LOCKHEED MARTIN CORP

Moderator: Julie Marcy
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10:30 am CT

(Courtney Chambers): All right, good afternoon everyone. Again, I'm (Courtney Chambers) and I believe we're going to go ahead and get started this afternoon. I work here at ERDIC in the Environmental Laboratory and Technology Transfer for Eco System Restoration.

And I'd like to welcome you to our web meeting on Climate Change Part 2 by Dr. Kate White. This series of web meetings on ecosystem restoration topics by ERDC and the Ecosystem Restoration Planning Center of Expertise is designed to address a variety of topics including training, lessons learned, research and development, and emerging issues.

The web meetings are recorded and their archived files are posted on the Environmental Gateway under the Learning Tab. And I'd encourage you to go get that library and refer to it for future resources.

The Learning Exchange Notification System is how we send out initial email notification to everyone signed up for webinar announcements and that occurs two weeks prior to a webinar and that is sent from the Corp Lakes address.

In this email we encourage you to register for the webinar which enables you to add it to your Outlook calendar and then be updated as far as any changes or additional information that may occur regarding the webinar. And also those who register for the webinar will be sent a reminder the day before the webinar itself.

The next scheduled web meeting we have in this series will be on October 4 on the National Fish Wildlife and Plants Climate Change Adaptation Strategy by Janet Cushing from IWR.

And just a few more notes before we begin today, we are going to have a question-and-answer session the last 15 minutes of the presentation. However, if during the presentation you'd like to ask a question you can do so in the chat feature over there or if there's an appropriate pause in the presentation you can do so verbally.

But do remember to remove your phone from mute before speaking so that we can all hear you. And as a tagalong to that reminder, we would ask that you would leave your phone on mute when you're not asking a question so that we don't get any background noise interfering with the webinar.

In order to have a more comprehensive list of attendees I do ask that if you're calling in as a group that you just take a few minutes to type in the names of the attendees in the chat box just as (Adam Fox) from Detroit Planning has done, thank you (Adam). And then now today I'd like to give you today's speaker on Climate Change, Dr. Kate White, who is a civil engineer with the US Army Engineers Institute for Water Resources.

She co-leads the USACE response to climate change program and represents USACE on the Agency Adaptation Processes Working Group for the Council

on Environmental Qualities Interagency Climate Change Adaptation Work Group. Dr. White is helping guide climate change adaptation pilot projects and is leading a nationwide screening level assessment of USACE vulnerabilities to climate change impact. She's also heavily involved in interagency and international collaboration in the area of climate change.

All right, Kate, I'm giving you the presenter rights and you can share your desktop at this time.

Dr. Kate White: All right, so I'm going to - perfect. So I'm going to share the presentation or documents, let's see if I can do it that way.

(Courtney Chambers): Well, no, share the - desktop if you want to present from PowerPoint itself you need to share your desktop.

Dr. Kate White: Desktop and then I need to bring up - okay, so I've got - I have it up on my screen. Is everybody else seeing it?

(Courtney Chambers): Yes, ma'am.

Dr. Kate White: Good, okay. And I see the date still says XX because that's my - I forgot to change it to the 6th but today is the 6th and this is Climate Change Update Part 2. And for recap for the webinar Part 1, this is really an active area for the Corp of Engineers Civil Works Program and it really began on lessons learned from Hurricane Katrina where two of the items that were really pointed out to the Corp were the need to incorporate new and changing information and especially changes that we knew would be happening from something like sea level change.

Climate change itself requires both adaptation to climate change and mitigation so where - I'm hearing a little - that somebody else's - I guess I won't worry about it. All right, so it's both adaptation and mitigation. So mitigation is really trying to decrease in some ways the emissions of greenhouse gases and other matter that allow greenhouse gas concentrations to rise in the atmosphere and contributing to global warming. Whereas adaptation is really dealing with the issues that climate change brings us.

So adaptation is challenging. It has a longer timeframe but we are making progress on this. One of the things I'm going to talk about, and I talked about last time, was the pilot projects that we're doing. And second that we're using district-led guidance updates, which really develops new knowledge from the district point of view for the people who are actually trying to implement this. So this is just a brief recap from the last webinar.

So the planned webinar for today was a nationwide screening level climate change assessment of the vulnerability of our civil works mission, etc. to climate change in variability. So progress on our guidance, integration adaptation and mitigation, some ecosystem considerations, and then the FY11 adaptation pilots that were due back in June, in early June.

So the way it really works though is our screening level of climate change out assessments are not done yet. They've turned out to be really, really complicated and although in the - at the time I gave the first seminar on the 7th of June we had some preliminarily results. It's taken us quite a few months to actually be able to understand and communicate those results.

So I'm going to actually go on to this kind of mishmash of lots of different climate change headlines and essentially we know climate is changing. We know that some of these changes are occurring already, especially in areas of -

new the poles, especially the Artic ice with changes in sea ice, and then snow dominated watersheds in the US.

Particularly with the snow dominated watersheds we've got about 20 plus years now of information that really show that changes are occurring. But the thing is we don't know exactly how fast climate is changing. We don't know how these changes are going to manifest themselves. We don't know whether some of the changes are going to be irreversible, etc.

On the other hand we do know - we know our mission and operations. We know the work that we're supposed to be providing, the value we're providing to the country, and we're well prepared to move forward into the future.

