

AUTHOR RESPONSE TO EXTERNAL PEER REVIEW COMMENTS ON DRAFT EPA REPORT:

“Climate Change Vulnerability Assessments: Four Case Studies of Water Utility Practices”

Prepared by Eastern Research Group - December 17, 2010

Page	Line	#	Comments	Author Response
			Charge Question 1	
			Please comment on the overall effectiveness of the report. Please discuss the report organization and clarity. Are there other ways of presenting the information in this report that would be useful for other utilities to learn about approaches for assessing vulnerability from these case studies?	
		1	This is a brief but effective report, which presents four case studies of climate change studies and resulting actions by water utilities across the U.S. Its effectiveness must be judged against its purposes, which are broad but not atypical of case studies about how organizations make decisions. The purposes are explained by the authors in the following ways. First, the report follows the 2009 First National Expert and Stakeholder Workshop on Water Infrastructure Sustainability and Adaptation to Climate Change,” and workshop participants thought that “it would be useful to develop case studies of successful adaption projects and activities to help individual utilities learn from each other.” Therefore the first test of the report is whether it helps utilities to learn from each other about adaptation to climate change.	A comment, no response required.
		2	Another purpose of the report is to illustrate a range of issues and current approaches taken by selected utilities that are leaders in climate adaptation to understand and respond to climate risk. The report was also intended to help identify the types of technical assistance most needed to support assessments. Finally, it is a companion to another report, “Climate Change Vulnerability Assessments: A Review of Utility Practices.”	A comment, no response required.
		3	The report is well-organized and presents the material clearly, but the level of detail in the cases requires patience to wade through. To provide a summary of the complex issues that it addresses the report presents “observations across the case studies,” both in the executive summary and in the summary at the end. I guessed that these observations would be discussed also in the companion report, and I found that the report was readily available from the Internet as EPA 800-R-10-001, dated August 2010. Clearly, the same general body of knowledge is addressed in the two reports, but the “observations across the case studies” in this report seem to be unique to it.	A comment, no response required.
		4	To assess whether the report could be organized better, I turned to the basic purposes, to help utilities learn from each other, and concluded that the “observations across the case studies” would be the key to that goal, not the details of the individual cases. However, I could see how some utilities might want to contact their peers to partner or cooperate in specific studies and they would be interested in the details.	A comment, no response required.
		5	To assess the observations and how they might help utilities learn from each other, it is necessary to look at them one-at-a-time. This is discussed in a subsequent section of this review. Based on the observations across the cases, it seems that the report is effective, but it could be more effective if it was more specific about uses of the case information. I will explain this opinion more under the final section of this review entitled “other comments and suggestions.”	The Executive Summary and Introduction sections have been revised to clarify the purpose and limitations of the report. Utility decision making involves a range of issues in addition to concern about climate change. It was therefore difficult to say specifically how information from these studies contributed to decisoin making.

