter the air but also greenhouse gas emissions.

In the summary for policy-makers—I think it was in chapter 3 or 4—it talked about how important it is to change our lifestyles. I think the encouragement is for us to realize that the industry has to clean up and we have to use technologies to clean that up. We also individually have responsibilities to change the kinds of vehicles we drive, the amount of energy we use for vehicles, transportation, also improving our homes. Maybe it means a new furnace, new hot water tank, or changing to energy-efficient light bulbs, or whatever. That's one side of the equation.

The other side of the equation concerns the demands of people globally who want a better standard of living. If we become more efficient, and we need to, and it's actually fun to do...the other part of the equation are the people globally who want a better quality of life. That means more energy, more greenhouse gas emissions, and more pollutants.

I guess the first question I have—and hopefully I'm making sense here—is how important is it that we have not only Canada, with our policies and our government committed that we are going to reduce greenhouse gas emissions by 20% by 2020 or more, but also that we have countries like India, China, and the United States also buying in, committing that they are going to reduce greenhouse gas emissions and that they commit to targets and goals to reduce? I believe it's these major emitters that have to be part of the solution. Otherwise we're not going to be able to globally achieve reducing greenhouse gas emissions.

Dr. Weaver, could you and Dr. Stone comment on that?

Prof. Andrew Weaver: First of all, I'm glad you raised India, because in fact Canada's emissions are the same as India's, even though India has 34 times our population. It's very easy to blame India, but in fact between 1900 and 2002 Canada emitted 22,600 million metric tonnes of carbon, which is almost exactly the same as India has done.

And this is the point. The key issue here is that it's not what's happening today: the atmosphere knows about cumulative carbon emissions. It's all very well talking about today, but we really have to talk about the cumulative emissions that a country has made, and in that respect Canada and India are on a par.

That's number one. Number two is—you've raised a good question, and now we're talking about ethical issues, in terms of who has the development and who has not—that what's going on in Alberta in terms of electricity production is no different from what's going on in India. Sure, they don't have electricity in India, and it's easy to get it from coal, and they do, but it's no different in Alberta.

The thing we have to realize is that if society—that's global society—wants to sustain itself, we'll have to go towards carbon neutrality. We're pushing climate to a regime that simply is unparalleled in the quaternary.

In order to reach carbon neutrality, we will need new technologies. The key issue here is that you want to be the leader in developing those new technologies, because the leaders will be able to sell those technologies to the world, and every person in the world is a consumer of energy. Rather than going into this kicking and screaming, which frankly is what I see as happening at the national level—and that's not partisan, but it's at all levels of government—is that we should be viewing this as an opportunity, as the province of British Columbia has done.

I'm seeing leadership in Canada, but it's not coming from a federal level; it's coming from a provincial level, where they see that there are economic opportunities and they want to be building those widgets first. It's just a shame that it's not happening at the national level in Canada.

● (1640)

Mr. Mark Warawa: Doctor Weaver, thank you for your comments. I don't think you answered my question. I'm going to try Dr. Stone.

How important is it to have the major emitters, all of them—and I believe 70% of the countries are not part of Kyoto, and Canada is—in the boat rowing in the same direction?

Prof. John Stone: Thank you.

Climate change is a global issue. It's a global issue, as Andrew Weaver said, because the CO_2 that we emit stays in the atmosphere for a long time. It is well-mixed, and it doesn't matter where it comes from.

The United Nations Framework Convention on Climate Change, when it was finalized in 1995, recognized that. The wording of the convention talks about common but differentiated responsibilities, and these depend on a country's per capita emission. China's emissions as a total are the same as those of the U.S., but the per capita emissions are far less. In other words, China per capita still has lesser emissions than the U.S.

A notion of common and differentiated responsibilities also looks at questions of wealth. There are some countries that, through technological wealth, economic wealth, human wealth, or whatever, actually have the ability to reduce the emissions more than others. You talked about some countries that, like India, are still in poverty.

