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Mr. Scott Simms

Standing Committee on Fisheries and Oceans

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● (0845)

[*English*]

The Chair (Mr. Scott Simms (Coast of Bays—Central—Notre Dame, Lib.)): Good morning, everybody.

Pursuant to Standing Order 108(2), this is a briefing on report number two, "Adapting to the Impacts of Climate Change, of the Reports of the Commissioner of the Environment and Sustainable Development".

Thank you for joining us this morning.

First, I'd like to announce to the committee the presence of the pride of Dauphin—Swan River—Neepawa. Ladies and gentlemen, I present to you Mr. Bob Sopuck.

Mr. Robert Sopuck (Dauphin—Swan River—Neepawa, CPC): You're far too kind.

The Chair: Bob, it's good to have you back—and I actually mean it.

Some hon. members: Oh, oh!

The Chair: No, I do.

Mr. Robert Sopuck: A politician who means it.

The Chair: Yes, I know. It's a degree of honesty that comes by every now and then. That was lovely Liberal applause; I can say that.

To get things started this morning, for the first hour we have, certainly no stranger to this committee, Julie Gelfand—it's good to have you again—Commissioner of the Environment and Sustainable Development; and a Director from the Office of the Auditor General, Mr. David Normand.

Thank you so very much.

I'm assuming it's one presentation, not two.

Ms. Julie Gelfand (Commissioner of the Environment and Sustainable Development, Office of the Auditor General): That's correct; it's one.

The Chair: Ms. Gelfand, you have up to 10 minutes. Please go ahead.

Ms. Julie Gelfand: Thank you.

[*Translation*]

Mr. Chair, I am pleased to be here today to discuss my report on adapting to the impacts of climate change, which was tabled in October 2017. I am accompanied by David Normand, the director responsible for this audit.

Before I present the findings of this audit, I wish to take this opportunity to highlight key findings from another one of my fall 2017 reports, which looked at the progress on reducing greenhouse gases.

In that report, we found that Canada had missed all of its reduction targets since 1992 and that it was not on track to meet the 2020 target. The federal government has set new, more difficult targets for 2030, which means extending the timeline.

In December 2016, the government released the newest of its climate change plans—the Pan-Canadian Framework on Clean Growth and Climate Change. Environment and Climate Change Canada has made progress in working with the territories and provinces to develop this new plan to meet the 2030 target. However, the plan remains the latest in a series of plans that have been produced since 1992.

● (0850)

[*English*]

Environment and Climate Change Canada already estimates that even if all the greenhouse gas reduction measures outlined in the new pan-Canadian framework are implemented in a timely manner and result in emissions reductions, more action will be needed to meet the 2030 target.

Canada's climate, as you are all aware, is becoming warmer and wetter, and the impacts, such as extreme weather events, rising sea levels, increasing ocean acidity, and decreasing sea ice and permafrost, pose significant risks to Canadians and the economy.

In our audit on adapting to climate change, we wanted to know whether the federal government was ready to adapt to a changing climate. Overall, we concluded that it is not; however, in the case of Fisheries and Oceans Canada and a few other departments, there are a few glimmers of hope.

Environment and Climate Change Canada developed the 2011 "Federal Adaptation Policy Framework", which is aimed at integrating climate change considerations into programs, policies, and operations. Through this framework, each federal organization is to apply its experience in risk management to the climate change issues that could affect its ability to deliver its mandate.

In this audit on adapting to the impacts of climate change, we looked at whether 19 federal organizations, including Fisheries and Oceans Canada, had assessed risks and taken measures to adapt to climate change in their areas of responsibility.

[*Translation*]

We found that most of the federal departments and agencies we examined did not take appropriate measures in order to achieve this. We also found that Environment and Climate Change Canada, in collaboration with other federal partners, did not provide adequate leadership to advance the federal government's adaptation to climate change impacts.

We are happy to report, however, that Fisheries and Oceans Canada was one of the five departments that did complete comprehensive risk assessments and integrated adaptation into its programs and activities.

[*English*]

For example, in 2005 Fisheries and Oceans Canada identified the greatest risks to its mandate, and in 2012 it refined its analysis: two times it had done risk assessments. Some of the risks they identified included potential negative impacts on ecosystems and fish stocks, the safety and accessibility of waterways, as well as impacts on infrastructure, such as small craft harbours and Canadian Coast Guard assets.

We also found that Fisheries and Oceans Canada was one of the five departments that made progress in responding to the climate change risks they had identified. Through its aquatic climate change adaptation services program, Fisheries and Oceans Canada conducted 38 research projects and developed 22 adaptation tools to monitor and study the impacts of climate change on Canada's fisheries, aquatic ecosystems, coastlines, and coastal infrastructure.

For instance, to address the high risks it identified to the 750 core commercial fishing harbours it manages, the department, among other things, developed two web-based adaptation tools to manage potential infrastructure damage from climate change impacts.

The first is the Canadian extreme water level adaptation tool, which provides future projections of sea level rise. The second is the coastal infrastructure vulnerability index, which combines environmental, harbour engineering, and socio-economic data into a measure of harbour vulnerability to climate change impacts. This helps engineers and managers plan where best to invest in adaptation projects.

One example of the way the Canadian extreme water level adaptation tool can be applied was seen at Margaree Harbour in Nova Scotia. Rising sea levels and increasing storm surges compromised harbour infrastructure. In 2010 the wharf was breached, and much of the facility was under water. Using information provided by the tool, the department raised the wharf by seven-tenths of a metre in 2016 to accommodate projected sea level rise over the structure's operational lifetime.

Risks from climate change cannot be completely eliminated; however, vulnerabilities can be reduced by taking measures to adapt, such as the measures we have seen with Fisheries and Oceans Canada. Other departments also see that it can be done.

● (0855)

[*Translation*]

Adaptation is about making informed, forward-looking decisions to manage the risks that climate change presents and to take advantage of new opportunities. Strong and sustained leadership from the federal government is essential because the cost of inaction is estimated to greatly exceed the cost of taking action.

Lastly, I will take this opportunity to mention two audit reports that I will present to Parliament this spring and that could be of interest to this committee: one is on salmon farming, and the other is on conserving biodiversity. In those audits, we checked to see whether Fisheries and Oceans Canada has made progress in meeting the 2020 biodiversity targets on protected areas and species at risk. I would be happy to appear before your committee to discuss the findings of these reports after they are tabled.

Mr. Chair, this concludes my opening statement. We would be pleased to answer any questions the committee may have.

Thank you.

The Chair: Thank you, Madam Commissioner.

Let's go to the first question.

[*English*]

We're going to Mr. Hardie, I believe—for seven minutes, please. Thank you very much.

Mr. Ken Hardie (Fleetwood—Port Kells, Lib.): Thank you, Mr. Chair, and good morning to our guests.

It would appear that with the exception of the record that the Department of Fisheries and Oceans produced over the last number of years, much of what we as a government have been talking about in terms of managing climate change has been aspirational but without necessarily the proper alignment to produce measurable results.

Is that a fair assessment?

Ms. Julie Gelfand: I'm sorry, are you talking about adaptation, or are you talking about mitigating, in terms of reducing greenhouse gas emissions?

Mr. Ken Hardie: Well, we'll start with adaptation, because I don't think the other one is even as good a story as....

Ms. Julie Gelfand: Yes.

In our audit we looked at whether or not 19 different departments did complete risk assessments to see whether they were vulnerable and what the risks to their mandates associated with climate change were. We found that five departments did a good job and about 14 did not.

The five that did good jobs did what Fisheries and Oceans Canada did. They looked at their entire mandate and asked what all the programs and policies they have were; what all the services they provide to Canadians are; what all the risks of climate change were —sea level rise, more bad weather, extreme weather events. They asked what they were going to do to all of their assets and programs and then how they were going to deal with those risks—not just identify the risks, but determine how they were actually going to deal with them.

Five departments did that. There are another 14 that did not. Now, it's not that they did nothing. Some of those departments may have done something small. For example, we found that National Defence looked at the north and said, “We have some assets in the north and we need to worry about them.” From our perspective, that wasn't a complete risk assessment. What does the Department of National Defence do for Canadians? What does their entire program look like? What are all the risks of climate change to its entire mandate? Are they ready to adapt?

We were looking for complete risk assessments and then at whether or not departments were actually getting ready to adapt. In the case of Fisheries and Oceans Canada, they were. Five departments did what we would say were good to really good jobs, and about 14 did not.

● (0900)

Mr. Ken Hardie: Then, on the adaptation piece there are mixed results, but at least some work is happening, and DFO has been notable in its performance.

Let's turn to the other side, and that's the mitigation, the prevention of a problem in the first place. It would seem to me that, as one nation—there are certainly things that Canada can do on a localized basis, I suppose—we're on a wild horse that's running pretty fast. Probably we're relegated to just holding on for dear life in some cases, are we not?

Ms. Julie Gelfand: In the case of reducing greenhouse gas emissions overall, Canada has set several targets over time. Starting in 1992 with Kyoto targets, at least three or four different targets have been set. Canada has not met any one of those targets. During that time Canada has come up with—depending on how an auditor defines a plan—anywhere from five to eight different plans that have been developed. None of those has been fully implemented; our emissions continue to rise.

Overall, the new pan-Canadian framework is a positive note in this series of 25 years of not a lot of action—a lot of planning, not a lot of action. The pan-Canadian framework is notable because it's the first time that it has brought the provinces and territories together. Although a couple of provinces have not yet signed it, most of the others are part of the deal. It has more glimmers of hope, but we have not yet seen action and an actual reduction of greenhouse gas emissions.

Mr. Ken Hardie: There's knowing what to do—and it would appear that the DFO has done a lot of work to assess its physical plant, if you will, its assets—and then there's doing it. You mentioned the Margaree Harbour episode as one in which, in fact, the remedial action was taken.