		6	<p>Based on the observations across the cases (discussed later), it seems that the report is effective, but it could be more effective if it was more specific about its objectives and if it described the actual decisions that utilities make that are based on adaptation to climate change. The objectives are rather vague, although that is not necessarily a fault with the report so much as it is a result of the scope of work that it responds to. Also, it is difficult to measure the extent to which utilities will learn from each other from the report and the actual decisions where utilities use the climate assessments are not always clear. Again, this is not so much a fault of the report as it is a result of the complexity of the water supply decision-making process, which involves many processes and decision points.</p>		<p>The Executive Summary and Introduction sections have been revised to clarify the purpose and limitations of the report. Utility decision making involves a range of issues in addition to concern about climate change. It was therefore difficult to say specifically how information from these studies contributed to decision making.</p>
		7	<p>The report is very effective in illustrating how four different water utilities responded to climate change and the need for adaptation. It is well organized and consistent throughout. I think, however, if I was a water utility manager reading this report I would have some difficulties because there is no introductory material on what causes climate change, its general impacts on water resources, and generally how impact analysis is done. While system specific impacts are discussed in detail in the case studies, if I did not have a general background on the topic of climate change I might be a little lost. For example, there are several references to GCMS, SRES scenarios, downscaling. How would I know what these are?</p>		<p>A large volume of introductory literature is available from other sources on climate change and climate change impacts on water resources. To keep this report focused we do not provide much in the way of introductory material. References have been added referring the reader to appropriate background material on these topics.</p>
		8	<p>Several ways around this. Have an introductory chapter, have a glossary, have an appendix on this, have a few references to some reports like the 2009 USGCRP report, other WUCA reports etc.</p>		<p>References have been added</p>
		9	<p>Also, the report effectiveness might be improved by more analysis and explanation of why the utilities did what they did –eg used this sort of model or this sort of analysis. Perhaps that is in the companion report referenced on page 2.</p>		<p>A 2010 companion report produced by EPA Office of Water provides additional detail on the types of approaches used by water utilities to assess vulnerability to climate change. Reference to this report has been added throughout this report. A detailed discussion of why utilities featured in this report did what they did was not possible based on the source materials used to develop this report.</p>
		10	<p>This is a well written, accessible piece of work, drafted in a tone suited to a general technical audience with interests in climate change, water management and the institutional responses of the water sector to climate change. The report provides a high level analysis and summary of the efforts of four water utilities to evaluate the effects of climate change on their water supply systems. Readers can well appreciate the general approaches these utilities have adopted; the sorts of decision tools and frameworks employed; the types of data used to support their work; and the external relationships newly-established to inform the utilities' studies. Most utilities are at the early stages of considering climate impacts on their business and the report supports this impression, even where climate impacts have been considered since 2002, say.</p>		<p>A comment, no response required.</p>
		11	<p>The analysis of climate impacts here is generally restricted to infrastructure systems rather than utility businesses as a whole. This may be a feature of the legislative requirement of vulnerability assessments in the US, but there are broader business risks and opportunities that emanate from climate change that organisations might also consider. These are discussed in Department for Environment, Food and Rural Affairs' (Defra; England and Wales) guidance to bodies reporting adaptation activities to Government:</p>		<p>The report was not intended to focus solely on infrastructure, though that has been a major focus of the utilities. Additional observation/conclusion has been added about the perceived focus on water supply. Text text has also been added to clarify that the report is not necessarily comprehensive, but rather illustrates approaches being taken to develop and use climate change information at selected U.S. utilities.</p>

			Broader features might include (i) those business functions impacted by climate change; (ii) the approach used; (iii) a summary of risks; (iv) the actions proposed to address risks; (v) some discussion of uncertainties and assumptions; (vi) an evaluation of the barriers to adaptation and interdependencies; (vii) arrangements for monitoring and evaluating risks over time; (viii) good practice examples of actions taken; and (ix) areas for further work. It is recognised that vulnerability assessments do not appear to require this breadth of institutional analysis, but utilities will experience other risks and opportunities beyond those summarised in this report.		The report was not intended to focus solely on infrastructure, though that has been a major focus of the utilities. Additional observation/conclusion has been added about the perceived focus on water supply. Text text has also been added to clarify that the report is not necessarily comprehensive, but rather illustrates approaches being taken to develop and use climate change information at selected U.S. utilities.
		12	As a reviewer, one must take much of the report as 'as read', in that one can not verify, or otherwise, the technical outcomes reported in the summary report. This said, notable points of good practice are:		A comment, no response required.
			<ul style="list-style-type: none"> • East Bay Municipal Utility District's (EBMUD) policy analysis, customer engagement and executive level engagement in their work, combined with a structured analysis of uncertainties and institutional constraints (often ignored); 		A comment, no response required.
			<ul style="list-style-type: none"> • New York City's Department of Environmental Protection (DEP's) active management of climate information and integration with their capital investment programme; 		A comment, no response required.
			<ul style="list-style-type: none"> • Seattle's (SPU) tiered approach to adaptation decisions and no-regrets decision-making, allowing the prioritisation of quick wins; and 		A comment, no response required.
			<ul style="list-style-type: none"> • Spartanburg Water's apparent 'fit-for-purpose' (light touch) analysis for smaller utilities with less resources. 		A comment, no response required.