The third reason, and there are probably more, happens to do with history: that it is we in the industrialized world who are responsible for most of the emissions in the atmosphere at the moment, and therefore it is we in the industrialized world who are responsible for many of the impacts we are already seeing and are going to see in the future.

Yes, we do need to have everybody on board, but we have to understand that different countries have different abilities to contribute. I think that what the developing world is looking for is for us in the developed world, the industrialized world, to show an example—to lead—and that means Canada. I think it's in all of our interests to make sure that the development paths of these developing countries don't necessarily repeat our development paths; that we somehow provide them with the technologies, the wisdom, and the know-how.

The bottom line, as far as I am concerned, is that, true as all those arguments may be—and I think you posed a very important question—we have to start, and we have to start now. If we continue to prevaricate and say "No, after you, Alphonse", etc., we'll never get the action that we absolutely need.

The Acting Chair (Mr. Nathan Cullen): Thank you, Dr. Stone, and thank you, Mr. Warawa.

Mr. Scarpaleggia, you have five minutes.

Mr. Francis Scarpaleggia (Lac-Saint-Louis, Lib.): Thank you. And I concur that you're doing a very good job.

Dr. Weaver and Dr. Stone, we understand that George Bush has invited all U.S. members of the IPCC panel to the White House to celebrate their work and the Nobel Peace Prize that they're sharing with former vice-president Gore. Has either of you received an invitation to celebrate from Prime Minister Harper?

● (1645)

Prof. Andrew Weaver: No, but that's okay, because there would be some irony to flying in a plane from Victoria to Ottawa, and all the emissions that you would incur accordingly, just to accept such congratulations. I'm not expecting it, and that's perfectly fine.

Mr. Francis Scarpaleggia: The sound here is terrible. I didn't understand what you said.

Prof. Andrew Weaver: What I said was that there would be some irony to getting in a plane to fly all the way to Ottawa with the emissions that one would entail, just to go to such a meeting. I haven't. I don't know if John has.

Mr. Francis Scarpaleggia: Maybe your assistant neglected to show you the letter?

Prof. Andrew Weaver: I never got a letter, but again, we don't do what we do for congratulations after the fact. So I'm not holding that against him.

Mr. Francis Scarpaleggia: I understand.

I'd like to move on to a more serious question. It's the issue of adaptation. Is adaptation distinct from conservation or measures that help reduce greenhouse gas emissions? I'd like to understand the difference. Adaptation is saying we have a problem: there are going to be these changes to water flows, or to shorelines, and we have to adapt so that we can continue living, and so on, with the effects of climate change. But is there a point at which adaptation and conservation intersect? Do you understand what I'm getting at?

Prof. Andrew Weaver: Yes. John very eloquently put the two pieces together.

Adaptation is a necessary requirement. We have climate change in store as we try to adjust climate to the emissions we've already created. No matter what we do, we have climate in store. It will change the statistics of weather or climate down the road. We need to know how those changes will occur, and how they will impact us, and what we can do about it. That's adaptation.

Mitigation means saying we as a society have to stand up and ask what we deem to be acceptable. Do we deem it to be acceptable to take us past 2.1 degrees, or whatever it is that will be the point of no return, beyond which we've committed to Greenland melting, and we've committed ourselves to sea level rising seven metres, no matter what we do?' Do we believe that? Frankly, I don't. But mitigation comes in when you try to cut your emissions so you don't pass that. So you have to do them in parallel.

Mr. Francis Scarpaleggia: Now, how much—

The Acting Chair (Mr. Nathan Cullen): Mr. Scarpaleggia, I think Dr. Stone may have had an intervention.

Prof. John Stone: I perhaps should intervene and let you continue first, and then I'll come back with some of my own thoughts.

Mr. Francis Scarpaleggia: Sure.

So when it comes to adaptation, you seem to be saying that we're not doing enough research on adaptation. We have the Climate Impacts and Adaptation Research Network that is being discontinued. For example, I had a group in my riding of Lac-Saint-Louis that was doing some work on adaptation in the area of water resources, and their funding has been cut.