How vulnerable are other facilities up and down our coasts, including the north coast?

Ms. Julie Gelfand: You'll be hearing from the department right after us. I would recommend that you ask them that question, for specificity.

I would say that generally the Canadian government has $66 billion of assets to manage. We know this because I live in the Auditor General's office, and he looks at the books. Having $66 billion of assets and not a lot of risk assessment to see whether or not those assets are at risk is, I think, putting the country at risk, from an adaptation perspective.

For the specifics about the harbours and which ones are more at risk, however, I think it would be best to ask the department. What we noted was that they are looking at risks associated with waterways, they're looking at the risks associated with their Coast Guard assets, with all the different harbours. They are looking at their full program, assessing the risks, and then coming up with actions that they can actually implement; with studies; with research tools that communities can use to deal with and adapt to the changing climate, the rising sea levels, etc.

Mr. Ken Hardie: That is something we noticed when we were up north with this committee to look at marine protected areas. We heard from people living up there that there was concern that the permafrost was thawing, that there were more slides coming down into the rivers, basically compromising fish habitat, etc. That kind of analysis on those issues and effects was beyond the scope of this review, is that correct?

Ms. Julie Gelfand: That's correct.

However, I would like to draw your attention to a report that will be released this March by me and auditors general from the provinces and the territories. Over the past few years, auditors general from across the country have been doing a joint project on climate change. They've worked together. For the first time, we have almost all the provinces and territories working together and basically doing a common audit. They've asked the same questions around whether we're reducing our greenhouse gas emissions and they've asked the same questions about adaptation.

Right now our Auditor General is in the Yukon or the Northwest Territories doing a hearing on the climate change audit that was done for that territory. We've done them for all three territories. Nunavut will table in late March, Alberta and B. C. are tabling in March, and then we are releasing a joint report from all the auditors general on these, wrapping up all these individual provincial and territorial audits into one overall report. It's going to be released March 27, and I would be pleased to come to discuss it with you after that date.

● (0905)

The Chair: Thank you.

Mr. Arnold, you have seven minutes, please.

Mr. Mel Arnold (North Okanagan—Shuswap, CPC): Thank you for being here today. I'm sure it's an interesting department to work in and to oversee.

The government has set targets for areas that will be protected via MPAs, marine protected areas. Has DFO implemented any planning to be adaptive, if climate change alters or moves certain marine conditions that are integral to the effectiveness of an MPA?

Ms. Julie Gelfand: Based on the audit we did in adaptation, I suspect the answer would be yes, because they did a very good risk analysis. Again, I would ask the department, which is coming up right after us, to give you specifics on that.

We are in the midst right now of auditing the department on whether they're going to reach their targets for marine protected areas. That report will be tabled in Parliament on April 24. I'll be able to tell you a little more then.

This specific question you could ask to the department.

Mr. Mel Arnold: Thank you.

I guess more of a general question, then, for you on this, and hopefully you'll be able to answer this one, is how much of a global impact there will be if Canada reaches its targets or doesn't reach its targets. How much of a global impact is it going to have, and how will it affect Canada's need for adaptation?

Ms. Julie Gelfand: It's often been said that Canada emits about 2% of the world's emissions. There are many other countries that emit 2% of global emissions, and in the end they add up to 100%. There is thus a responsibility on the part of every government. They've recognized in the Paris Agreement that everybody has a role to play in reducing their emissions.

In terms of adaptation, Canada is already feeling the effects of climate change. We're getting increased extreme weather events; increased sea level rise is already happening; we have more flooding —we've seen examples in Toronto and Calgary, and in Ottawa just this past summer—so we're already having to adapt to climate change. That's why we did this audit, to see whether the country was ready to adapt.

Irrespective, the greenhouse gases are in the atmosphere. They're continuing to be pumped into the atmosphere. The world will have to adapt to a changing climate, but at the same time, the world has agreed and Canada has agreed to reduce its emissions. They have a new target aimed at 2030 to reduce their emissions. We will continue to audit to see whether Canada is on track to achieving that goal.

Mr. Mel Arnold: If Canada is producing only 2% of the emissions and other countries that are producing tenfold that amount don't make any changes, what effect can Canada have?

Ms. Julie Gelfand: Right now, I believe, other than the United States, everybody is involved in the Paris Agreement, so all the countries are working to reduce their greenhouse gas emissions.

Mr. Mel Arnold: China, India, and Asian countries as well?

Ms. Julie Gelfand: That's correct, yes. They've all signed on to the Paris Agreement. Everybody is trying to aim to keep emissions and the global temperature rise at less than two degrees and even hoping to get to under one and a half degrees. The goal of the countries around the world is to reduce emissions.

Mr. Mel Arnold: To go more into the details of the assessment you have done on DFO, have assessments also been done to consider a drop in sea levels? You mention that they've done assessments that deal with a rise in sea levels. Have assessments also been done to address a potential drop in sea levels, requiring harbour dredging and so on?

Ms. Julie Gelfand: I'm going to pass that on to David.

Mr. David Normand (Director, Office of the Auditor General): Yes. Fisheries and Oceans did a risk assessment of their climate change risks related to adaptation and came up with six risks. To address those risks, they implemented some 38 research projects and 22 adaptation tools.

Some of those tools use web-based technology and satellite technology to measure sea level rise and sea level drops. They also measure the impact on coastal erosion and other coastal characteristics. They also have a tool that measures and can predict how much damage there will be and where it will occur in their assets over their lifetime.

● (0910)

Mr. Mel Arnold: Have assessments been done on the impact of sedimentation in lower river reaches and some of the estuaries? Have those assessments been done by DFO?

Ms. Julie Gelfand: At that level of specificity, you'd have to ask the department that. We were looking to see whether or not they had looked at their entire mandate and had developed and actually planned for all the risks associated with all of that. The specifics are really at the departmental level.

Mr. Mel Arnold: Thank you.

The Chair: Mr. Donnelly, please, for seven minutes.

Mr. Fin Donnelly (Port Moody—Coquitlam, NDP): Thank you, Commissioner and team, for being here and for doing the good work that you do.

You stated in your opening remarks that Environment and Climate Change Canada already estimates that even if all the greenhouse gas reduction measures outlined in the framework are implemented in a timely manner and result in emission reductions, more action will be needed to meet the 2030 target.

If Canada considers new pipeline projects, for instance, which we know are going to add carbon to the atmosphere and into the ocean, does this make sense? Is this even achievable or possible?

Ms. Julie Gelfand: It's not my role to comment on policies that the government decides. My role is to look at commitments that the government makes and whether or not we're going to achieve those commitments. At this point, what we can tell you is that Environment Canada has said that even if they implement everything that's in the pan-Canadian framework, there's going to be a gap, which means that more effort is going to be required, so we are all going to have to pitch in.

Mr. Fin Donnelly: If we were to look 25 years backwards to, say, 1992, when, as you mentioned, they first started setting targets, Canada hasn't achieved or hit a single target. We've been burning oil and gas in that time frame. I guess if we were to look backwards, we'd say that our track record isn't good.

Ms. Julie Gelfand: That's correct. I would say that over time we've set several different targets. We have not met any of those targets. We've developed many different plans and we have not implemented those plans. Where are we at now? We have a new plan, but it's a plan, and it's one in a series of plans. If it's implemented and everything in there gets implemented properly, we're still going to have a gap. More will be required. This is something that the government has already indicated.

Mr. Fin Donnelly: Commissioner, I know you're aware of the Cohen commission and its final report, which contains 75 recommendations. I'd like to ask you specifically about the final recommendation, number 75. I'll just read it out:

> An independent body such as the office of the Commissioner of the Environment and Sustainable Development should report to the Standing Committee on Fisheries and Oceans and to the public as follows:
>
> By March 31, 2014, and every two years thereafter during implementation of the Wild Salmon Policy, on progress in implementing the policy in relation to Fraser River sockeye salmon.
>
> By September...2015, on the extent to which and the manner in which this Commission's recommendations have been implemented.

On May 14 of this year, we had the Department of Fisheries and Oceans here to give us an update on their progress to date in implementing Justice Cohen's recommendations. Clearly, given recommendation 75, this is problematic. My opinion is that the department is in conflict of interest due to its conservation mandate on the one hand and its promotion of a fish farming industry mandate on the other.

Is your office currently investigating the progress of the Cohen commission's recommendations and, essentially, how could we initiate a study or a review whereby the commission is looking at this so that it's essentially an independent review, not the department looking at itself and asking, “How did we do?”

Ms. Julie Gelfand: That's a wonderful question.

When I became commissioner, the Cohen commission recommendations were definitely one of the high-risk items that were brought to my attention as one of the issues that we could audit. Soon after that, the government indicated that it made a commitment to implement all of the Cohen commission recommendations. I can't remember exactly when they made that commitment, but our office thought, okay, they've made the commitment to implement, so let's give it a bit of time, and then we can go in and audit that issue.

One way you could encourage that as a committee would be to make a recommendation and send in an all-party letter saying, “We believe the commissioner and the Auditor General's office should do an audit.” That would definitely raise it in our risk register, if you like, because we audit things that are of high risk and things that are of importance to parliamentarians. If one parliamentarian says “this is really important”, well, that's interesting, but if an entire committee says “this is of interest to us”, then it goes way up on our list of what we could do and when we could do it. What I would recommend, if you're interested in that as a committee, is that you write a letter to us as an all-party committee. That would probably encourage me, as commissioner, to launch an audit on it.