		13	Overall, this report is highly effective at meeting its stated goals; to provide case studies in climate change adaptation over a spectrum of utility size and geographic service area. It contains an appropriate level of usable detail and provides diversified insight to the approaches taken by the four utilities. The organization of the report is straightforward, following a logical path to the conclusions.		A comment, no response required.
		14	There are two missing items in the report that are explained in more detail below in response to other questions. Namely the missing items are a clear definition of "successful adaptation" and a clear explanation of the lessons learned from each utility. In direct response to this question, " <i>Are there other ways of presenting the information in this report ...</i> ", both of these missing items would be elucidated by some kind of a summary graphic that shows the important decision flow paths used in these adaptation projects. A decision framework, flow chart, etc. could be useful to understand the difference, for example, between a "bottom-up" approach and a "top-down" approach, why models are used, etc. If such a graphic were developed, it may help the reader understand the key differences between the approaches taken by the 4 utilities. It may be that such a graphic is not possible, or is too confusing. This is just a suggestion for consideration to the authors.		The report was reviewed for normative language, such as "successful" to ensure it is purely empirical and descriptive. We have added reference to a 2010 companion report prepared by EPA OW to point readers in that direction for more specifics on vulnerability assessment methodologies. We have provided references for "top-down" and "bottom-up," but believe that a decision framework or flowchart would be difficult to implement because of the complexity of water resources decision making. The EPA companion report referenced above provides a more detailed description of these approaches.
Charge Question 2					
			What information, if any, could be added (or deleted) to improve the report?		

		15	<p>As the purpose of the report was to produce information that might enable utilities to learn from each other, the researchers had in many ways an open-ended set of goals. The underlying subject—to draw lessons about adaptation strategies for climate change—would seem to require a wide range of cases and situations, but the cases selected represent a fairly narrow set. They comprise two West Coast utilities that are leaders in research (EBMUD and Seattle PU) and two East Coast utilities, the New York City DEP and Spartanburg Water, a utility that serves 180,000 people. The researchers explain how the set was selected, and it probably does provide enough variation to produce the desired results, but a broader and more nationally-representative set of cases might have provided greater insight about the observations. In particular, one wonders if conditions in the Midwest, Mountain West and Southwest might produce some additional interesting results. Although the report says that southwestern utilities are represented (page 2), EBMUD does not fall into this region, which might include parts of Texas, New Mexico, Arizona and adjacent areas.</p>		<p>The goals of this study has been clarified/emphasized in new material added to the Eexecutive Summary and Introduction sections.</p>
		16	<p>See above and below. Also, I think a section in each case study on how each vulnerability analysis was organized and led would be useful information if I was a utility manager</p>		<p>References have been added as appropriate to a 2010 EPA companion report which provides a more detailed discussion of the general types of approaches being used by used by U.S. water utilities to assess vulnerability to climate change.</p>
		17	<p>Whilst recognising there may be limitations on what can be placed in the public domain, I would have liked to have seen more detail on the analysis and the data that emerged from the vulnerability assessments. This would have been especially valuable for Spartanburg Water, because many utilities may be in their position and would have benefited for a more detailed description of how they pulled together data and models to inform their analysis. An additional aspect relates to interdependencies. Internationally, Governments are now seeking to think through and evaluate the engineering interdependencies of infrastructure systems subject to climate change impacts, and some brief discussion of this and the broader stakeholder communities and organisations that might be affected (or need to be consulted) as a result of these risks and any adaptation responses required, would have been useful.</p>		<p>References have been added as appropriate to a 2010 EPA companion report which provides a more detailed discussion of the general types of approaches being used by used by U.S. water utilities including 3 of the 4 utilities featured in the report. The comment on interdependencies is outside the scope of the report. The purpose and scope of the report has been clarified in the Executive Summary and Introduction.</p>