So why is it - go forward? Yes, there it is. Okay, so I put here update with 2011 headlines because we're already maladapted to climate variation events. This is the variability of climate that, you know, we're accustomed to dealing with.

In 2011, I think now we're up plus $1 billion events. News analysts today were saying it's about $1.5, $1.7 billion from Irene but that's the national - the cost to the nation, that's not the cost to personal property which is four to five times higher than that.

So if we took these from 1980 to 2010 and started adding on just the 2011 events we're looking at significant costs for mal-adaptation to climate events. So that particularly, you know, as Steve Stockton was saying, Mr. Stockton, the Director of Civil Works would say, when we adapt to climate change events we're also doing things that help us do our job better everyday anyway.

So next just to briefly remind people that climate change mitigation is about carbon, all right, and that's really the actions to avoid the unmanageable conditions that will come with a lot of - any more atmospheric warming. In fact, we're already past the warming levels that we've seen in previous times and so we're kind of in uncharted territory and that's one of the problems we're dealing with our adaptation program.

We've got a fairly active mitigation program underway through the operations and regulatory community of practice and the environmental community of practice on the military side. So we'll talk a little bit about this later but I'm talking primarily the adaptation here.

So climate change, adaptation is about - really about water and that's because climate change directly affects the hydrologic cycle and with it the quality and quantity of water resources. So the things that we're concerned about here, minimum flows impacting safe habitat suitability, threatening endangered species, water availability and quality.

We're caring about water that's available for our own - say, our hydropower program. We care about too much water in terms of our flood program, too little water in terms of our fisheries issues, our navigation program, our recreation program.

So these are a couple steps that the Corps done. I'm pretty sure I mentioned this or maybe not, it was submitted 3rd of June to the Council on Environmental Quality Office of the Federal and Environmental Executive and the Office of Management and Budget. And if you don't know about the Office of the Federal Environmental Executive, OFEE, O-F-E-E, it's actually worth probably Googling up C-E-Q-O-F-E-E just to see what this group is.

But these - this group actually has a lot to say about anything environmental. So I think learning about them is very good for us. At any rate, we looked at the complex issues associated with climate change adaptation in this plan and report, which contains a two-page policy statement signed by the Assistant Secretary of the Army for Civil Works, Ms. Darcy.

And in this, these are just a few excerpts that I'm showing here, it's the policies of USACE to integrate climate change adaptation and planning and actions into our agency's mission, operations, programs, and projects. As Mr. (Salt) would say, he means that to me mainstreaming, he doesn't mean it to be tacked on at the end.

Be doing this using the best available and actionable climate science - and climate change information. And we should be considering potential climate change impacts in all of our long-term planning, setting priorities, and making decisions going on.

So this is actually about what was submitted in June to the OFEE and the (OMP), not made public by them. So all of the agencies - well, almost all the agencies have submitted these. DOD hasn't yet and I'm not sure that they actually will but that's another story. We're talking about civil works here so we've submitted this.

It's just now being rolled out to the districts so I think it will be available on the website within the next day or two and I'll make sure that (Courtney) has the information so that you can get a copy of this yourself and look through it and see - what's going on. So again, mainstreaming climate change adaptation means that we'll be considered at every step in the project lifecycle.

And the idea here is really that - to reduce the vulnerability, to enhance the resilience of our water resources infrastructure. It doesn't mean we're redesigning everything for climate. It means we're including climate as well as all of those other changes that do affect us, things like changing budget, which I think everybody's facing right now, changes in land use, changes in demographics that might impact demand.

So I'm going to start with sea level, this is pretty much the easiest one. We know they're changing globally. We know they're changing locally. And this picture here really represents collaborative efforts that we're undertaking with NOAA and with USGS around sea level. So it's got a lot of information. The little gray circles and bubbles, that's population density from the census.

You can see where the high population areas are. The big fuchsia or purple circles, those are the principle ports, that's from our navigation data center. The arrows around the edge of the coastline going up and down, that is the local relative sea level change from the NOAA size and gauges information.

And then this strip of - the ribbon of color around the outside of the coastline is from the USGS Coastal Vulnerability Index, which the index made up of six variables and parameters that looks at potential for erosion of undeveloped coastlines.

So this already gives you a lot of information about how sea level is changing. You can see that areas that are blue are actually going down, that's why we call it sea level change, not sea level rise although sea levels globally are rising. They're rising at different rates for different reasons but it's the local one that really impacts our projects.

So if you're in an area with a green or a blue you're generally not too concerned. If you're in an area with a yellow or orange or particularly a red then you're dealing with it probably already on your projects.

Okay, and this is just a little close up because it can be hard to read. All this information is available now in Corp Map so you can plot these up for yourself and drill in and use the Google background if you want to do that. We had Greg Bertrand at the Portland District do this for us for another project and I figured this was a good example of the kind of information you could use to communicate with your stakeholders and even with other project members.

Okay, so one of the things we've been really working on is moving science into action and sea level is good example of this. So in 1986 the Corp Guidance at that time required people to take into account the observed trends and that's really the - if I look at here in this inset map, the comparison of sea level rise scenarios, this is the tides and gauges information from NOAA and this would be observed trends.

In 1987 the very influential NRC study on sea level change came out. We particularly funded that and our policy that came out the year before was really in recognition of the information coming out from there.