When it comes to adaptation, can we just borrow some research that was done elsewhere, or do we have to do a lot of our own indigenous research? I can see, for example, when it comes to the St. Lawrence River, here we'll probably have to do our own indigenous research, because it's unique to Canada. To what extent can we just borrow other people's research, and to what extent do we need to forge ahead with our own research? How far behind are we in terms of doing our own research?

Prof. Andrew Weaver: John, would you like to go first?

Prof. John Stone: Thanks, Andrew.

Just to answer your previous question a little bit, one has to look at adaptation and mitigation—emission reductions—as working together. We need them both. Clearly the more successful we are at reducing emissions, the less adaptation we need to do, and the more adaptation we do, the less we possibly have to reduce emissions. You have to see them together. But you also have to understand that if you look at the drivers of adaptation and the drivers of mitigation, they are very closely linked to the drivers of wise development decisions. That's why I said this nexus is really important.

Now, if one wants to look at vulnerabilities, that's what it all comes down to. Mr. Warawa mentioned risk management—and climate change is the quintessential risk-management issue. If you look at vulnerabilities, those are very place-specific. It depends on the particular exposure. It depends on the particular sensitivity of the system and of the adaptive capacity. Adaptive capacity depends on how wealthy you are, what sorts of sharing mechanisms you have for risk, and the like. So, yes, adaptation is very place-specific, and we are going to have to do the research to understand how best to adapt within Canada and within regions of Canada.

● (1650)

The Acting Chair (Mr. Nathan Cullen): Thank you, Dr. Stone.

I'm sorry, we're well over.

Mr. Watson, you're next.

Mr. Jeff Watson: Thank you, Mr. Chair.

Thank you to all of our witnesses for appearing.

I want to pick up where the parliamentary secretary left off, with the question of whether or not we needed all major emitters on board, rowing in the same direction.

Forgive me, I want to bring this into sharper focus. We had somewhere in the midst of six minutes' worth of answers between two panellists, and I think I heard a footnote saying “yes”. I want to bring this into sharper focus by maybe proposing a hypothetical.

If Canada and the United States were to shut down, theoretically, literally shut down industry and everything else, will global carbon dioxide emissions continue to rise, or would we have achieved stabilization, or, as you suggest as the next step, decarbonization?

Prof. Andrew Weaver: I'll answer that very quickly.

Of course carbon dioxide will increase, and it will continue to increase until Canada and the U.S. come up with the clean technologies that the rest of the world want to use. Frankly, why would you burn something that's polluting your air?

I don't know whether you've been to Beijing. Walk around there and breathe the air. They don't want to burn that, but they don't have the alternatives at hand right now. Therein lies the key.

Mr. Jeff Watson: I may take exception with that, Mr. Weaver. They have a space program, they have a growing military. There are some choices their nation is making as well, so I don't necessarily agree with that.

Mr. Stone, I'd like to hear your answer.

Prof. John Stone: I think some of this is becoming more and more academic, if I may.

Within the United States there are significant changes in motion. You only have to look at the number of bills before the House and Senate in the U.S. You only have to look at the actions that have been taken by many of the states. You only have to look at some of the things that have already been done by large industrial conglomerates in the United States.

The tide is clearly changing in the U.S. I think if we don't pay attention to this, we could find ourselves on the wrong side.

If you look at India and China, yes, I know the rhetoric, I've heard it for 15 years. But if you go behind that and into China and into India and see what's actually happening there, they are moving as well. The Chinese are very concerned because of water availability. They understand the threats to them from climate change and they're making some changes—and the Indians, likewise, because of energy security.

My sense, just listening and reading around, and talking to colleagues in those parts of the world, is that increasingly more and more countries are saying yes, we need to be on board, we need to do something. It won't always be the same thing, and it may not be through a global regime, but I think we shouldn't worry about what is somebody else going to do. I think if we prevaricate and delay, we may find ourselves at a crucial point simply on the wrong side of this issue.

Prof. Andrew Weaver: May I add something quickly?