		18	<p>There are instances where “successful adaptation projects” are mentioned, with little evidence given or a definition of “success” provided. While I have little doubt that benefits of adaptation projects were indeed realized, or are expected to be realized in the future; some clarity on what constitutes “successful adaptation” would be very helpful to the reader. For example, the Executive Summary states in the first paragraph that an outcome of the stakeholder workshop held in 2009 was a recommendation to develop case studies of “<i>successful adaptation projects and activities</i>”. This is reiterated in the summary on the bottom of page 1 (lines 27-32). A definition of “success” would improve the reader’s ability to see how the utilities actions were developed. Generally a successful adaptation project should reduce expected risks to failure in a cost-effective manner. This framework would help the reader understand how the various strategies attempted to reach this goal.</p>		<p>The report was reviewed for normative language, such as “successful,” to ensure it is purely empirical and descriptive. Revised Executive Summary and Introduction to clarify purposes of report.</p>
		19	<p>In another case, in the Executive Summary, page ix, second bullet, the claim is made that “<i>utilities benefitted by working with climate change researchers</i>”. How? This is a critical point. I believe that the utilities did indeed benefit from interactions with the research community. However I did not find evidence of direct benefits. Did the benefits differ across the four utilities?</p>		<p>This has been reworded to remove the declaration about benefits and simply state that utilities have established partnerships with climate scientists. Further references have been made to the 2010 companion report prepared by EPA OW for those seeking more specific information about the use of science/vulnerability assessments.</p>

		20	For utilities that are hesitant to interact with the research community (due to cost constraints, lack of intra-organizational expertise, political constraints, etc), it is important for them to recognize that interacting with the research community can be done in a variety of ways. Evidence of the benefits of this interaction is important for those utilities that do not exist on the “cutting edge” of foresight, planning and management.		This observation/conclusion has been modified to be more accurate. It is beyond the report scope to advocate for utility/researcher engagement
		21	More should be done to synthesize the lessons learned from the four utilities endeavors. Considerable background is given on each utility: service areas, population, functions, etc. Each utility approached climate risk and vulnerability differently, yet generally yielded many of the same conclusions by finding a path to “no-regret” actions that make sense in the face of the great uncertainty surrounding climate model output. Definition of no-regret in the face of risk and uncertainty is an important lesson. In fact, small utilities reading this report may decide to focus solely on this approach. Diversification of highly vulnerable system components satisfies many goals besides future climate uncertainty. More detail on this would result in a high-impact report to the utility industry.		New observation/conclusion added to highlight this point.
Charge Question 3					
			Please comment on whether the summary observations listed in Chapter 6 are justified and appropriate based on the four case studies? If not, why? Are there other summary observations that should be added?		
		22	The summary observations are in the executive summary and at the end of the main body of the report. They are copied below (in italics) with my comments about each one.		A comment, no response required.
			<i>For the four utilities researched for this report, conducting climate change vulnerability assessments appears to have increased awareness of climate change risks, informed decision making, and provided support for adaptation measures.</i>		
		23	This seems to be the most substantive of the observations, and the others are perhaps supportive of this one. It will require some justification and explanation to document the extent that decision making and support for adaptation have been affected. I looked for this justification in the details of the cases, and report my findings about increasing awareness of climate change risks, informing of decision making, and providing support for adaptation measures in the last section.		Modified Executive Summary and Introduction to state report objectives more clearly (i.e., the report is descriptive not evaluative)
			<i>Utilities have benefitted by working with climate change researchers.</i>		
		24	This conclusion is one that we researchers often reach, but again, the proof will be in the pudding, that is, to document why we think this is the case.		This has been reworded to remove the declaration about benefits and simply state that utilities have established partnerships with climate scientists. Further references have been made to the 2010 companion report prepared by EPA OW for those seeking more specific information about the use of science/vulnerability assessments.
			<i>The large utilities used a wide array of climate change scenarios to capture some of the uncertainty about future climate change.</i>		
		25	This is a positive statement about how the utilities carried out some of the work, and seems to be valid but not particularly remarkable.		A comment, no response required.
			<i>The utilities used models to manage and understand the dynamics of their systems.</i>		
		26	Leading utilities use many models to study scientific and management issues, so this observation seems fairly obvious.		A comment, no response required.