Two-thousand, planners needed to also consider the potential for increased global sea levels and those global sea levels were all along here, this purple higher line that I'm running the mouse across here. This was potentially thermal expansion of the ocean plus maybe some accelerated ice melts. So in 2000 we were required to look at the sensitivity of our projects to the extrapolation of the current trends plus this high level change.

Two-thousand-and-nine guidance came out with three scenarios that essentially added a moderate scenario in the middle, which was very close to the IPCC, the Intergovernmental Panel on Climate Change, water levels that are represented by these two dashes here which are kind of the high end and the low end of their special report on emission scenarios out at 2100. Our moderate is right about in between here and, again, these are derived from the global sea level.

So in 2011 we've updated the (unintelligible) 165-2-211. It's now called 212. It's kind of hung up in publishing because recently (ACE-IT) took over the publishing of Corp guidance and this was the first one. So since July it's being published. So the new guidance really just adds to the recent science and essentially tells us that the practical bound for changes in sea level is about two meters overall by 2100 according to the latest research since 2007.

We've also got a team that's working on adaptation guidance for sea level. There's a person from every coastal district that's involved in this and if you've got any questions you can either contact your MSC point of contacts for climate.

And if you don't know who they are you can just email me and put it - you know, question on sea level at the top of the subject line so I make sure I get it. But we've got people working on these teams and essentially what we're trying to look at is to make sure that everybody considers for all of our projects how one might adapt to changing sea level to whether it is the - whether it's the extrapolation of the current, whether it's some higher rate probably are two different scenarios that we have.

And one of the things we have to do is start to plan things like potential for non-structural responses or the potential for retreat well ahead of time. We

don't want to continually do an - say, an off storage structure and then a beach nourishment and then some dunes and then a floodwall and then higher floodwall and then start talking about non-structural retreat measures.

We need to consider those earlier so that we don't have costs that is really urging us to continue investing more funds in an area where we may not have a long-term sustainability.

So the idea is to identify when you might have trigger points on lead times that would help you make a decision about different adaptation options. So we're farther ahead in sea level. And another way we're moving science into action is to start considering all those things that build on sea level. So this would be your waves and your tides and your surges.

And one of our team members on the sea level adaptation guidance is Dave Crebo from the Naval Academy and he's done some work for us. It's based on some work by Chip Fletcher of Honolulu or excuse me, from the University of Hawaii.

And what we're doing here is essentially looking at our past historic record of storms and our tides and then using our scenarios if we have - say, this is our moderate scenario, just adding on that past record and see what does this look like when you're going into the future because we don't really have any scientific guidance telling us how surges, waves, tides, and shores are going to be changing.

So the idea here is - for him it has a personal requirement because this is Hurricane Isabel in September 2003 and this is his hallway in the Naval Academy. You can see this is not really what the Naval Academy wants to advertise for its technical and specialist engineering building. But also for him

what it said was we're going to be seeing more of this more often and if we're going to design some measures to help adapt to this you need to know what those elevations might be and how often they are.

So based on the curve I showed you in the previous slide, if we go back here again, the idea of taking our scenarios and adding the past record on to them we can then develop a family of curves that gives us an idea of what the frequency is relative to a flood threshold. And here we're showing their engineering building flood threshold. Now we can see how the frequency may change in flooding due to different kinds of events.

So for sea level and for coastal issues we actually have a fairly well established path ahead although there are obviously some gaps. We have - we also have a reasonable science base for these changes occurring in these western dominated watersheds. For example, this is the center of mass of annual flow.

This is a study from 2004 so this is just up to 2000 data but you can see by these large red circles that these are - the center of mass of flow now up to 20 days earlier than it had been previously. So this has a very large impact on water regulation when we're considering reservoir rule curves that may not have enough flexibility to deal with their situations.

We're also facing pressure from our stakeholders to start to refill our flood space earlier and that's maybe intuitively comfortable if you're thinking about the center of mass, the flow moving earlier in the year, but on the other hand if you could still have the potential for rain on snow event you could still have a flood event that would exceed downstream control limits.

So it's important to be really careful, not just make a decision that seems intuitive but needs to be studied more carefully. So again, for the western snow dominated watershed we have some pretty good information. We've also got more recent information in the - on snow in the Northern Plains.

And on the right here I'm showing a study that was done for Fargo, in part to support the project there, but this was really looking at expert panel, looking at the kinds of events that they've seen over the past years.

And they're looking at maybe a cut point where after this point here, the 50s, may have changed the base flow level or the annual flow level. So these are the kinds of things that we could be using in our hydrology that we don't actually have policy for yet at this point.

And the real reason for that is, we talked briefly about this during the last seminar, but that is basically our assumption of stationarity that is essentially the past looks like the future, the - still look like the past. This assumption though has been very useful for a long time in the United States and in other countries as well.

We're not the only ones that are looking at stationarity. It let us take a statistical approach based on past records to help us design future projects.

We probably have been successful so far because we had very good engineers, 20s and 30s and 40s building and designing a lot of these projects who were able to understand the potential flood issues and who could add a factor of safety on top of whatever the design was so that they could account for unknown affects such as changing climate or climate variability or land use.

And primarily land use, land cover changes are the ones that really impact a lot of hydrology for our inland rivers.

But essentially climate change undermines this basic assumption that facilitated our management of water so long and so we can't anymore rely on the fact that devastation area situation, we don't. As we looked at this slide before, a stationary situation would allow the data period or the past period, which can't make that assumption any longer.