Mr. Jeff Watson: I'd like to get to another question.

The Acting Chair (Mr. Nathan Cullen): I think Mr. Watson would like to get to another question, so perhaps in a future answer, Mr. Weaver.

Mr. Jeff Watson: I want to get this down to an ownership level in terms of the micro level as an individual citizen. In reading the global report and looking at the global picture, it's a little difficult for somebody sitting in Windsor, Ontario, to be able to grasp what's happening half a world away or in polar regions, for example.

In order to bridge some of that disconnect, can you talk about what some of the effects would be, say, on the Great Lakes region, or something a little closer to home? I think when people have a sense of what's happening in their backyard they're more likely to make some changes, as well. Can you bring that a little sharper into focus for us?

Prof. John Stone: I'll try.

Prof. Andrew Weaver: I can add the usual stuff that at our latitude you're going to have an increased number of extreme events, an increased number of extreme precipitation, a decreased amount of snow, the likelihood of precipitation coming in snow, and so on and so forth.

The question you raise is precisely the point I raised earlier, that this is exactly what the people want, and that's exactly what the Climate Impacts and Adaptation Research Network was designed to provide, but there is no information available on that scale being done in Canada now because of cuts.

So you're right that people want this information, but who's going to give it to them? The IPCC is not tasked with doing new research, it's tasked with testing what has been done. It has assessed what's been done, and now it's back to doing research.

● (1655)

The Acting Chair (Mr. Nathan Cullen): Dr. Weaver, that will have to be it.

Mr. Watson, did you want one last comment, or are you okay?

Mr. Jeff Watson: No, that's fine.

Prof. John Stone: I'll just to try to answer your question to be helpful.

We're going to see the potential for lower levels in the Great Lakes. We already do. I think we understand some of the reasons for that, and it has to do with evaporation, particularly the evaporation in winter. When you don't have ice cover like you used to, but you still have the winds going over the water, which is warmer than normal, and evaporation, you see lakes like Lake Superior with significantly lower levels than they've had. Now, it may be natural variability, but it may not be. That gets back to the risk management issue. This is a risk management issue.

If the Great Lakes are lower, you have, of course, big problems for industry and the population. You also have problems for navigation within the Great Lakes. We know that in the past, when the Great Lakes levels and the St. Lawrence levels have been lower, it's had an enormous impact, for example, on traffic at the port of Montreal. You simply couldn't get the big ships in there that they used to; there was not enough draft.

So for the area of the Great Lakes, you can certainly expect lower levels, and that will have significant environmental, ecological, and economic impacts.

The Acting Chair (Mr. Nathan Cullen): Thank you, Dr. Stone and Mr. Watson.

We'll move on to Monsieur Bellavance.

[*Translation*]

Mr. André Bellavance (Richmond—Arthabaska, BQ): Thank you, Mr. Chairman.

Thank you for your testimony.

I'm particularly sensitive to the matter of agriculture since I'm responsible for it within my party. I've read an enormous number of doomsday scenarios attributable to climate change. Global warming is a proven fact. So when we read these scenarios, we feel that Quebec and Canadian agriculture might have to face catastrophic situations. For example, there could be more hours of sunshine, but more rain and parasites. To my knowledge, no farmer has shown any intention of becoming a banana or coconut farmer in Quebec.

Could you tell me whether you have any projections describing respectively the physical and economic consequences of global warming for agriculture?

Prof. John Stone: It would be preferable for me to answer you in English. I hope I clearly understood your question.

[*English*]

Agriculture is actually a very difficult case for knowing what the impact is going to be. I've seen estimates on both one side and the other. It really depends on where you are. Canada is a large country with tremendous possibilities, adaptive possibilities. If you can't grow something here, then you perhaps can grow it in other parts of the country, and if you can't grow this crop, then you perhaps can grow a different crop.