Often when a government commits to something we give it a bit of time before we go in and audit it, which is interesting, because the audits on climate change happened right in the middle of the pan-Canadian framework negotiations. We were auditing things before the pan-Canadian framework, essentially, and then the pan-Canadian framework came into play, so that was an answer the government could give us in terms of dealing with these issues. When the government made its commitment to implement, our staff would think, okay, let's give it a year or two, maybe three, for them to implement, and then let's go in and do an audit. To shorten my answer to you: a joint letter by the committee to us would be a way to initiate it.

The only other thing I was going to say is that we are doing an audit on aquaculture that will be released in April of this year. We're looking at salmon farming in New Brunswick, P.E.I., and off the B. C. coast. We're also looking at the Aichi biodiversity targets. Some of those pertain to the Department of Fisheries and Oceans.

● (0915)

Mr. Fin Donnelly: Thank you.

Since the review and the department's commitments, we've had Fraser River sockeye runs added to SARA, the Species at Risk Act, so there are some definite concerns. It would be good to have an independent evaluation of those. Definitely, we'll take that, and maybe this committee will consider passing a motion to ask you to come and do that or to review that. I know that we can't obviously direct it.

Ms. Julie Gelfand: That's correct.

Mr. Fin Donnelly: I take your point.

Finally, I would mention the invitation, I think, once you've completed that salmon aquaculture report, to bring that report to this committee. It would be most welcome.

You also mentioned the climate change plans of the provinces and territories, and you'll have that report here at the end of the first quarter. This committee might want to take a look at that as well.

Ms. Julie Gelfand: We'd be pleased to come and talk to you.

One is being released—I get the dates a little bit mixed up—on March 27. That's the collaborative report on the climate change audits that have been done in the provinces and territories, both for reducing greenhouse gases and for adapting to climate change. It's a wrap-up report. We'll be releasing it with other auditors general across the country on March 27.

On April 24, I'll be releasing three audits: one on aquaculture and salmon farming; one on biodiversity targets, which implicate Fisheries and Oceans Canada; and one on whether or not Canada is prepared to implement the sustainable development goals of Agenda 2030, which also have a goal about life beneath the sea, life in water.

The Chair: Thank you, Ms. Gelfand. I have to put down the law of the committee for just a moment. My apologies.

Before we go on to our next question, your office requested to have a couple of pictures taken of us in action. We normally don't allow this, but I'm just looking for any objections from anybody if they take a few pictures from their office.... Okay?

Please proceed during the next round of questions.

Ms. Julie Gelfand: I was not aware that we were asking for pictures. It's a bit odd.

The Chair: Well, there you go. You have permission. Whether you do or you don't, it's entirely up to you.

Mr. Morrissey, please, for seven minutes.

Mr. Robert Morrissey (Egmont, Lib.): Thank you, Chair.

Madam Commissioner, I live in a part of Canada that is extremely vulnerable to climate change. I'm a member of Parliament from Prince Edward Island. We're seeing this every day with a rising sea level and extreme weather.

My question is about this comment that is often made: why should Canada be doing anything if nobody else is doing anything? I would like you to elaborate on the benefits of Canada being a leader in the field of greenhouse gas reduction instead of us saying, well, nobody else is moving, so therefore we cannot achieve anything with Canada moving on its own.

Canada is one of the largest countries in the world. It has significant coastal areas that are vulnerable. Where do you see the benefits of Canada showing leadership in the area of greenhouse gas reductions?

● (0920)

Ms. Julie Gelfand: In my role in the Office of the Auditor General, my job is to talk to you about the results of our audits. In my position, I cannot give you just opinions about things. I cannot opine.

What I can tell you is that we did do an audit on Canada's investments in green, clean technology. We released it at the same time as the adaptation audit and the mitigation audit. We found that Canada—I'm going by memory here, because it was a few months ago—does a very good job of investing in new green, clean technology. Our audit was quite clear.... The language I used was that Canadians should feel confident that the money we're putting into a couple of these funds run by Natural Resources Canada and Sustainable Development Technology Canada is well managed and well given out to new green technology.

In our audit, we found that we're good at the beginning, but we're not that good at getting from the beginning to full-scale market implementation. That's part of the innovation curve that Canada is not as good at. I would suggest that many studies are indicating that there are new opportunities in clean technology. Also, some people have indicated that Canada should become a leader in this, because we have opportunities to become a leader in it.

There's something you said that concerned me, which was that others are not doing anything in terms of reducing greenhouse gas emissions?

Mr. Robert Morrissey: They're not doing enough.

Ms. Julie Gelfand: Okay. For example, I am on an expert panel reviewing the German government's sustainable development strategy, and I'm heading off to be part of an international peer review for that. I would argue that many countries are reducing their greenhouse gas emissions, and while some of them contribute 2% or 3% globally, they are still proceeding. I would say that countries are trying and are working hard to figure out how to transition to a low-carbon future, which is something that all the countries that signed on to the Paris Agreement agreed to do. Canada agreed to do that, and we go in and audit to see whether or not Canada has done it.

Mr. Robert Morrissey: Thank you.

I have a couple of short questions.

In your audit, have you identified or taken a look at the impact of climate change on tidal action? We talk about reasons we're subject to tidals or storm surges.

Ms. Julie Gelfand: Absolutely.

Mr. Robert Morrissey: Have you done an analysis on the impact on tidal action?

Ms. Julie Gelfand: Again, it wouldn't be our office that would do the analysis. We would ask the departments whether or not they've done it, and we would get them to show us that they've actually done it.

Mr. Robert Morrissey: Has it been done?

Ms. Julie Gelfand: That would be a question to ask the departments. Those are very specific questions.

Again, I'm going to suggest that, based on the work that we did, it is highly likely that they did do that because they did do a very good risk assessment.

Mr. Robert Morrissey: Maybe, then, it's.... This question is in the same direction. One of the things that would have an extremely negative impact on Atlantic Canada would be the impact of warming sea temperatures on the traditional species. In fact, this summer.... Everybody's aware of the situation with whales in the gulf. Most of the expert opinion is that they're moving there because of climate change to follow a food pattern that is no longer there.

Is the department, in your analysis, preparing the risk of the impact on inshore fisheries within Atlantic Canada?

● (0925)

Ms. Julie Gelfand: Yes, I would suggest that they have. We're also in the process of starting an audit on the whole issue of marine mammals. That will be coming out in the next year or so—a separate audit just on the management of marine mammals.

Mr. Robert Morrissey: I'd like you to focus on what you've noticed in your assessments over the last number of years. Could you identify some key trends that you may be observing that would alarm you as commissioner of the environment?

Ms. Julie Gelfand: Again, unfortunately, that's not my role. My role is to identify risks that the Government of Canada may be facing. I can audit against commitments that the government has made. It's not within my purview to opine on what the commissioner sees.

Mr. Robert Morrissey: That's okay. Within those risks—

Ms. Julie Gelfand: What I would say is that the selection of my audits would be your indicator of what is of concern to me. By selecting audits like what's happening with marine mammals, what's happening with salmon farming, what's happening on adaptation, our leadership in getting all of the auditors general from across the country to look at adaptation and mitigation. The selection of the audit topics would be your best indicator of the issues that are of concern to the commissioner.

Mr. Robert Morrissey: What were those audit topics over the last 10 years?

Ms. Julie Gelfand: Over the last few years, we've looked at climate change almost annually because that's a big one. That's a big issue that the government has indicated is a big issue. We've done a bunch of others. We did one on the National Energy Board. We've done one on the Canadian Nuclear Safety Commission. We're doing several in the areas of fisheries, such as aquaculture. Fisheries management was one that we did recently. I believe we appeared.

Mr. Fin Donnelly: You did an audit on rebuilding stocks.

Yes. We did audits on species at risk, on biodiversity. The marine mammals audit is coming up, as well as one on the ability of Canada to implement the sustainable development goals.

This, by the way, is an area where Canada is leading—on Agenda 2030. We are leading a group of international.... All the auditors general from around the world have indicated that they are concerned about whether or not their countries are able to implement these sustainable development goals, and Canada is leading on the preparedness audits. Are the countries prepared to implement the sustainable development goals? We're leading on that.

The Chair: Thank you very much, everyone.

Mr. Miller, you mentioned splitting your time. Mr. Arnold was under seven minutes, so I can give you three minutes each, or you could start and pass it to Mr. Sopuck as you see fit.

Mr. Larry Miller (Bruce—Grey—Owen Sound, CPC): We would appreciate that three minutes. I just have a couple of brief questions, and I'll just turn it over to Mr. Sopuck for the balance. Is that okay with you?

The Chair: Yes, I'll give you the five-plus minutes. Just pass it to Mr. Sopuck when you finish.

Mr. Larry Miller: Yes. Thank you very much.

My thanks to our witnesses for being here.

As my first point, Mr. Arnold was asking you about what countries had signed on and what have you. You mentioned China and India and maybe another country. Yes, they've signed this accord that says we're shooting for a goal. Well, what I'd like to say is that Mr. McDonald, Mr. Hardie, and I could sign an accord that said our goal was to grow a full head of hair by the end of next week.

Voices: Oh, oh!

Mr. Larry Miller: When we don't do that, there are no consequences. I know it may sound humorous, but the reality is that if anybody believes these countries will actually fulfill their goals, I suggest that the sky is a little different colour in their world.

About your presentation, Ms. Gelfand, I have yes-or-no questions. First, there's man-made climate change. There are things man does that affect the climate. We all know that. They're miniscule in the whole thing, but they're there. Should we address them? Of course we should, and I believe governments are, around the world; not all governments, but many are. Then there's natural climate change. There are two distinct ones.

Would you agree with that statement?

Ms. Julie Gelfand: Yes.

Mr. Larry Miller: Okay. Thank you.

Second, do you actually believe that a government can stop or change natural climate change?