So let's talk a little bit about climate impacts to weather. So on the top here we have probability of occurrence along the Y-axis and then we have temperature here in this top figure. And we have maybe some kind of a probability distribution, this one looks like a normal distribution, could be any distribution but we'd say average is about here in the middle. And then the ones on the left are the cold temperature extremes.

They, for convenience, it's the lower 10% of the population temperatures. And then over here on the right it's the hot - say, the highest 10% of the temperature extremes. Both temperature we have precipitation, again, probability of occurrence. These would be the light precipitation events, average precipitation events, and then the heavy and again, maybe the upper 10% of the precipitation events.

We've got kind of a fair picture of what do these things look like and what an extreme might be. And next let's look at how do these things change in a climate and why does - why are we seeing the kinds of effects we're seeing. So in the temperature one let's move it just to the right just a little bit, all right, so we've got the newer climate.

All right, so what it means is potentially less cold weather, okay, more hot weather and more record hot weather. So we've moved really beyond the extremes that we had before, right. And this has ramifications in the entire hydrological cycle. It impacts snow, snowmelt, frozen ground, evaporation, transpiration, all kinds of hydrologic issues.

And if we go down and look at precipitation, how that might change, I see that this new curve here, heavy black line, so this is less of the light precipitation and more of the heavy precipitation, all right, because it's warmer. We can have more water vapor in the clouds and therefore it can fall out and see it.

So what we see is - you've probably heard the phrase the dry get drier and the wet get wetter. And sounds comforting but really actually a problem for us along the entire continuum of our missions in operations, particularly in ecosystems.

So just to kind of drive the point home, I've got the drought monitor for April 19, 2011; (NIDAS), a group that we have a liaison to, Dr. (Ralph Olsen). The point I want to make here is even when we have droughts, droughts don't protect us from floods, all right.

So in April we were suffering from the effects of a lingering drought. And at this particular lake, (Ten Killer Fairy Lake) we had a flood. We had about ten inches of rain and we had a flood. And the project was able to pass the flood successfully but it - partially because it had a low pool because of the drought.

On the other hand floods don't protect us from drought either. So here we are looking at part of the United States, looking at in Corp Map the UOC for the Emergency Management Center, looking at all the areas subjected to floods

and other issues. And we're also seeing drought at the same time in some of these locations.

So the Ohio River record droughts this year, we're seeing some drought there. We're seeing some drought, you know, in Louisiana and areas like that. And of course, today they're not suffering from drought, they're suffering from too much water. So these extremes - it doesn't mean that if you're in a dry area of the country you're not going to be also seeing more precipitation or if you're in an area that gets a lot of snow than it's going to be more rain.

So when we get the guidance we're kind of looking at the things that we know, the things that we don't know, and then what are we learning and what are we doing about it. Our guidance can't wait until we've got perfect answers. We need to be able to start with some high level of guidance and then allow people to include those in their projects and move forward.

So I'm showing a couple of documents here. I've got the climate change and water resources management, a federal perspective, USGS Circular 1331 available on the web. So this kind of laid out all of these items, what do we know and what don't we know.

Well, actually it didn't lay out at the bottom. Then two of the really big needs that we face from here were what do we do about non-stationarity and so we had a workshop about that, followed that workshop up with proceedings. We followed the proceedings up with a collection of 13 special issues it the Journal of the American Water Resources Association in June 2011.

And if people are interested in those I can pass them along to you. So we've got some information on non-stationary and now we can begin together with

the other water resources agencies to start writing some broad guidance about non-stationarity.

It's not going to be be-all, end-all because there's a lot more work to be done but at least this will give us guidelines on how to determine whether we can still use that stationary assumption or whether things have changed enough that we can't. And if we can't then what do we do about it.

Second major thing identified in Circular 1331 was there's a million ways to move from some basic understanding of climate changes in the atmosphere to our projects on the ground.

And we want to make sure that people undertake studies that include climate change along with all the other changes facing them, that they undertake them at the right level of effort so that they're not investing too much upfront in a very detailed level of effort requiring lots and lots of modeling that they don't really need until later on. They need to scale it to the decision as well.

So in the upfront, if you have a very high consequence decision maybe you do need that level of modeling or if you have a project with lots of life-saving consequences, something like that, but otherwise in many cases there maybe information - sufficient information available to help you get to your decision point without investing too much.

So we had another workshop on addressing the portfolio of methods and that is currently working with the agencies. There's a summary report available and we're working with the agencies to come up with some approaches for some types of decisions that we make in water resources that are fairly standard so that we can provide guidance on that.

So what don't we know? We have - we don't know things in the long-term planning arena and we also don't know things in the short-term and the kind of weather to climate arena. So in the long term, the Corp and Reclamation put together a document published in January called Addressing Climate Change in Long-Term Water Resources Planning and this is really here's our user needs, sciences agencies, please tell us how you're going to fill them.

And since then the USGS and NOAA have been leading the science agencies in developing a response. And I actually just got the first draft of the response this morning but I haven't had a chance to look at it. But I'm imagining it will be published some time around, say, February or March.

And what they're going to do is lay out a science strategy to help us meet information that we need. So it'd be very interesting to have a few people volunteer from your ecosystem community or practice to take a look at the science response and tell us if you think this is going to meet your needs or not.