Without giving a long answer, it seems that for North America, up to a global mean average temperature increase of two degrees, there probably could be net benefits. If you go past that, everything then starts going downhill. I'm sure you understand. With warmer temperatures, you have a longer growing season. You have more CO_2 in the atmosphere, and that's a natural fertilizer. There's the problem of whether we're going to have enough water, necessarily, and that's a big question. But the adaptive capacities of agriculture in Canada, in North America, are quite significant, so there really is a question of whether the impact will be negative or positive, and when.

I can't be more precise, I think, than that at the moment.

[*Translation*]

Mr. André Bellavance: That means that, for a certain types of production at least, there could be benefits for a certain period of time, but, if there is not enough political will to slow down global warming, it is clear that temperatures will eventually rise. While an extra degree or two may bring some benefits for a certain period of time, they will be lost.

● (1700)

Prof. John Stone: Undoubtedly.

[*English*]

What I said was more appropriate to the part of the country you are from.

I think the prairies are going to have specific problems because of water. As I said earlier, because more of the precipitation in winter will fall as rain and not snow, you won't get the snowpack building up. You're going to have melting of the glaciers. You already do have that, and that's a big reservoir. You're going to have differences in the timing of runoff and the like. And you already have prairies that are semi-desert, where agriculture is sometimes a little marginal. So if you have these additional water stresses—and we've seen droughts in the past—then for agriculture in the prairies there could be consequences sooner than you might see in eastern Canada.

[*Translation*]

Mr. André Bellavance: I also talked about the possibility that we might have to face rising numbers of parasites that are not found here for the moment.

Have you considered that issue?

[*English*]

Prof. John Stone: Absolutely. A good case in point is the mountain pine beetle that we have in British Columbia and Alberta. We used to be able to deal with it because winters were cold enough that most of the population was killed off. They're not now, so they can reproduce. That's going to be true of lots of parasites and other things that we sort of take for granted, like the migration of birds and butterflies that are essential for pollinating plants. So it gets a bit complicated.

Prof. Andrew Weaver: It's an emerging issue. For example, on Vancouver Island, where I am, there is cryptococcus gattii, which is more typically tropical, and It has emerged on Vancouver Island because of our increased likelihood of drought. It requires becoming an aerosol to infect people.

The evidence is all anecdotal, at least in terms of medical parasites or viruses.

The Acting Chair (Mr. Nathan Cullen): Thank you, Dr. Weaver.

Merci, Monsieur Bellavance.

Mr. Jean.

Mr. Brian Jean (Fort McMurray—Athabasca, CPC): Thank you, Mr. Chair.

Dr. Weaver, I find it hard to believe that China should have a free ride in this issue of global conscience. They have approximately $1.4 trillion in foreign currency reserves, and I think they can afford to buy just about anything they want as far as cleaning up the environment. I understand their local environmental difficulties, but as my colleague Mr. Watson said, it's an issue of priorities.

From what you've said, Dr. Stone, it is an inevitable conclusion in the short term that we are going to have a negative result, and even if we put the brakes on full stop we're going to leave track marks or skid marks for about a hundred years.

Prof. John Stone: I didn't say a hundred years.

Mr. Brian Jean: Those are my words.

Prof. John Stone: Certainly the climate has a memory. It won't let us forget. We have altered the composition of the atmosphere by our introduction of greenhouse gases to levels that we haven't seen for close to a million years. We know what effect greenhouse gases have on the climate, and therefore it is very solid physics. We know that we can expect impacts as a result of what we've already done.

As the IPCC says in its report, some of those, regardless of what we do in the short term to reduce emissions.... That doesn't mean we shouldn't do everything we can to set ourselves on a path to reduce emissions.

Mr. Brian Jean: I agree with you 100%. I think this government is well on its way.

I had the opportunity to visit Reykjavik during the polar conference in 2004. As a statistician I was shocked and left very concerned by what I saw at that conference and with these most recent reports.

When I sat on committee onBill C-30 I had the opportunity to listen to experts. They seemed to indicate that the biggest impact in Canada is going to be primarily on infrastructure and transportation, especially in our north, but along the lakes and oceans. We heard experts' evidence that indeed investments in transport and infrastructure would reduce greenhouse gas emissions towards green space. I remember one person from Quebec who gave us very good evidence that a real investment in infrastructure and transportation would mitigate the effect of climate change.