Ms. Julie Gelfand: I don't think anybody can stop the natural variability of the climate, but again, I'm not the scientist. My job is to look at what the government has said it's going to do—

● (0930)

Mr. Larry Miller: No, no, I'm not talking about what the government has done. I'm talking about—

Ms. Julie Gelfand: But that's what I can talk about.

Mr. Larry Miller: —natural climate change.

Ms. Julie Gelfand: I'm sure the government has acknowledged that there is both natural climate change and man-made climate change.

Mr. Larry Miller: Well, I'm glad to hear you say that, because it actually helps your credibility on it when you say that. I don't believe that any government can stop natural climate change.

Mr. Sopuck, the floor is yours.

Mr. Robert Sopuck: Thank you.

Ms. Gelfand, I listened to you very carefully about how you could not comment on policy. You're obviously a devotee of *Yes, Minister*, because Sir Humphrey said that many times at committees that he was in front of. But you're quite right in that regard.

I want to ask about DFO's adaptation audit. You relate it to fish stocks. You talk about Canada's climate as becoming “warmer and wetter”. I should point out that in prairie Canada, for example, we're having a severely normal winter this year. As you know, with many fish stocks the year-class strength depends on water temperature and water flows. Many of the species—for example, the walleye—do much better when spring water temperatures are higher and there are higher flows.

Has DFO done any analysis of the effect of climate change on commercially and recreationally important fish stocks in Canada?

Ms. Julie Gelfand: My understanding, based on our audit, is that the answer would be, yes, they did a full risk assessment. The specifics of individual species would be a question to ask the department.

Again, what did I go in and look at? We went in to see whether or not the department had looked at the entire program, at the full gamut—Coast Guard, wharves, science, fisheries management, species at risk, protected areas—and looked at all their climate risks. They did an analysis in 2005. They redid that analysis in 2012. They also developed a whole series of tools and research projects. Out of all the government departments, five actually looked at climate change from an entire mandate, including their assets.

That is the level we looked at. If you start asking me about specific species, you'll have to ask the department about that. Did they do a risk assessment? That's what we looked at. Was it a good risk assessment? Did it look at their entire program? Did they start adapting? Did they actually start developing tools? That's where this department did a good job, in both those areas—risk assessment and tools.

Mr. Robert Sopuck: Sure. It's important, however, when an assessment is done, that a net analysis be done. I'm not arguing for climate change, obviously, although, as Mr. Miller pointed out, climate does change. I mean, any prairie farmer realizes that year-to-year variations can be quite significant. The old-timers back home still remember 1961 as being the driest year they saw in their entire farming career. The agricultural community is acutely sensitive to changes in weather and climate. In prairie Canada, at least, we seem to be entering into a dry cycle, after about 15 years of a wet cycle.

In terms of their audit of facilities, there are a number of inland small craft harbours—for example, on Lake Winnipeg, Lake Winnipegosis, and so on—where there are commercial fisheries. Did their analysis look at inland harbours?

Ms. Julie Gelfand: I'm pretty sure, yes. I believe the person responsible for inland harbours will be speaking to you right after. My understanding is yes.

Mr. Robert Sopuck: Can you comment on what the findings were? I'm not going to be here for the second hour, so I'm kind of curious.

Ms. Julie Gelfand: I don't have the details of that.

Mr. Robert Sopuck: Having looked at the entire DFO analysis—I'll go back to the fish stocks—do you think it is able to prepare the commercial and recreational fishing industries for the expected changes in fish stocks that will occur because of climate change?

Ms. Julie Gelfand: It has assessed the risks, and it has developed a series of tools. In our other audit on the fisheries management plans, we made several recommendations to rebuild stocks. I was concerned about whether or not we could have another collapse of a stock. I believe it has already come back to this committee to indicate what it has done in terms of those rebuilding plans, and how it is following up on our recommendations.

My assessment is that DFO has a good handle on the risks associated with climate change, and it is developing the tools to help all its stakeholders deal with it and adapt.

The Chair: Thank you, Mr. Sopuck. We are doing a small craft harbours study. We embarked on it, and we are going to Manitoba. Before you leave, could you pass on some suggestions as to what sites we could visit?

● (0935)

Mr. Robert Sopuck: That's an easy one. I'd be happy to do it.

The Chair: Thank you very much, sir.

Mrs. Jordan, for five minutes.

Mrs. Bernadette Jordan (South Shore—St. Margarets, Lib.): Thank you, Chair, and thank you to the witnesses for being here today.

I only have five minutes, and I have many questions. You had mentioned that Canada's climate is becoming warmer, creating significant risks to Canadians and the economy.

When you look at a risk and at the departments that have done a good job, was looking at the impact on the economy a part of the risk assessment, or was there a mitigation assessment?

Ms. Julie Gelfand: Nineteen different departments were assessed. Each department did its own risk assessment. When I look at the totality of all those, what I did not see was whether they were brought together, so that the centre of government could say there are bigger risks in fish than there are for Health Canada, or there are bigger risks for Parks Canada's assets than for DND. The government did not go to that level.

We have 19 departments, and 14 did not do a very good job. In some cases, they did nothing at all, no risk assessment whatsoever. Some did little bits. Yes, they had assets they were worried about, they had assets over there, certain programs. We consider those to not be a good job. Only five out of the 19 did what we consider to be a good job; therefore, the Government of Canada does not have a good sense of what the risks are to the $66 billion of assets.

Mrs. Bernadette Jordan: What were the four departments that did a good job?

Ms. Julie Gelfand: I have them in a chart. There were 19, I keep forgetting which one's which. They were Health Canada, Indigenous and Northern Affairs Canada, Natural Resources Canada, and Transport Canada.

Environment Canada was the lead. It was the one that developed the adaptation policy framework that said that each department should assess its adaptation risks and its climate change risks. Environment Canada didn't follow its own policy. That's not a good position to be in.

Mrs. Bernadette Jordan: When you looked at these, what time frame were they given? You mentioned that there's $66 billion in infrastructure assets belonging to the Government of Canada, and I guess that would cover the 19 departments, basically, that you looked at.

It might take a little while to do a full analysis on $66 billion worth of assets, so what's your time frame when you're looking at these reports?

Ms. Julie Gelfand: Our audit covered the period from June 2010 to June 2017, a seven-year period. The adaptation framework was released in 2011. We started before the adaptation framework, which said that risks must be assessed. It came in during 2011, and we gave them six years.

Mrs. Bernadette Jordan: Do you monitor the pan-Canadian framework plan that is now in place to see if it's being worked on? I'm not asking for an opinion on it, I'm just asking—

Ms. Julie Gelfand: Yes, we will be auditing it.

Mrs. Bernadette Jordan: Is that something that you monitor to see if it is actually working toward targets and goals, or is it something that someone has to ask you to do?

Ms. Julie Gelfand: I can advise you that the office is giving the government a couple of years essentially. They announced it in December of 2016, and we're now into 2018, and we're planning our 2020 audits. After they make an announcement of a new plan, we normally give them a few years to implement. My guess is that we will be doing audits on the implementation of the pan-Canadian framework.

Mrs. Bernadette Jordan: I have questions about small craft harbours, but they're specific questions. Would it be better to ask...?

Ms. Julie Gelfand: The department, yes

Mrs. Bernadette Jordan: I guess the other question I would go to is.... Actually, most of them are on small craft harbours, so thank you.

The Chair: Thank you.

Mr. Arnold, go ahead for five minutes.

Mr. Mel Arnold: In the absence of Environment and Climate Change Canada leadership, did DFO develop its own action plan to look at this, to do the assessments? How did they arrive at the conclusion that they needed to do these?

● (0940)

Ms. Julie Gelfand: Environment Canada issued a framework on adaptation, which asked each department to look at its climate change risks and to start getting ready to adapt, essentially. That adaptation framework was released in 2011. We noted that the Department of Fisheries and Oceans did its first risk analysis in 2005, so they preceded Environment Canada's adaptation framework. They did their first assessment in 2005 and their second assessment in 2012.

Why did they do their first assessment in 2005? You'd have to ask them why they decided to start looking at it early.

Mr. Mel Arnold: When did Environment and Climate Change Canada start giving the directive to—

Ms. Julie Gelfand: It was in 2011.

Mr. Mel Arnold: In 2011, so DFO actually started prior to that. That's interesting.

Ms. Julie Gelfand: Absolutely. They were ahead of the curve.

Can I say that it's not often that I say anything positive about anything the government does?

Voices: Oh, oh!

Ms. Julie Gelfand: I just want to be really clear. Audits usually find all the mistakes, everything that everybody hasn't done. I feel like I'm a grade-school teacher always hitting people over the head. It's such a pleasure to be able to say the department, and several departments in this case, actually did what they said they were going to do. I just want to make it clear that it's not often I get to do it. It's a good feeling to be able to say, “They've done a good job”.

Mr. Mel Arnold: You might be joining the general public out there with that perception, unfortunately. It's not true. Government departments, I think, do yeoman's work, so kudos to them, especially DFO, if they've been out ahead on this one.

The report found that just over $500 million had been allocated to climate change adaptation since 2011. How much of that funding went to DFO over the years?

Ms. Julie Gelfand: I don't have the breakdown of how much went to each department.

Mr. Mel Arnold: Okay.

Mr. Sopuck, do you have any further questions?

Mr. Robert Sopuck: No, I'm good for once.

The Chair: Okay, I have five minutes here and three minutes here, and I don't have quite eight minutes left. Here's what I'm going to do.

Mr. Finnigan, would you be okay if I went to Mr. Donnelly and then back to you for your questions?

Mr. Pat Finnigan (Miramichi—Grand Lake, Lib.): Yes. I have just one question.

The Chair: You have one question. Okay. Thank you, sir.

Go ahead, Mr. Donnelly.

Mr. Fin Donnelly: Thank you, Mr. Chair.