So other things that we don't know are how do we actually put all this information into practice now since we're supposed to be mainstreaming it and we could be mainstreaming it in planning, in design, in construction, in existing projects. How do we do that? And so we've been undertaking some adaptation pilot studies to look at these. I've got a few of them listed here.

We've got a small project in the Everglades, the C111 spreader canal that deals with ecosystem restoration planning and sea level change. We've got two sediment pilots; one, they're paired based in pilots with Reclamation. So we've got two, Garrison Reservoir in the Upper Missouri and a (Cotte) Reservoir on the Rio Grande and they've got parallel, one on the Yellowstone, one on, I think, on the Rio Grande downstream from ours.

And we've got one in Iowa, the Coralville Multipurpose Pilot Study. And we've got several more but these ones I thought were really good examples in the way they kind of addressed the information that they needed to know.

Instead of looking at climate change as an overwhelming issue facing them they said here's the few questions that are really pertinent about climate to these particular projects and the studies that are ongoing there. So I think they may be good examples for you yourself.

And then, again, we had this adaptation plan and report that came out just now. And then at the bottom is kind of guidance and this particular guidance is our sea level change guidance from 2009 that was just updated in July but it still kind of in the publishing mill.

So the path forward for hydrology then would be to hold workshops to gain expert opinions, and at the top I have the non-stationary, at the bottom I have the portfolio of approaches. Next we need to have peer reviewed publications because we need to be legally justifiable in the steps that we take for a variety of reasons, mostly because we get sued when we do things that are, you know, maybe a little bit outside the standard practice.

So in June - gosh, the date's wrong on the bottom, I'm sorry. June 2011 it came out for the non-stationarity work and it's supposed to be by June 2012 which I just noticed for the - a similar thing will come out for the portfolio of approaches.

We should have broad guidance for both coming up in the next year and this may be engineering technical letters, which would actually turn into civil works technical letters so it would apply across civil works and we're working

on that with headquarters as well and potentially engineer regulations also and it's something in the planning guidance notebook. And then those would get refined guidance into a manual or something else as we go along later on. So these things will be coming, they're just not here yet.

So now I've talked a lot about kind of the water, the adaptation end of things, and so now I'm just going to briefly go back to the mitigation. And the idea that integrating adaptation and mitigation is really important.

So we've kind of thought about adaptation in the big S sense which is to be able to - big S for big S sustainability, to really perform all the work that we need to do in an increasingly dynamic environment, all right. And so that includes climates as well as other changes.

And for mitigation, small S, we need to increase our water and energy efficiency and we need to reduce greenhouse gas emissions. So this is the conservation pie. But they need to be integrated. We don't want to say invest, say, a lot of money on a renewable power supply in an area where we may be subjected to coastal erosion in the future so that this investment would be lost in a fairly near term.

At the same time, we don't want to forestall mitigation impacts by undertaking adaptation that doesn't allow for the addition of some kind of mitigation. So we really need to consider these at the same time.

So for mitigation in Ops our point of contact is John Coho and in the Environmental Community of Practice is Antonio Giardina. And right now there's quite a bit of information out about the sustainability, S, the work that they're doing. It's again primarily energy and water conversation and greenhouse gas emission reduction.

We've got targets for greenhouse gas emissions reduction by 2020 and this is kind of showing our 2008 measurement or estimate of greenhouse gas emission and then our 2010 estimate. And then this is kind of the - fly past if you will of what our reductions will look like. The difficult thing about this is we've only - there's three different scopes of emissions, Scope 1, Scope 2, and Scope 3.

And we're kind of counting Scope 1 and Scope 2 and a little bit of Scope 3 right now but as more Scope 3 are required to be counted it's going to be more difficult to meet these reductions. So that really people considering ecosystem projects need to consider this as well.

So if we talk about the sustainabilities, again, one more time, when we think about mitigation, again, it's avoiding the unmanageable conditions that might result as we continue to go past where we have known responses in the earth system. And the big-S adaptation is managing the unavoidable thing, the consequences that we can't avoid right now, how do we manage them.

If we go from conserving energy and water to ensuring robust and resilient emission operations - for mitigation and conversation, primarily we understand the problems and we have science available.

On the other side on adaptation, we're still working on it. We don't have a lot of actionable science and we're going to have to begin taking steps in that vacuum and also trying to push the science agencies into doing science that fits the needs that we have.

So we have many methods and technologies available for mitigation, not so many for adaptation, although we do think based on our coastal themes that

the engineering is there. It's how do you - you know, what is the elevation? How do you plan for it be adaptive over time? How do you respond over time? So we think that we're not nearly as badly off in the adaptation world for engineering as we thought initially.

Basically you can count things that you're mitigating or conserving but you can't really necessarily count - and this is particularly true for ecosystems where we've got a lot of ECs moving around we don't fully understand the interrelationship of those species already. So it's very qualitative process for adaptation.

And secondly, when you make a conservation move you can measure it and, you know, your result is going to be fairly close to when you actually took the move. In adaptation, you may implement an adaptation action and not see those results for five or ten years.

So it's - maybe going to be hard to ascribe the results that you get to the actions that you actually took. So this one is going to be a little difficult for us to be able to communicate as well. And so it's also probably going to be higher cost.