			<i>A review of literature on climate change and understanding of how recent extreme events could become worse in the future informed Spartanburg's consideration of climate change in its decision making.</i>	
		27	As this conclusion deals only with Spartanburg, it does not seem to apply across the cases.	Spartanburg Water is the only small utility included in this report, and took a different approach to assessing vulnerability than the larger utilities featured in this report. Although not a truly cross-cutting observation, we feel approach taken by Spartanburg Water is nonetheless an interesting observation to present.
			<i>Utilities expressed an interest in obtaining better information on climate change, and that their needs are reflected in future research.</i>	
		28	This would be expected and is an indication that the utilities found merit in the work they did.	A comment, no response required.
			<i>Overall, the case studies presented in this report suggest that while there is uncertainty about how climate will change in different regions of the country, through analysis and study, utilities are able to improve their understanding of the risks they will likely face from climate change .</i>	
		29	This seems like a logical conclusion, which might encourage utilities to assess the uncertainty in their supplies that might occur from climate change.	A comment, no response required.
			<i>The results of vulnerability assessments by the four utilities presented in this report were used in different ways to inform and support adaptation.</i>	
		30	This is a general conclusion, which is bolstered by the example of Seattle studying the impact of conservative assumptions on reservoir management.	A comment, no response required.
		31	The observations in Chapter 6 are justified and appropriate given the case studies except for possibly the second from the last on page 54 about the utilities being able to make informed decisions. How do we know they made "Best" decisions ? Again, the report could be improved on what a Best or even Good adaptation strategy is (eg robust, flexible, adjustable, dynamic etc). It seems that only EBMUD and SPU really assembled a real adaptation strategy with a defined dynamic strategy over time. How does Spartanburg know it is doing enough to respond to climate change ? It seems they are just hoping that better operation today will help (which it will), but is this plan reasonably effective for adaptation ? It seems NYC is not yet at the point in its analysis of assembling a dynamic strategy.	The focus of this study has been clarified/emphasized in new material added to the Executive Summary and Introduction
		32	I think an improved observation might be that some utilities are taking climate change seriously, have not let uncertainty or lack of resources stand in their way, and have undertaken a range of analyses to respond to it.	A new observation/conclusion expressing this point has been added
		33	The summary observations are provided on introductory pages ix to xii and are a list of distilled insights from the four utilities examined. These are valuable. They act as a status report on the level of engagement in adaptation and of activity by these utilities, and they highlight cross-sectoral issues for utilities internationally. Important aspects of these summary observations are that the issue of climate change appears to have acted as a stimulus for work on improved decision analysis and engagement with the research community; and that a range of tool and techniques from quantitative hydrological modelling through qualitative decision support and integrated policy assessments is in use to support this activity. It would appear that adaptation decisions informed by robust qualitative analysis and reasoning can still be made by smaller utilities without highly developed institutional capacities for detailed analysis. Good and pragmatic use appears to have been made of available international scenarios, downscaled to regional levels in these case studies.	A comment, no response required.

		34	In general I found the summary observations to be justified. However, as introduced in my response to question 2, I found several conclusions slightly exaggerated or unsupported by citable evidence. While I agree generally with the overall conclusions, and believe they are true, I would like to see evidence cited to support the claims. For example, in the second bullet, the claim is made that the utilities benefited from their interaction with the climate research community. However the text in the bullet summarizes <i>who</i> the utilities interacted with, but does not describe the benefits realized from this interaction.		The specific example has been reworded. Others have reviewed and removed, especially normative phrases such as "successful."
Charge Question 4					
			Are you aware of any essential references or data that are omitted from this report? If so, please provide a full citation and, if possible, an electronic copy of the reference.		
		35	As this report focused on the cases themselves, it is perhaps not relevant to suggest references about the main topics of modeling and adaptation to climate change, which are discussed in the report's companion document. However, I can suggest two sources for references that might strengthen the report. The first would be the documents and reports that stemmed from the workshop on utilities and climate change that was organized by the Water Research Foundation with cooperation from the Water Environment Research Foundation and UKWIR in 2008. This workshop, which was held in Denver in January 2008, produced a report entitled "Water Industry Climate Change Research Needs Workshop."		The focus of this study has been clarified/emphasized in new material added to the Executive Summary and Introduction. We believe the references suggested here fall outside of that focus.