It's just to see if there's an observation, because it's to talk about the good news. You mentioned in your report to us that Fisheries and Oceans Canada was one of the five departments that made progress on climate change risks. Then you go on to talk about the 38 research projects and the 22 adaptation tools to monitor. How is it that this department is doing better on such a tough topic? You've heard comments on some areas where they don't do so well with public relations or fish stocks, rebuilding plans, etc. How is it, in your opinion or from your research, that the department is doing so well?

Ms. Julie Gelfand: That would be a great question to ask the deputy minister.

Mr. Fin Donnelly: I should ask the department?

Ms. Julie Gelfand: Absolutely. What we found was that they did do good analyses. They did two of them. They were ahead of the curve. They've developed all kinds of tools. It's a comparative, so you compare it to the other departments. At some point I remember the director coming in and saying, “Where do we say good and bad, or do we say great, good, not so good, or terrible?” We decided to just put a line, “They did good”, “They did not do good”.

Mr. Fin Donnelly: My colleague perhaps could follow up with department officials then.

Thank you.

The Chair: Thank you, Mr. Donnelly.

Mr. Finnigan, your question, please.

Mr. Pat Finnigan: Thank you.

Thank you so much for being here this morning.

Of course, we know climate change occurs naturally all the time. I mean, we remember when we used to touch the wires on top of the snowbanks in the great winter of 1965, I think it was. We know that happens, but we also know that man is responsible for additional climate change and catastrophes that we're seeing around the world

Having said that, even if we had met all of what we promised in the last 20 years, we probably would still have events that are now I guess responsible because of man's pollution. I don't know if you would agree with that. I don't think we could say, if we had done that 20 years ago we wouldn't have those small craft harbours being washed out and all those things.

Have we looked ahead, and have all departments looked at and budgeted for what's coming? Have we done an exercise in that sense? Whether it's agriculture, fisheries, and all the other, it's going to cost us. We know that. Have we done any exercise on that?

● (0945)

Ms. Julie Gelfand: I don't believe that the Government of Canada has an overall assessment of the costs of not adapting to climate change and the costs of adapting. The researchers would argue, and I've read studies, that not adapting is going to cost more than spending the money to adapt. However, because the Government of Canada has not done a good assessment of its risks across all of its assets, all of its programs, it does not have a good idea of the risks to government assets and programs, and delivery of programs to Canadians. If it doesn't have that, it can't have budgeted that. That has to be the first step.

Mr. Pat Finnigan: You would say it's a good idea to start budgeting for what it's going to cost because we know it's real.

Ms. Julie Gelfand: Absolutely it's real, and we are adapting now. We did another audit on severe weather which showed how much money was being spent by federal coffers to help provinces after disasters, and we saw a real spike in terms of the value.

You could talk to the Insurance Bureau of Canada, as well, who could give you very specific information about how the costs of flooding and extreme weather have increased in the last few years. I would encourage you to talk to them.

Mr. Pat Finnigan: Thank you.

The Chair: Monsieur Normand, thank you, and, of course, Ms. Gelfand. Thank you so much for your presentations, your honesty, and your zest for your job.

Ms. Julie Gelfand: Thank you.

The Chair: I get the feeling you really like your job.

Ms. Julie Gelfand: I do.

The Chair: We like ours too. Thank you so much for accommodating us.

Folks, we have a few minutes. Once I see our department coming in and ready, we'll start again.

● _____ (Pause) _____

●

● (0950)

The Chair: Welcome back, everyone. Let's all settle in. As we mentioned before, this is a briefing on report number two, “Adapting to the Impacts of Climate Change, of the Reports of the Commissioner of the Environment and Sustainable Development”, fall 2017.

As you know, we passed a resolution that we have to have a hearing on these reports within six months, which is what we are doing now, because I mentioned this was presented in the fall of 2017.

Right now, we have the Department of Fisheries and Oceans in front us: Arran McPherson, Acting Assistant Deputy Minister, Ecosystems and Oceans Science; Keith Lennon, Director, Oceans Science Branch; and Pierre Pepin, Senior Research Scientist in Science.

We also have Donna Jean Kilpatrick, Director, Engineering and Technical Services with Small Craft Harbours.

We also have some special guests with us. We have a whole slate of replacements joining us, and we are certainly honoured.

First, from Edmonton Strathcona, Linda Duncan.

From Dufferin—Caledon, David Tilson.

From Lambton—Kent—Middlesex, Bev Shipley.

Thank you all for joining us.

Dr. McPherson, go ahead for up to 10 minutes please.

Dr. Arran McPherson (Acting Assistant Deputy Minister, Ecosystems and Oceans Science, Department of Fisheries and Oceans): Thank you, and good morning.

I would like to start by thanking you all for giving us the opportunity to join you here today to highlight the work that's being done by departmental scientists to better understand and predict the impacts of climate change in aquatic environments, and to help advance the Government of Canada's efforts on climate change adaptation.

My colleagues have already been introduced.

I'd also like to thank the commissioner, who I think is no longer with us, for both her report and her presentation. DFO welcomes the report's acknowledgement of the departments efforts to address the impacts of climate change. The report recognizes that Fisheries and Oceans Canada has shown leadership in the area of climate change adaptation, and has conducted numerous risk assessments on how climate change impacts the delivery of the department's mandate.

Four specific risk assessments were completed. One for each of Canada's three oceans, and for its major inland waterways, under the aquatic climate change adaptation services program. These risk assessments concluded that there is a high probability that Canada's aquatic ecosystems and coastal infrastructure will be highly impacted by climate change over the next 50 years.

Specifically, Canada's oceans are expected to become warmer, fresher, more acidic and less oxygenated as a result of the increase in carbon dioxide in the atmosphere and the changing climate.

These changes in ocean conditions may have profound impacts on aquatic ecosystems and fisheries, coastal infrastructure, and the coastal communities that rely upon them for their sustainability. These potential impacts are creating the need for information and tools that can be used to help the department and its stakeholders respond and adapt to these changes. This is why DFO conducts science, research, and monitoring that is necessary to understand both the current state of the ocean environment as well as how it may be changing.

For example, due to the increasing risk of ocean acidification, aquatic ecosystems that use calcium for their shells or their external skeletons may eventually have difficulty in forming their outer protective coverings. This may mean that, in the future, salmon productivity could decline in the Pacific, because an important food source, copepods, which are small marine molluscs, may not survive in the long term due to the potential changes in their ability to grow a shell.

To respond to this type of increasing risk, DFO has an ocean acidification monitoring and research program, so that scientists have a better understanding of the extent and rate of ocean acidification in the coastal and offshore waters in all three oceans. DFO is conducting research to better understand the biological impacts and responses to ocean acidification by key species that require calcium to survive.

Many coastal communities in Canada are vulnerable to the impacts of climate change resulting from sea level rise and associated storm surges, flooding, and erosion. Future projections of climate change and the marine environment indicate that declining sea ice and rising sea levels will impact Canada's coastline and the infrastructure in these areas. Understanding these changes is essential for inputting into coastal planning processes, and developing adaptation strategies that can minimize the harmful effects that may result.

To better adapt to these future conditions and as the commissioner mentioned in her speaking points, DFO developed the Canadian extreme water level adaptation tool, which provides sea level rise projections for Canada's coastlines over the coming century, and advice on how to build coastal infrastructure to accommodate this projected rise.

This web tool was originally developed for internal use by the small craft harbours program. However, it now represents a positive example of how we've translated scientific data and analysis into usable information products and tools that will help coastal communities in Atlantic Canada. To take this even further, DFO has partnered with the Ecology Action Centre, based in Halifax, Nova Scotia, to bring this information on potential sea level rise directly to coastal communities.

DFO is also working to better understand and predict the vulnerability of commercial species and their prey to the impacts of climate change. DFO scientists are combining research with long-term observations and computer-based models to predict future ocean conditions, such as water temperature, currents, and ocean chemistry. These predictions can provide fisheries managers with insights into future potential ranges and migration patterns of commercial fish species as well as species at risk.

● (0955)

In turn, this type of information can inform decisions about how the timing of a fishery may change, how centres of distribution of species may change, or even how the condition of the fish may change over time. To provide an example, DFO scientists are looking at the impacts of changing ocean temperatures on the timing of the seasonal moults in lobster. Changes in temperature, the availability of prey, and other ecosystem factors can affect the moult timing in lobster. The timing of the moult is important, because it determines when the lobster shells harden, when they fill with meat, and when they're in top market quality. The results of this work will then help fisheries managers and the members of the industry themselves when they're considering the optimal timing for the fishing season.

While I've given you a few examples of how DFO is working to undertake the research needed to support its program decisions, this is also work that supports Environment and Climate Change Canada's overall leadership on climate change, including the actions of the pan-Canadian framework.

On behalf of DFO, we look forward to continuing to provide high-quality, credible climate change science that will benefit Canadians. We're happy to be here today and to answer any questions you may have.

● (1000)

The Chair: Thank you, Ms. McPherson.

Ms. Jordan, you have seven minutes, please.

Mrs. Bernadette Jordan: Thank you to the department officials for being here today.

As you know, we just had the commissioner of the environment here. She gave you a glowing report card on the work you're doing with regard to climate change mitigation and adaptation.

I have a number of questions with regard to small craft harbours specifically. The commissioner referenced the Margaree Harbour and using the tool to make sure that when the new structure was put in place, it met rising sea levels and storm surges. Is that tool used on every small craft harbour that needs to be fixed, changed, built, or rebuilt? I'm wondering this because in my riding I have probably the most small craft harbours in the country. There have been times, over the last number of years, when I have seen money put into building or fixing a structure, and then it's under water. It has not been adapted to the surges that are happening.