So we also think about it on a continuum of less complex to more complex. So if it's a dynamic case as we just talked about cause and effect, they're far apart in space and time, you know, then it's going to have a more complex response even just interpreting it, and that's pretty much our adaptation - more of our adaptation. Cause and effect, they're close in space and time, that's more of our concentration.

If you think about how familiar we are with them, if the answer's predictable, if I say I'm going to be changing from a mix of petroleum and coal to a mix of

petroleum, coal, and renewables then we think that, you know, we're going to be having lower greenhouse gases, that's fairly predictable. We don't necessarily know how all of our changes are going to - what's going to result from our changes in the adaptation sphere especially with the ecosystem. So relatively high uncertainties.

And then in conversation, pretty much people know the language of conservation, they understand - and I'm not talking species conversation. I'm talking about conserving energy and water. People are very familiar with that and have the language and sort of priorities that they can discuss and share.

But when you start to talk about adaptation you really get into more a balancing of difference needs, different needs for flood, for water supply, for ecosystems, for social values. So these are going to be more complex. So we would call these wicked problems on the complex side and it needs really a participatory problem solving process.

And piece meal means - on the less complex side, means that really you can kind of take the problem apart and deal with each piece separately, like you can deal with your water, deal with your energy sources, deal with your greenhouse gas emissions. Whereas you can't necessarily take apart an ecosystem and just deal with one at a time.

So big-S, little-S. So an example of the kind of information we're using in - looking at sustainability on the conservation side, the little inset map below is a map of the EGRID which is the Emissions and Generation Resource Integrated Database if I've got it right, EGRID, which is - tells you essentially when you purchased power, is it clean or is it dirty. Is it emitting a lot of greenhouse gases or is it emitting a few greenhouse gases?

So the blue and the green on this lower map, you know, more hydro, more nuc - you know, more hydro, more nuke in New England. More coal or oil down here in the oranges and reds. And so how does this translate to our projects as shown up above where you can see that the big red dots are the ones that are using - you know, purchasing power that has a lot of carbon dioxide equivalent emissions, all right.

Now I've taken actually the three biggest ones out of here because they're so big that they make all these little tiny dots and you can't really see them. Let's see, I took out the Baltimore district.

I took out a very big pumping project in here and I can't remember off the top of my head what the third one is but you can - this site's available on the sustainability website, the - from John Coho and I can pass that to you if you want but you can actually kind of slide this little slider bar back and forth and see which projects - you can get right down to the small projects. You can really blow up and see where these are.

But you can see, if you're in a big red project that the kind of thing you want to do here is a renewable or a different source of energy. And you want to make sure that when you pick that renewable or different source of energy that you're not impacting the actual project, you know, the authorized purpose of that project and not impacting its ability to perform in the future. So they really have to be closely tied together.

Okay, so ecosystems and climate change. There's been a lot of recent work. I think I mentioned the Loraie et al study 2009, the Velocity of Climate Change, looking at how climate is changing fast in certain locations with the expectation that this would change the habitat and then there would different rates of change of different - of ecosystems and different components of

ecosystems. (Joan) sent out, 2009, this was committed terrestrial ecosystems changes due to climate change.

In other words, there's a lag time between the change in climate and how terrestrial ecosystems change along with them. And I think this is very obvious to people who are dealing with - especially plants to trees that plants have a quicker generational time and trees don't. So - that we are committed already to certain ecosystem changes and this could be useful information for people in their ecosystem projects.

Another recent one, McDonald Madden we just did in 2011, optimal timing for managed relocation of species faced with climate change, pretty forward title. Again, it's a science report. This isn't a guidance or something to, you know, tell you how to do something but it's the kind of thing that would inform your opinion as you consider the project in general that you're dealing with.

And then Chen et al, rapid range shifts of species associated with high levels of warming so this kind of ties back into the Loraie et al velocity of climate change.

So basically these papers really ask us to rethink our assumptions about ecosystems in the same way that the stationeries paper in 2008 really forced us to rethink our assumptions about hydrology and how hydrology functions and how it changes over time and how it might impact our projects in the future. So these are just a few of the papers. And again, if you're interested you can contact me.

So Chen et al, I just picked that one here because this was interesting to me because it found that latitudinal and elevational shifts have been significantly

greater in studies with higher levels of warming. And these higher levels of warming could be very much associated with these - the dry get drier and the warm get warmer areas that we've seen.

The factors that they found important was there was a time delay in response, okay, so you might have a specialist in a certain kind of habitat or an immobile species like in a big old tree. Or an immobile species could be a species where there wasn't a corridor for them to move. It was just a one-spot to another spot and they couldn't really get there, physiological constraints.

They may be sensitive to different variables at different life phases. Maybe the youth phase or the adult phase are more or less sensitive. And then there's also the other drivers of change that was kind of talked about throughout which are the non-climatic factors, you know, the new roads coming through, the new whatever's happening, new land use, land cover moving from rural to urban or something like that.

So but there are studies actually showing that species are going to be moving – are moving and are going to be moving.

There's also this national ecological observatory network or NEON, which has got 20 different ecoregions and of course like everybody else's system of monitoring, none of the ecoregions exactly lines up with anything, including our own districts.

But the idea here is that they are going to try to put together permanent research stations that can be supplemented by additional data when people need them.