I know it's not enough, but this government has moved forward with an unprecedented amount of $33 billion to invest in infrastructure over the next seven years, because of the $126 billion that we've been left with in infrastructure deficits from the prior Liberal government.

Would you agree, Dr. Stone, that investment in infrastructure and transportation is a way to mitigate in part—not enough, but one of many fingers that can be used to help—greenhouse gas emissions, and that infrastructure and transportation will have the biggest impact for Canada overall in the short term?

● (1705)

Prof. John Stone: Thank you.

There are two parts to answer. There's an adaptation part and an emission reduction part.

On adaptation, we certainly have a lot of infrastructure that was designed for what we might call a stable climate. We no longer have that situation; we have a climate that is changing. So such things as sewage and drainage facilities are sometimes totally inadequate for the increase in severity and frequency of heavy precipitation that we can expect. So it's quite clear for infrastructure in central Canada.

The bigger worry, of course, is what you do about infrastructure in the north. A lot of it is built on frozen mud that is essential for the survival of many of these communities, but the mud is melting. If the ice roads can't be relied on to bring in supplies in the winter when they need them, then clearly they're going to be suffering.

So on the adaptation side you're absolutely right. On the mitigation side there's clearly a lot we can do, including enhancing the energy efficiency of transportation. There are lots of ways to do it. But the IPCC report talks about the enormous possibilities from buildings.

Mr. Brian Jean: Thank you very much.

I do have one further comment. As somebody who studied science in the U.S. for some period of time, and now I live in the north, I can assure you I understand and my constituents understand what's going to happen. But science is about a significant number of opinions, research, and researchers, just like a huge basket of apples. This government is going to do it a little bit differently from the last government. We want to find the tastiest apples, the ones that are going to be the most satisfying, and sometimes that means that some apples are left in the basket and some aren't.

I would suggest to you, Dr. Weaver, that we pick the best and the juiciest apples in order to get the best results for Canadians—

Prof. Andrew Weaver: Frankly, you haven't picked apples.

Mr. Brian Jean: That's all right; it was a metaphor.

Dr. Stone, what technologies are essential for this government to develop in order to move forward in a positive manner on the remediation and the reduction of greenhouse gases?

The Acting Chair (Mr. Nathan Cullen): Dr. Stone, give a very brief answer, please.

Prof. John Stone: I don't think I can give a very brief answer. It's a very difficult question. The bottom line is it almost doesn't matter, as long as you start. Do something. Start wherever you start. It doesn't matter. I think we're running out of time. I'm not an alarmist, but I think we're running out of time. So it really doesn't matter where you start, but there is certainly a lot you can do in clean coal technologies, in carbon capture and sequestration. Some people will say it's like sweeping the dirt under the carpet, but we have enormous possibilities in Canada. There's an enormous amount we can do for simply energy efficiency in the home, in supermarkets. But just start.

Mr. Brian Jean: Are you familiar with our initiative on that in Alberta?

The Acting Chair (Mr. Nathan Cullen): Thank you, Mr. Jean.

We'll be moving on to Mr. Alghabra.

Mr. Omar Alghabra (Mississauga—Erindale, Lib.): Thank you, Mr. Chair. And I do want to reiterate, you're doing a fantastic job.

First I want to say that I'm glad the constituents of Mr. Warawa, Mr. Watson, and Mr. Jean who reside in India and China are very happy that they're holding the governments over there accountable. Perhaps they want to run there on an environmental platform, but my constituents here expect me to work with the government on making sure that we do whatever we can within our power to have an environmental plan here.

The Acting Chair (Mr. Nathan Cullen): Mr. Alghabra, I think if you'll direct your questions to our witnesses as opposed to the government, it would be helpful.

Mr. Omar Alghabra: What I want to do is first to thank Dr. Stone and Dr. Weaver for their contribution and their participation in this discussion today.