Is that tool readily available and always used, or it is just every now and then? Does somebody have to ask for it? I'm just wondering about the process for using the tool for that.

Ms. Donna Jean Kilpatrick (Director, Engineering and Technical Services, Small Craft Harbours, Department of Fisheries and Oceans): It is readily available to all of our regional engineers. In some areas it's used more than in other areas, where we don't have as extreme a rise in the sea level.

That said, it is a predictive tool, so it isn't alway right. We don't know whether the predictions are accurate or not, and in some areas it's worse than in others. But the tool is available to all of our regional engineers, yes.

Mrs. Bernadette Jordan: As we heard from the commissioner, we know that sea levels are rising. You said it here yourself. We know that climate change is having an effect on infrastructure. Would it not be prudent to have that available so that when there's a design being done for a small craft harbour, you make sure that...? We've seen on the south shore of Nova Scotia that sea levels are changing and storm surges are a lot worse than they've ever been.

I'm just wondering why we wouldn't use it all the time. I know you say it's a predictor, so it may not work, but at the same time, I question if it's even being used to the full extent.

Ms. Donna Jean Kilpatrick: It is being used. It's rolled out to the consultants who do designs for us as well.

Mrs. Bernadette Jordan: Okay.

With regard to small craft harbours specifically and the changes in sea level rise and storm surges—I'm going to put you on the spot here, and I'm not sure if you can comment on this—one of the things we have a challenge with is the amount of funding available to small craft harbours to mitigate. Should there be a special fund for just mitigation or adaptation for small craft harbours?

Ms. Donna Jean Kilpatrick: As you know, we have a lot of harbours. We have 750 core harbours, with 7,000 assets worth $5.2 billion. We know that the program is underfunded for the amount of infrastructure we have. That said, we've had great success in the last few years with getting extra budget money to address our program. We do know that the climate change effects will put more pressures on our program, absolutely, with respect to infrastructure deterioration faster than what we would like, with respect to storm surge damages, and with respect to increased dredging.

Mrs. Bernadette Jordan: Thank you.

You mentioned the American lobster molts and the science with regard to the changing seasons. We're seeing a lot more lobster in my area now than we've ever seen because of the colder waters and the movement.

With regard to the seasonal changes or the movement, have you looked at when lobster seasons actually open and close, and at possibly moving those? Because of the movement of the lobster, I guess I question if we're fishing at the right time.

● (1005)

Dr. Arran McPherson: I think, in the long term, that's the ideal outcome. Obviously, we don't have our colleagues here around the table who have managed the fisheries, so I can't speak to the processes that they undertake. The researchers who are working in Atlantic Canada on American lobster are doing that in lockstep with the program managers in those areas, and are trying to engage industry members as well. That's not to say that next year we're going to see a big dramatic change in the lobster season.

If we think about the time scale of climate change, which is decades, in 10 years, in 50 years, we just want to be sure that we have the information base that will allow us to have those decisions made most appropriately. That's the job of science.

Mrs. Bernadette Jordan: Do you feel that you have good, open communication between the oceans science branch and the fisheries branch to make sure that you're all on the same page when it comes to making the decisions that affect.... One of the things that we heard during the MPA study is that this was not always the case. I'm just wondering if, with regard to things like climate change, there are good lines of communication between fisheries and oceans science.

Dr. Arran McPherson: There are. We have a long history of working very closely in the science organization with the people who are responsible for managing the fisheries. That goes back, again, decades of experience working together. We also have research scientists and biologists who attend advisory committee meetings so that they have a direct engagement with the fishing industry themselves. I feel very confident that that alignment is there.

Mrs. Bernadette Jordan: You also mentioned in your report about the copepods and the impact that this will have on the Pacific, the salmon fisheries specifically.

When you're looking at this kind of thing—their inability to grow a shell—is there a time frame on it? Is this going to happen in five years? Is this going to happen in 30 years? I'm just wondering how you go about determining what the long-term or short-term economic problems would be with regard to this.

Dr. Arran McPherson: I'll take a stab at that, and I'll ask Pierre if he has anything to add from a research scientist's perspective.

I'll just come back to a point that I made a moment ago: when we think about some of the trends around climate change and the warming of the ocean and the changes in the ocean, we're really thinking of longer time frames.

When we're right up against a change, it's difficult to adapt. The longer we have and the earlier we start, the easier it is for us to detect changes over time. We rely on our monitoring programs to do that. I spoke to the monitoring that we're doing on all three oceans on ocean acidification, which comes to your point.

It's not to suggest that that change and the absence of copepods in this example will happen tomorrow, next year, or even in five years. That was an example that was meant to directly link the challenge with ocean acidification to something that's very tangible: a food source for a very important species for western Canada.

The Chair: Thank you very much.

Mr. Miller, you have seven minutes, please.

Mr. Larry Miller: Thank you to our witnesses for being here.

I was glad to hear Ms. Jordan's comment on small craft harbours and basically the funding or lack thereof. The previous government had put a fund in place. It wasn't enough—it never is—but it was there. I believe the present government cancelled that. Based on her comments, I hope that she will be urging that it be reinstated.

I asked the previous witness, Ms. Gelfand, about climate change, and I have a couple of short questions. There's man-made climate change, of which Canada is responsible for less than 2%. Then there's natural climate change.

Would you agree with that, that there are the two different ones?

Dr. Arran McPherson: I would agree that there's natural climate variability, as well as climate change attributable to humankind's actions.

Mr. Larry Miller: Why would you say "climate variability" with regard to the other instead of just "climate change"?

Dr. Arran McPherson: I'm fine with either.

Mr. Larry Miller: Okay, I just wanted to clarify that.

With regard to the natural climate change, is your testimony here based just on the man-made climate change or is it on a combination of both?

● (1010)

Dr. Arran McPherson: Pierre, did you have anything you want to add?

Dr. Pierre Pepin (Senior Research Scientist, Science, Department of Fisheries and Oceans): To get back to your question about natural variability versus climate change, we've been very careful in differentiating the variability that is inherent in the system, which is what I will call the multi-decadal or interannual variability, which is most of the variability that we're going to see, versus the trend that we've seen since the beginning of the previous century.

Making that distinction was part of everything we did in the risk assessment in all the climate research that we're actually doing. There are certain features of the inherent variability that we see from year to year. We can partition that, the year effect, I would call it, or the decadal effect, versus the long-term trend. When we talk about climate change, we talk about the change that will occur over the next century.

Mr. Larry Miller: Okay, I get that. I heard Ms. McPherson state that, and I'm okay with that.

It still appears though, Mr. Pepin, that you're bent on using the term "variability" instead of "natural climate change", and I'm not sure why.

I only have so much time, so I'm going to move on. Can citizen science, or local involvement—call it whatever you like—play an important role in monitoring our ocean, river, and marine environments to aid in the cost of gathering data? Can you comment on that?

Dr. Pierre Pepin: It's becoming much more popular. The community is getting much more involved.

The critical thing that we have to ensure is that the quality of the data is there. Many organizations come to us and consult. We have a lot of dialogue—particularly on the west coast, I would say, but on the east coast as well—in which we define some standards that have to be met. Naturally, there is going to be more inherent error in those data, but it can help us greatly in increasing the spatial resolution with which we can actually observe the changes.

Mr. Larry Miller: I agree with your comment that we've got to make sure that whatever science we use, wherever it comes from, is accurate. At the same time, we have to recognize that if there's potential for a problem when it's citizen science, there's also a huge problem in what you read based on, I'll call them professional scientists, because there are two very distinct opinions out there. When you insert the word "opinion", in my opinion, it's no longer science. It's based on an ideology.

I believe that we have to protect both sides and make sure that it is science.

My next question, I think, is probably for you, Ms. McPherson. I understand there were assessments done on the impact of sediment deposits in the lower reaches of rivers and estuaries, etc., and actually, Mr. Arnold asked about it with a previous witness, but they asked us to ask you. Could you elaborate on these assessments and actually tell me what measures are required?

Dr. Arran McPherson: I will start, and then I'll ask my colleague, Keith Lennon, who's the lead of our climate change program nationally, if he has anything he'd like to add.

As I said in my opening remarks, and I guess going back to what the commissioner said at the beginning, we looked at climate change impacts through every part of the mandate that we deliver as an organization to determine the risks. Then we took that and applied it to each of the three oceans, as well as to a freshwater environment.

When we looked at that, we looked mostly at the Great Lakes and Lake Winnipeg. Some of the work that we did in that undertaking was to determine the vulnerabilities of the nearshore habitat. We looked at water level changes, and how that might affect fish populations and their prey.

Therefore, that is something that obviously has risen to the top. All of our research findings and our research projects are available online. I just spoke to one specific example, but all of the ones that were mentioned earlier in this morning's presentation are available on our website for additional details.

Keith, did you have anything you wanted to add?

Mr. Larry Miller: Briefly, because I still have another question.

Mr. Keith Lennon (Director, Oceans Science Branch, Department of Fisheries and Oceans): As Arran has just mentioned, we conducted four large aquatic basin risk assessments, one of them on freshwater environments. We looked at six different risks associated with those: the ecosytem and fisheries degradation; changes to biological resources; species reorganization; increased demand for emergency response; infrastructure damage; and also, changes to access in waterways.

The risk assessment that we conducted in the freshwater environment indicated that there will be changes to the navigability of some of the freshwater environments. Navigability will increase in some areas and decrease in others, and there will be an impact as a result of sedimentation, etc. Therefore, we did look at that. The extent to which it varies depends on where you look, but there is an opportunity.... Also, our CAN-EWLAT, our Canadian extreme water level adaptation tool, looks at sea level changes in general, which include sea level rise and also drop.