And I think it's something that we should be starting to kind of feed into and say, you know, we need these things more here, here or here and these are the kind of species of concern or the projects of concern or the big things that are going to be happening where we might like to collect some of the data now. And the idea here is to start looking at national scale changes but we'll always need the really highly local changes.

Now looking at our FY'11 adaptation pilots. We have 35 proposals, which was a lot of proposals. We're funding about - a little over $1.5 million in FY'11. So these people are getting FY'11 and some of them have a tail going out to FY'12, etcetera. So they got this money, they're getting the money now if they haven't got it already.

And I'm just going to go over these briefly with you. We're going to have some more information out but probably not until the end of September because everybody just totally just under water on everything else that has to be done.

So one of them is the West (Malley) Watershed Project and they're looking from the summit to the outer reef so this is kind of a transect if you will of how to use the risk informed decision making in this watershed. The next one is - it shouldn't say physical it should say physic space and collaborative modeling.

It's really looking at a watershed within the Iowa (seat) so it's not Iowa (seat) or the entire watershed. The next one is looking at upland sediment production and delivery in the Great Lakes under climate change which is somewhat different from but related to the information that was developed in the current pilot's, the Missouri and then the Rio Grande but a totally different geomorphic region.

The next is going to be looking at the lower Columbia River estuary so it's an ecosystem restoration project. The next one is potential sea level rise impacts and wetland restoration. Different from the existing pilot on (C1-11).

Red River, the north flooding at Fargo so this would be a more in depth look at some hydrology. Looking at using the regional climate signs programs and reservoir and watershed risk-based impact assessments.

And this is good because NOAA had set up these things called RISA - R-I-S-A, Regional Integrated Science and Assessment Centers. And they're really supported by federal funding to provide information to partners and stakeholders including us on climate information in your region. So I would encourage you to seek out the RISA in your area and make friends.

Also the Department of Interior has set up what they call the CSCs, not to be confused with NOAA's CSCs on the coastal but these are Climate Science Centers which will provide climate information, again, make friends. And of course their regions don't overlap with the other regions.

And then there's also the landscape collaborative. And these again have different - even though they're Interior they have different regions than even their own CSCs. But there's some sources of information for all of you for your local area.

So then we've got one dealing with mountain snow pack on the Missouri and then a collaborative framework development on a highly urbanized area of Rockaway Inlet, New York. So these are initial FY'11 pilots. And there probably will be some FY'12 as well depending on the funding.

So the summary for this Part 2 is climate is changing, coastal is ahead of inland hydrology but hydrology is coming. Collaborative efforts with other agencies help us identify the long term and short term user needs but also we actually help the science agencies do science that's more actionable for us.

Integrated adaptation and mitigation, we recent - research on ecosystems and climate change encourages us to think a new ways. And the adaptation pilots increase our understanding so that's it for today.

(Courtney Chambers): Excellent. Thank you very much, Kate. What we're going to do now is go back to our Web interface that way if anyone would like to type in a question they can do so in the chat feature.

Dr. Kate White: Okay do I need to do something or can you just take it back?

(Courtney Chambers): I can take it back.

Dr. Kate White: Okay all right thanks.

(Courtney Chambers): All right. So at this time if anybody has any questions please feel free to ask. And if you decide to ask verbally please remember to take your phone off of mute.

(Valerie Sul): Can you hear me?

(Courtney Chambers): Yes ma'am.

(Valerie Sul): This is (Valerie Sul) and we're in the (South) Ft. Worth districts. One of the questions we have here is a lot of times we hear climate change, we don't hear anything about land subsidence and especially along the coast like Houston

and stuff like that we have an issue of land subsidence. Wanted to know how you're tying those two together.

Dr. Kate White: Oh okay that's actually a great question. So land subsidence was one of the big issues identified in the IPET studies after Katrina. And they tied it very closely together with sea level change because between the two of them you could really emphasize the changing sea levels at your local area.

So there was a program undertaken called the Comprehensive Evaluation of Project Datum, CEPD, that went around to all the core projects and identified whether their - what their datum was, their vertical control datum, and whether there was subsidence undergoing in that process.

So every district has somebody called the District Datum Coordinator. And that person can tell you for your entire area where you have some datum issues and subsidence issues.

And certainly when we looked at that chart of the one - the big US map where we had the arrows and the - all the different colors those arrows that showed red a lot of that relative sea level rise was due to subsidence there so subsidence is something that's very much in the minds of people dealing with sea level changes in the coastal areas.

Within the interior US there are areas with subsidence but they're - I mean, we've identified the areas but we're not dealing with it as carefully as the coastal areas.

So if you have questions on subsidence you can talk to your District Datum Coordinator and then you can also - if you want contact me and I'll put you in contact with the people who are conducting that study on comprehensive

evaluations of project datum and who are going to be conducting the upcoming study on the comprehensive evaluation of projects with respect to sea level change because that's an important aspect of that.

Yeah, that's the perfect one so you see where the red arrows pointing up are. And you see yellow and orange around your area.

(Valerie Sul): Thank you.

(Courtney Chambers): Any other questions this afternoon?

(Danny Wayman): Yeah, this is (Danny Wayman) in the New Orleans District. I just had a quick question about the FY'11 adaptation pilot.

(Courtney Chambers): Yeah.

(Danny Wayman): Specifically the risk informed decision making for potential sea level rise impacts on wetland restorations. Do you have a point of contact or a lead for that?