If they will allow me, I want to direct some of the questions to the officials here today. I want to give them the opportunity to answer some of our questions.

Gentlemen, I'm curious to know if you believe that we know everything we need to know about adaptation and the impact that global warming will have on our environment.

Dr. Brian Gray: On a procedural point, Chair and Clerk, we were invited to be here to speak to the IPCC process and our involvement in that, and I'm not sure if this is an appropriate question. I defer to the Chair.

● (1710)

The Acting Chair (Mr. Nathan Cullen): Thank you, Mr. Gray.

Mr. Alghabra, the context of today's meeting—we've had some straying from topic—is around the delivery of the IPCC report. If you can make your questions directed to department officials in that vein, that would be helpful.

Mr. Omar Alghabra: Okay. Thank you, Mr. Chair.

Do you believe that adaptation is a major issue facing the world, including, obviously, Canada?

Dr. Brian Gray: That's the same question.

The Acting Chair (Mr. Nathan Cullen): Mr. Alghabra, if you want to refer to how the IPCC talks about adaptation or something specific to the context of this report, you may. You're generalizing the question beyond the context. If you could be more specific to the report we have in front of us, we can allow the representatives from government to answer.

Mr. Omar Alghabra: Mr. Chair, the report says that adaptation is a serious matter and we have witnesses who tell us that the federal government is cutting research on this matter. I don't mean to put the officials in a difficult position on a matter of policy.

The Acting Chair (Mr. Nathan Cullen): Right.

Mr. Omar Alghabra: I want to get their professional opinion on what we can do as a government. Do we have all the facts or are there any missing links?

The Acting Chair (Mr. Nathan Cullen): I suppose if I can assist you in your question, in the IPCC there is mention of the issue of adaptation. I'm assuming the government officials have read that part of the report. If you're asking for implications from those findings in the IPCC on Canada, that might be something Mr. Gray can help us with.

Mr. Omar Alghabra: Thank you, Mr. Chair.

Dr. Brian Gray: I'll try.

In the synthesis report that Dr. Stone and Dr. Weaver have answered numerous questions about, there is a section on adaptation that lists numerous possibilities and numerous things people should keep their eyes on. An interesting aspect of it deals with combining, where possible, activities to address both mitigation and adaptation at the same time and looking for opportunities for other co-benefits to those activities—for example, if it was water quality or air quality or biodiversity, if you're dealing with something related to landscapes, forestry or agriculture.

Mr. Omar Alghabra: Can you tell me a little bit about the research the government is doing in that area?

Dr. Brian Gray: Sorry, what research do you mean?

Mr. Omar Alghabra: I mean the research on adaptation.

Dr. Brian Gray: Francis will be able to speak to this a little bit. We have an adaptation and impacts research division, under Dr. Zwiers. Dr. Zwiers is the director of the atmospheric science group.

Actually, no, it's not under it, is it?

A voice: No.

Dr. Brian Gray: No, it's under a director general.

But we have a small group—about a handful—roughly eight or nine scientists in our impact and adaptation group who are scattered across the country.

Mr. Omar Alghabra: Is it true that the funding level is at the lowest it's ever been for that department?

Mr. Brian Jean: In 1920 it was lower.

The Acting Chair (Mr. Nathan Cullen): Mr. Alghabra, if I can reference you, the comment made by Dr. Weaver earlier was for funding for external groups, which would be difficult for Mr. Gray to answer. It was not in terms of internal funding for the federal government.

Again, if you would like to reference that back to the IPCC, I understand the intention of your question, but time is short, and I think you might want to focus your interest.

Mr. Omar Alghabra: I'm just trying to gather my thoughts. What I was intending on going to, I'm not able to.

Can you tell us a little bit about some of the work the department is doing on adaptation, then? I'm not talking about research.

Dr. Brian Gray: I'd be happy to be formally invited to come back to speak to that, and to have the appropriate officials from our department. I'm not in a position right now to speak to that.