		36	The second category of references would be those that probed how decisions about water security are made and how models and studies inform them. Again, this is probably outside the scope of the case study report being reviewed, but the topics are relevant.		While an interesting and related topic, a review of the water security literature is outside the scope of this effort.
		37	Perhaps reference the USGCRP 2009 Global Climate Change Impacts in the US report, and the WUCA report Decision Support Planning Methods: Incorporating Climate Change Uncertainties into Water Planning, January 2010.		The USGCRP has been cited to refer readers to information on water resources and climate change. But the WUCA report on decision making did not seem directly relevant to the purposes of this report.
		38	The reference list is US-centric. This is perhaps OK given the audience, but because many countries and their water utilities are on a similar journey, reference could be made to other international efforts and studies. It would be a missed opportunity if we developed parallel expertise and capacity in adaptation studies without sharing our efforts more widely or without reference to other work. References to major work in Australia, Europe and Canada should therefore be referenced.		This report is based on public documents from each of the featured utilities. While the reviewer makes an excellent point, this report is not intended as a literature review of water utility adaptation efforts. Rather, it is descriptive of the approaches being taken by the 4 utilities featured in the report. This scope of this report has been clarified in the Introduction and Executive Summary.
		39	I am unaware of any major bibliographic omissions. However, I feel the report could be strengthened by providing a literature review section on utility adaptation. It would provide the reader with a broader context from which to understand the various approaches taken by the utilities; how do the utility case studies lay on the broader international utility landscape? For example, water utilities in Europe, Australia and New Zealand have made contributions to the climate change adaptation literature. These citations, while not imperative, could strengthen the overall report.		This report is based on public documents from each of the featured utilities. While the reviewer makes an excellent point, this report is not intended as a literature review of water utility adaptation efforts. Rather, it is descriptive of the approaches being taken by the 4 utilities featured in the report. This scope of this report has been clarified in the Introduction and Executive Summary.
Charge Question 5					
			Please read and consider all public comments received by EPA on this report (comments were received from 2 groups). Please comment on the validity and appropriateness of comments submitted by each public entity. Are there specific comments you strongly agree or disagree with? If so, which ones?		

	40	Two sets of public comments were received, one from the Association of California Water Agencies (ACWA) and the other from the Natural Resources Defense Council (NRDC). The comments from ACWA are complimentary of the report and mainly point to the need for unique local and regional approaches and to the need to consider climate change policies, such as the ACWA principles.		A comment, no response required.
	41	The comments from NRDC are much more extensive and are signed by one of their attorneys. NRDC did not always seem clear on who would respond to its comments as it suggested a few times that the utilities provide additional information, whereas the researchers prepared the case studies from information provided by the utilities. The main points made by NRDC are summarized here, with my comments alongside:		In general, the NRDC comments are asking for a more evaluative approach to the subject matter. New material added in the Introduction and Executive Summary sections clarify that this is beyond the scope of the report. This is consistent with the reviewer's comments on the NRDC comments
		NRDC: Have cases describe not only actions but insights and assessments from experiences		
		This reviewer: Agree, but suspect this would greatly expand the scope of the report		
		NRDC: Add insights about adaption strategies		
		This reviewer: Agree, but think this will require additional research		
		NRDC: Consider worst case scenarios		
		This reviewer: This is definitely desirable in adaptation studies and the report could be augmented by explaining how the utilities did or did not consider extreme cases		
		NRDC: Consider multiple benefit strategies		
		This reviewer: This is highly desirable, but would seem to expand the scope of the report		
		NRDC: Expand discussion of risk tradeoffs		
		This reviewer: This includes issues such as conflict between flood protection and drought security. It would be good to discuss this more, but it would expand the scope.		
		NRDC: Additional resources needed		
		This reviewer: I concur that it would be good to explain how modeling and planning require additional resources, and I also think it would be good to explore the cost-benefit calculation of providing such additional resources.		