Dr. Kate White: Yes actually I do. If you can send me an email I'll send you that back. I don't have it off the top of my head.

(Danny Wayman): Okay. Yeah, I'll do that.

(Tom Kendall): Kate, is that the one in San Francisco?

Dr. Kate White: I think it is.

(Tom Kendall): Okay then it's probably me.

Dr. Kate White: You're on the phone.

(Tom Kendall): Yeah this is (Tom Kendall).

Dr. Kate White: Okay, (Tom Kendall), there you go.

(Tom Kendall): Yeah.

Dr. Kate White: And again I would encourage people as soon as we get the FAQ sheets out that provide the point of contacts in more detail on what each pilot is doing I'd, you know, encourage you to call these people, talk to them about the pilot, see if there's any nugget of information in what they've learned so far or how they've set up their study that could help you in your current projects.

Because remember Mr. (Salt) is talking mainstreaming; he's not saying well, you know, it's only for the ones that start in 2012, he's saying, you know, we're going to have to deal with this with all our projects. And it's really a smart way to do business.

It's not, you know, climate allows us to open the door to other changes that we know are impacting us because it's really the global changes, all of them together that are causing - that are impacting our projects.

Okay any other questions?

(Courtney Chambers): Kate, are there - do you know at this time if you're going to have funding for any future pilots in FY'12? And if so will there be a proposal process?

Dr. Kate White: Oh god, funding is the - so funding is always the worst question of all.

(Courtney Chambers):Right.

Dr. Kate White: The issues that we're facing as everybody in the Corp is coming into FY'12 is are we going to be in continuing resolution or will there be a budget? So if we're in continuing resolution we'll have funding, we'll probably have another call for projects - we'll probably have it earlier in the year than we did last year because people will be a little bit more organized I think if we're in continuing resolution about getting the funds out.

If we get a budget there's two questions there. If we get a budgeted omnibus bill that has some language attached to it about climate change or did the Senate actually look at energy and water issues come up with some kind of language then reconcile it with the House's language that's existing because the House's language stripped all the agencies one by one, at least the water resources agencies, stripped them all of the ability to take climate change adaptation - do climate change adaptation funding.

So there's some issues with funding with respect to that. So I hate to say it but continuing resolution looks like our, you know, the best path forward at the moment. But it's difficult to say what that will look like.

And I would encourage people to think about your own projects, think about where a climate change adaptation pilot study that you might do would be beneficial to your project but also to similar classes of projects around the country so that if we have a call you have a case - you can make a case - justify why yours would be highly rated and again contacting the people who are conducting their pilots to get the information from them.

(Courtney Chambers): Great. I have one follow-on question from that. How do you post a call like that? Where do people find out about that?

Dr. Kate White: Oh the - the call - well we went to the MSC climate change points of contacts and I think we would - we'll probably try to find a way to reach a wider group this time. I believe I sent you the spreadsheet listing the names but, you know, it was fairly late in the process so...

(Courtney Chambers): Right, I think our last Webinar was like three or four days before the deadline.

Dr. Kate White: Yeah, I think it was too; I think it was just like, you know, less than week before the deadline.

(Courtney Chambers): Right.

Dr. Kate White: There was actually no time for people who had just heard about it. So let me - that's a good question. Let me think about a wider dissemination.

(Courtney Chambers): Distribution - yeah.

(Renee): Hi, this is (Renee). We could also use the same mailing list learning exchange that we do for the Webinars.

Dr. Kate White: Okay.

(Courtney Chambers): That would be excellent, yes.

Dr. Kate White: Okay.

(Renee): Okay.

(Courtney Chambers): So at that time if that time comes, yeah, if you would let us know we can then send that out through the learning exchange notification system.

Dr. Kate White: Okay that'll be great. And as soon as we get our FAQ sheets pulled together which may be during September on all the things we'll pass them along so that people can take a look at those too and contact people.

(Courtney Chambers): Okay. That sounds excellent. As you get those we'll post them with your Webinar as well that way all of your documents regarding climate change are together, okay?

Dr. Kate White: Okay. And there's also www.corpsclimate.us which is the Corps Climate Change Website.

(Courtney Chambers): Corpsclimate.us.

Dr. Kate White: Yeah. And again I'll try - I think it's in the next day or two that the rollout for the adaptation plan will be available and then I'll see if I can get you that URL as well so people can just come straight to you.

(Courtney Chambers): Okay. That sounds excellent. Are there any other last questions?

(Tom Kendall): Kate, I - this is (Tom) again.

Dr. Kate White: Hey.

(Tom Kendall): I missed the beginning of this and I'm just wondering did you guys talk at all about the updated (unintelligible) circular coming out?

Dr. Kate White: Yes. The - so...

(Tom Kendall): You don't have to rehash it if you did - so I just - yeah.

Dr. Kate White: So (ACE-IT) is in charge of publishing now.

(Tom Kendall): Okay.

Dr. Kate White: Do I have to say anything else?

(Tom Kendall): No.

Dr. Kate White: It's there, it's there. I can - actually I can give - I can give (Courtney) some language on the differences between the old and the new which essentially the old guidance updated in a few areas and I'll provide that information. And it reminds me to nudge again what's the status of that.

(Tom Kendall): Great, thanks.

(Courtney Chambers): All right well with that I do believe we'll wrap up today. I want to thank you all for participating.