The Acting Chair (Mr. Nathan Cullen): I appreciate your frustration, Mr. Alghabra. Unfortunately, time is over, and questions were unable to be heard.

I think we have our last questioner. Mr. Harvey.

[*Translation*]

Mr. Luc Harvey (Louis-Hébert, CPC): Gentlemen, thank you for being here today. It's not just an hour and a half or two hours that we should have, but rather a few days. I am the last person to speak with you and I only have five minutes. That's very short. I'll try to be brief and I ask you to provide brief answers.

Thank you as well for helping us repair perhaps the last 13 years of Liberal government rule, which resulted in a 36% gap between the Kyoto Protocol and us.

I've been to China and I've been to India. I've also been to Africa. I saw various things and I've made various observations. During my visit, we learned that 2,300 new coal-fired power stations were being built in China, whereas here we are trying to close seven coal-fired power stations and make significant emissions reductions.

I also heard that we weren't making enough of an effort, whereas $9.1 billion has been invested. Only $1.4 billion had been invested over the previous 10 years.

My question is this: how much money would we have to invest for you to find it satisfactory?

● (1715)

Prof. John Stone: Is it up to me to answer? I can start.

[*English*]

I have always held that you can't buy your way out of the climate change problem. It's not going to be enough. Money will certainly be required to develop the new technologies and to put in subsidies and incentives to get people to take them up, but I don't think you can solve this problem simply by pouring money into it. There has to be an element of political will and political leadership and political example.

Sorry, it sounds as though I'm preaching. I don't intend it to sound like that. But as the IPCC talks about, and our chair mentioned, it's a matter of lifestyles. It's a matter of aspirations. It's a matter of imagination. All of these are essential ingredients.

It's not just money. There are lots of things we can do that don't necessarily cost money, which mean slight changes in lifestyles, lifestyles which are not absolute in any way.

I can't give you a number. It's going to have to be significant for the technologies. But it shouldn't simply be money from the federal government. It should be money from provinces. It should take advantage of the self-interest of large-scale industry and the like.

There are a lot of aspects of that question to be answered.

[*Translation*]

Mr. Luc Harvey: Mr. Stone, what is your weight?

Prof. John Stone: What is what?

Mr. Luc Harvey: How much do you weigh?

Prof. John Stone: I haven't weighed myself in a long time. In kilos, it's about—

[*English*]

The Acting Chair (Mr. Nathan Cullen): I'll have to interject. I'm not understanding

[*Translation*]

the purpose of your question.

Mr. Luc Harvey: You'll understand. When I ask them their weight, most people answer 100 pounds or 200 pounds, whereas we switched from the Imperial system to the metric system more than 30 years ago. In light of that, how long do you think it will take to change the attitudes of populations so that they become aware of the environment and change the way they do things?

[*English*]

Prof. John Stone: I think it sometimes can be very quick. I think it sometimes can take a while.

Let me give you an example. In the 1970s the Japanese, for the first time, made an entry into the North American car market. That was because we had an energy crisis at the time. But what you saw was that within a few years, the Japanese car industry had something like a 40% share of the North American car market. Why was that? Why did people go out and buy these Japanese cars? Sure, to some extent I believe it was because they're more energy efficient, but also because they were better built, they had more bells and whistles on them, and frankly a lot of people thought they were cool. That change happened very quickly.

So I think with the right incentives and the right technologies, changing those aspirations can happen very fast. There are clearly a lot of things that won't, because you have embedded capital investment—for example, coal power plants and the like. But I think there's no simple answer to that.

I'm not a sociologist by training, but I think some things can happen quickly.

● (1720)

The Acting Chair (Mr. Nathan Cullen): On that positive note, I'll thank our witnesses—and Dr. Weaver on the line—for being here today.

The meeting is adjourned.

Published under the authority of the Speaker of the House of Commons

Publié en conformité de l'autorité du Président de la Chambre des communes

Also available on the Parliament of Canada Web Site at the following address:
Aussi disponible sur le site Web du Parlement du Canada à l'adresse suivante :
http://www.parl.gc.ca