● (1015)

Mr. Larry Miller: Okay, good, because that's where my second question was going to come in on this, whether assessments had been done to consider if there is a drop in sea levels. With natural climate change, it can go either way. One of the examples I was thinking of when I asked that question was on the potential need for dredging of harbours.

Could you comment on that further?

Mr. Keith Lennon: I think I covered it a little bit but yes, of course. As part of our risk assessment as well as the development of our adaptation tools, we took a look at changes in sea level itself. It could be rise; it could be drop. We also looked at opportunities, at storm surges and actually inundation. Those also impact erosion of coastal areas as well. We developed an adaptation tool that we use for our small craft harbours, which now is accessible through the Ecology Action Centre, that provides information to coastal communities in Atlantic Canada on what they should do with regard to their projected sea level changes.

The Chair: Thank you.

Ms. Duncan, go ahead for seven minutes, please.

Ms. Linda Duncan (Edmonton Strathcona, NDP): Thank you, Mr. Chair. It's a delight to be in your committee.

The Chair: It's a delight to have you.

Ms. Linda Duncan: I understand that DFO has received accolades from the commissioner, compared to other departments including Environment, for its climate research, so kudos to you.

I am a prairie member of Parliament, and I have to share with you that for 45-plus years, I've been deeply concerned about the federal government's removal from responsibility for inland fisheries. I am looking at your report, which looked at three oceans and major inland waterways. As I understand it, you were concentrating on the St. Lawrence, the Great Lakes, and Lake Winnipeg. Famed scientists, such as David Schindler and W.F. Donahue have done extensive work on the potential impacts of climate change to glacier-fed rivers, including the Peace-Athabasca and including both the Saskatchewan basins. I'm wondering why DFO has failed to look at those inland waters.

Dr. Arran McPherson: I'll start—and then I'll turn to my colleagues to ask if they have anything they'd like to add—by reflecting that when we initiated our risk assessments, we began with the areas for which we had the most data. When we looked at the freshwater environment, we selected those areas for which we could access a really long time series, or as long a time series as possible, of environmental information, temperature information, as well as information about the biota. For those types of areas, the ones we focused on, that was more easily accessible; that's not to say that this is the only part of Canada for which we've actually undertaken work on climate change research or tools. These made up the focus we used to ask how we could direct our research and what the main things and the main risks coming out of this type of assessment were. We recognize that it won't be perfect, and recognizing this will point us to future research and future tools that will be of value.

As I said, just because that's where we focused our risk assessment initially doesn't mean that's the only place in fresh water where we've undertaken research.

I'll ask my colleagues if they have anything to add.

Pierre.

Dr. Pierre Pepin: I think you've raised a very good point. I think it's a very important one.

I'm one of the few remaining people who were involved in setting up that initial process. It was the first peer-reviewed process we undertook in terms of looking at the impacts of climate change. Yes, it would have been very nice to have all the participants at the table looking at aquatic environments in general. We extended invitations to the provincial governments that had responsibility associated with the freshwater environments. Some participated; some did not, and that was a shortcoming. When we redo this in a few years' time, I think we should reach out to a broader range of the scientific community, reframe the objectives and the terms of reference associated with that review process, and definitely look at aquatic environments and not just at our areas of responsibility. Being one of the leads on the impacts and vulnerability assessment, I will tell you that we really scrambled to meet the needs of the government at the time.

● (1020)

Ms. Linda Duncan: Thank you.

I'd still have to say that the three major basins you're looking at are glacier-feds. I think it's a huge gap in analysis. I would look to assurance that the federal government is going to step up to the plate and deliver on a responsibility for those inland fisheries. We already have considerable science showing that we're already seeing impacts to flow rates in the Peace-Athabasca delta, and that obviously will have significant potential impacts to the fishery and indigenous reliance on the fishery as well as navigation.

In relation to that, is DFO playing a role in the UNESCO review that has been called on the Wood Buffalo world heritage site? Two of the directives are looking at the flow rates in that basin into the world heritage site and the impact of climate, so it would seem normal to me that, given that your department is looking at the impacts of climate, you would be pulled in by Parks Canada, as they are leading that study by UNESCO.

Dr. Arran McPherson: I'm not aware of our involvement, so that would be something I'd have to come back to the committee on.

Dr. Pierre Pepin: The role of DFO in looking at flow rates in rivers and glacier-feds on the other side of the Rockies is much more considerable because of our reliance on the importance of salmon fisheries in those areas. I'm not aware of what's happening on your side of the Rockies.

Ms. Linda Duncan: Of course, for the Site C dam, when the review was done both federally and provincially, they did not look at the transboundary impacts into Alberta, so of course, flow rates impact on the Peace, and in turn the Athabasca River, into the world heritage site. I know that certainly the first nations will be looking to DFO to intervene and provide information and advice for that review.

Dr. Pierre Pepin: The issue of flow rates and also the timing of the flow are critical aspects to the dynamics of those systems, both in terms of how they impact the communities that are reliant on them and how they impact the biology of the animals. That is something where there are a number of research projects across the country, whether they are labelled as climate research or not, that are being addressed by a number of my colleagues in various parts of the world. We do bring in input from academic partners and provincial researchers, if there are any, to provide us with advice on how to do things.

Ms. Linda Duncan: Thank you.

[*Translation*]

The Chair: Before we continue, I would like to welcome Eva Nassif.

You represent the riding of Vimy. Is that correct?

Mrs. Eva Nassif (Vimy, Lib.): Yes.

[*English*]

The Chair: Now we're going to Mr. McDonald for seven minutes, please.

Mr. Ken McDonald (Avalon, Lib.): Thank you, Mr. Chair.

Again, thank you to our witnesses. It's not every day, I think, that we have groups or people appear at this committee who make it interesting, but today has been, because I think most of us are affected in some way by this.

My riding of Avalon is on the Avalon Peninsula part of Newfoundland and Labrador, and all but one community is bounded by the Atlantic Ocean. People depend on it very much, so we see first-hand the storm surges, sea levels, and the changes in climate. Where I live, in particular, it's about a five-minute walk to the ocean. There's a river and a pond that at one time would freeze in late fall and wouldn't thaw out until April of the next year. Now you hardly get the chance to play a game of hockey on it before it thaws out again, then refreezes. A lot of changes are happening.

My first question would be around the sea rise and storm surges that are taking place. Communities on the ocean have a tendency to put an awful lot of infrastructure along the ocean. It could be damaged very easily with a good storm surge. In particular, my hometown, for example, will approve a subdivision to be built because, of course, the land next to the ocean is at a premium. At one time, people thought it was worth nothing. Now, it's hundreds of thousands of dollars just to get a building lot.

We see erosion year after year after year taking place. There are water lines. There are sewer lines that are very close to the ocean, and that goes ahead. Do we, as a department, ever advise provinces or communities, and say, “Look, if you're putting this infrastructure in the ground right here, you have to understand that in 10 or 20 years' time, if the sea levels reach where they are predicted to go, and storm surges increase the way we've seen them increase, you stand to lose all that infrastructure and cause a major environmental catastrophe right on the edge of the ocean”?

● (1025)

Dr. Arran McPherson: I think you've pointed to why it's very important and what the value of the pan-Canadian climate change framework is about, which is departments, provinces, territories, and municipalities working together.

Some of the items you touched on in your points could be informed by some of the work we're doing, which is why we work in lockstep with departments such as NRCan, which is advising provinces and municipalities about things that go beyond our mandate.

Our mandate in Fisheries and Oceans is about the oceans. It's about how those things, the oceans, might be changing. We're obviously interested in our own infrastructure and want to make those tools available to anyone who can use them.

We don't have the expertise to be advising municipalities on their building codes, for example. That type of interaction rests with other bodies of government. We feel confident that by working with other federal departments and provinces and making all of our information available online, and also by working with partners such as the Ecology Action Centre and others, we can make sure people are aware of the work we're doing and of how they can grab that work and incorporate it into the work they're doing.

Do you have anything you want to add to that?

Ms. Donna Jean Kilpatrick: No, that's good.

Dr. Pierre Pepin: Where we provide input is in sea level changes, working on providing forecasts of extreme events. That is always a bit touchy, because most of our observations are at that end of the scale, and we're talking about events that are at this end of the scale.

The erosion of coastal areas is of particular concern. When we did the risk assessment exercise for the Atlantic, for instance, we had people from NRCan who were participating, and that was part of the discussion. Coastal erosion is a geology problem much more than it is an ocean problem, and they are the ones who were speaking to that when we were trying to become informed.

Mr. Ken McDonald: It may be a geology problem, but it's the ocean that's doing the harm.

Dr. Pierre Pepin: Oh, yes.

Mr. Ken McDonald: I think that sometimes communities look at the economics of allowing buildings to be built and development to take place because it gives them a tax base. A lot of the communities are so small that they don't have the connection to all this information that's available out there. It's hard.

Even communities on the northern peninsula.... I think it was Daniel's Harbour a few years ago that ran into a major problem with houses having to be vacated because there was a fear of them just dropping off into the ocean. Nobody 50 or 60 years ago thought that would happen.

Dr. Pierre Pepin: I and a number of other researchers are involved with Environment and Climate Change Canada. We are putting together a report that looks at the interplay between these various elements, and it's a multi-department exercise. The report is supposed to be out sometime during 2018. I can't tell you exactly when, but I do have a second draft of the report and we will be meeting on it in March. It's designed to inform the communities in plain language of where there are tools, where there are resources that they can access.

● (1030)

Mr. Ken McDonald: That should be a good help.

When you look at mitigation, do you consider the economic impacts?

Dr. Arran McPherson: Broadly on climate change, or in a specific case?

Mr. Ken McDonald: Broadly, on climate change.

Dr. Arran McPherson: Some of the things we looked at—and I'll use the small craft harbours example—when the risk assessment was being undertaken were things like the value, what information we have about landings, and the value of the transactions that are being undertaken from that harbour. What we don't have is something that would say that looking across all of the department's mandate, across all of the lines of business we undertake, this is what we think the total cost of climate change would be for Canada, and I'll tell you one of the reasons why.

To do that type of undertaking, we'd need to be able to predict into the future how we think individual stocks would change and when, and which ones would increase and which ones would decrease. We don't have that level of resolution yet. I think it's early. It's too early for where we are in our analysis and research to be able to say that this is the total cost.

I recognize that's something people would be very interested in, but I think that's outside of where we are. It's too far into the future. It wouldn't be very meaningful if we gave a prediction at this point.

The Chair: Thank you, Mr. McDonald. I appreciate it.

Gentlemen, I'm going to split your time at two and a half minutes each, with flexibility. I'd cut the questions off at two and a half minutes, but if they're in the middle of an answer, I'll let that go on until it runs its course.

Mr. Shipley, for two and a half minutes, please.

Mr. Bev Shipley (Lambton—Kent—Middlesex, CPC): Thank you.

In the report, what was concluded was that "Environment and Climate Change Canada, in collaboration with other federal partners, did not provide adequate leadership [in] advance [of] the government's adaptation to climate change impacts". The report says that "there was no action plan" and there was no "clear direction to ensure the federal government would integrate climate change consideration into its own programs, policies, and operations". It states:

> ...the federal departments...did not take appropriate measures to adapt to climate change impacts.... As a result, the federal government could not demonstrate that it was making progress in adapting to...changing climate [change]. Stronger... leadership is needed.

Also, it "did not provide adequate leadership and guidance to other" departments. It "did not provide adequate tools and resources", and "it cannot demonstrate that the climate change risks to its areas of responsibility, including its assets, its programs, and other activities are understood or addressed". Why?

Dr. Arran McPherson: I recognize that you're reading directly from the report but acknowledge that I can't speak on behalf of Environment and Climate Change Canada.

Mr. Bev Shipley: My concern is that we had all these reports about the glowing response, and then for the Auditor General's, when you read some of them, it's actually not.

I will give you examples from your report: "Specifically, Canada's oceans are expected to become warmer", and all that; "increasing risk", which is I guess a model indication; and, "concerns" around "salmon". The waters are going to become warmer, yet we've heard from a colleague that her concern is that with cold water—it's not a concern, I think, but likely a good thing—we'll end up with more lobster.

We're getting many mixed reports. Why?

Dr. Arran McPherson: I think you'll see—I'll turn to my colleague Pierre in a second—that the impacts of climate change are not going to be the exact same across Canada. In some places we'll see changes that will be positive for these ecosystem components, but negative for others. As water warms, we may see species that once weren't in our waters moving into them and also see species that prefer colder or warmer moving elsewhere. It's very difficult for us to say as a department that there's one answer as it relates to climate change and this is what—

Mr. Bev Shipley: Okay. I only have two and a half minutes.

Then we talk about the long term. My colleague talked about the natural and the human.... Because we've talked a lot about surges, water temperature, and sea levels rising in our three oceans, can you provide—or maybe you have, and I apologize, as I'm just filling in—a graph of the last 100 years? Can you provide us a graph for the last 100 or 150 years, outside of the computer models that you're projecting things to happen on? As you've correctly indicated—I think Ms. Kilpatrick did—sometimes they work and sometimes they don't. Can you provide that for this committee so we can see what has actually happened over the last years and decades?

● (1035)

Dr. Arran McPherson: Just to clarify, that's a graph that provides data, not projections, looking at sea level changes and ocean temperatures.

Mr. Bev Shipley: It's for all those things that we talked about that you say we have—our sea levels, temperature, surges, and coastal erosion—and what changes in those have happened over the last 150 years.

Dr. Arran McPherson: We can certainly provide to the committee a graph that has the data we have as it relates to parameters that we measure, as opposed to other departments.

The Chair: Thank you.

Mr. Tilson, please, for two and a half minutes.

Mr. David Tilson (Dufferin—Caledon, CPC): Thank you.

I appreciate all the things you have said. You've also pointed out that areas in Atlantic Canada, Quebec, Ontario, the west, and British Columbia are all different.

All the issues are different, but there's no question that all of these things are affecting the waters, the wildlife, and the the fish. We know that because we're living it. We're members of Parliament, but we're also citizens, and we realize that it's going on. In Ontario, for example, in cottage country, the water is going up and down like a yo-yo. Sometimes it's really bad, and sometimes it's not.

I appreciate all of your comments. They have been very helpful to the committee. My question is, do you have recommendations acknowledging what Mr. Miller said, which is that there are man-made issues and there are natural issues? The public is going to be asking us, their members of Parliament, what we are going to do and how we are going to solve these problems. Do you have any form of recommendations that may help any of the areas of Canada?

Dr. Arran McPherson: I have a couple things. I appreciate your comments.

What we have are tools. We have research projects that inform the development of tools that will allow communities, stakeholders, and our own departmental managers to incorporate climate change considerations into their decision-making. I'll give you an example. We have a tool that will help northern communities predict how the sea ice cover in the Arctic Ocean will change over time, so they can look at that when they're planning their future commercial fisheries ventures. That's not the same as recommendations, I acknowledge.

What the department has said we are going to do about climate change is found in our federal sustainable development strategy. We have committed to our own actions around the same types of things in the pan-Canadian framework about reducing greenhouse gas, about being more efficient as we build infrastructure, and about undertaking the research necessary to really inform Canadian decision-making. That's what the pan-Canadian framework recommends, those are the types of actions our department is taking, and they are found in our federal sustainable development strategy.

Mr. David Tilson: I appreciate it's a difficult issue and all of us have different areas. I'm from Ontario and my issues are quite different from those in Newfoundland or Nova Scotia or the west.

I've had constituents talk to me about the water going up and down. In many cases it's down, but right now it's up. Next week it could be down.

"What are you going to do about it?" they ask. "You're a member of Parliament, what are you going to do about it?"

We look to you for advice. I appreciate that some of these issues are municipal, provincial, and federal. What should we be saying to people as to what the federal government can do?

Dr. Arran McPherson: It's difficult for the federal government to say, "This is the silver bullet that will solve issues of climate variability and climate change". That's why I keep coming back to those same things, around all of us collectively reducing greenhouse gas emissions and being more energy-efficient. We can't provide advice that would say, "Do this one thing and it will change the lake outside your dock". That's a scale of resolution that we don't have.

● (1040)

The Chair: Thank you.

We go to Mr. Hardie, for five minutes please, to close out.

Mr. Ken Hardie: Thank you, Mr. Chair.

Acidification and the impacts of that are interesting. I recall a few decades ago it was acid rain. It was the sulphur dioxide turning into sulphuric acid that was eating away at the stones of the Parliament Buildings and also damaging our lakes, rivers, and streams.

What happened? Where are we with that particular substance now, in the mix of what you're following?

Dr. Pierre Pepin: The issue there was the sulphur emissions from power plants, industry, and so on. As a result of the research that was done, largely in freshwater systems and in terrestrial systems, it became clear that these emissions needed to be reduced. The response from industry and governments was to ensure that the products being burned had lower sulphuric levels. So that problem—I don't want to say it went away because it still exists in some areas—was significantly moderated. In terms of the impact on the ocean, hydrogen sulphide is one of the components of ocean acidification, but the main component is the increase in partial pressure of CO2.

Mr. Ken Hardie: Let's talk about CO2. There have been some comments from our colleagues across the way, that there's naturally occurring and there's artificially occurring. If CO2 levels are increasing, where are the natural sources of the increase in CO2?

Dr. Pierre Pepin: There are several sources for greenhouse gases. Some of it is natural. There's a large body of it in permafrost in northern areas. There are the products of the digestive systems of most of the cattle and animals that we exploit for our own consumption. In all the climate models, those elements are actually incorporated as part of the natural projections.

Mr. Ken Hardie: But it would appear, particularly in the case of the animals, that is at least maybe indirectly human driven.

Dr. Pierre Pepin: Definitely it's indirectly human driven. In terms of the natural sources, they are far smaller than the burning of fossil fuels and human activities by a factor of probably 10:1, something like that.

Mr. Ken Hardie: As has been pointed out to you, you have really good marks from the environment commissioner on your efforts. I understand those efforts really spanned from, what, about 2012 through to 2016, 2017?

Dr. Pierre Pepin: It's something like that.

Mr. Ken Hardie: That must have then represented a priority, because what we also heard was the capacity of the department to undertake science had been degraded somewhat in that period of time. Was this, then, a priority to do this work, and why did you accept it as a priority?

Dr. Pierre Pepin: It was a priority partly because of the need, because of the importance, but it was also an opportunity to make greater use of the observation programs that we had. It forced us to actually bring a number of elements together in terms of data and knowledge and expertise such that, I think, the outcome was greater than the sum of its parts. We actually learned a great deal about how to work together, how to direct our efforts towards issues that are of national and international importance; and it was a synergy. Being one of the people who actually tried to get all the cats to work together, I'm extremely proud of the outcome.

Mr. Ken Hardie: Very good.

In the capacity now to undertake science, are you in better shape?

Dr. Arran McPherson: We certainly are. We received substantial investments in DFO science, both in budget 2016 and budget 2017. We are extremely fortunate that we've been able to harness those new people and the new technologies and the new partnerships that we've been able to enter into, to apply to this problem, but also to others that are of importance to the department and to the government.

● (1045)

The Chair: Thank you, everyone, for being here: Mr. Lennon, Ms. McPherson, Ms. Kilpatrick, and of course, Monsieur Pepin. *Merci beaucoup.*

That's it for today. We'll see you again on Thursday, colleagues. Thank you.

The meeting is adjourned.