	42	In summary, I agree in principle with NRDC's comments but think that much of their substance applies to a broader study of climate change adaptation and not to the cases themselves. However, I do discuss a related issue of scope in the next section.		
	43	I agree generally with those of ACWA even though I may not agree with all their Climate Change Policies. There comments are fairly general. On the other hand, the NRDC comments are very specific and I support all of them. Many of them are similar to my comments.		A comment, no response required.
	44	These are well reasoned and fair in my opinion.		A comment, no response required.
	45	I received two letters commenting on this report. The first, from the Association of California Water Agencies, is in agreement with the results of the report. The comments presented by the ACWA are valid and appropriate.		A comment, no response required.
	46	The second comment letter was written Steve Fleischli, Esq, Senior Attorney at the National Resources Defense Council (NRDC). The NRDC comments are largely positive, however Mr. Fleischli states that insights from the utilities are missing; namely that experiences of the utilities could be provided. I fully concur with this recommendation. Interviews were done with the utilities; some information must have been gleaned on the experiences of the <i>process</i> that each utility went through. Mr. Fleischli states: "The document should contain reflections on which actions taken were useful and which were not, and moreover, it should include a discussion by each utility of what it would do differently if it were given the opportunity." I agree wholeheartedly with this sentiment; the conclusions section seems a bit thin.		The Executive Summary and Introduction sections have been revised to clarify the purpose and limitations of the report. This report was based on available literature and limited interviews with utility staff. The report was intended to be descriptive of the approaches taken by utilities to assess vulnerability. We agree the types of question listed here would be very interesting and useful. Addressing the types of questions listed here, however, would have required a more extensive interview process that was beyond the scope of this report. We will consider this comment in framing future follow-on work on this topic.
Charge Question 6				

			Do you have other comments or suggestions for improving the quality of this document?	
		47	<i>Project impacts</i> I believe that the first observation across the cases is the most substantive and will focus my comments on it. It concludes that: "For the four utilities researched for this report, conducting climate change vulnerability assessments appears to have increased awareness of climate change risks, informed decision making, and provided support for adaptation measures." So, the claims are that the vulnerability assessments increase awareness of climate change risks, inform decision making, and provide support for adaptation measures. I use the term vulnerability assessment (VA) to mean any study or process to assess the vulnerability of utilities to climate change and not necessarily to a specific study or document called a vulnerability assessment.	A comment, no response required.
			EBMUD	
			Increase awareness of climate change (CC) impacts: Yes, staff has been active in studying CC and makes presentations to management and directors	
			Inform decision making (DM): Yes, EBMUD has a wide band of DM and they clearly use CC results in decisions.	
		48	Support adaptation measures: Yes, the DM impacts prove support for adaptation measures.	A comment, no response required.
			NYC DEP	
			Increase awareness of climate change (CC) impacts: Yes, NYC is pro-active about CC and the VAs add needed information.	
			Inform decision making (DM): Yes, As the researchers report the policy and analysis are proceeding on parallel tracks, so it is difficult to say how much the VAs have informed DM so far.	
		49	Support adaptation measures: Yes. As NYC is pro-active it seems clear that VA's will help in adaptation. DEP's Climate Change TF seems to be coordinating and participating in adaptation measures.	A comment, no response required.
			Seattle PU	
			Increase awareness of climate change (CC) impacts: Yes. Seattle is pro-active in CC studies and participates in committees and work groups. It seems committed to adapting to CC and the VAs provide needed information.	
			Inform decision making (DM): Yes. Given that Seattle is pro-active, it appears that DM will require the information from VAs as the political climate supports them and requires a responsive approach.	
		50	Support adaptation measures: Yes. Seattle appears committed to adaptation through a responsive approach and has directly used the VA information to support adaptation.	A comment, no response required.
			Spartanburg Water (SW)	
			Increase awareness of climate change (CC) impacts: Uncertain whether it is fair to say that VAs helped SW increase awareness of CC. The utility is incorporating CC into its ongoing plans rather than doing stand-alone VAs.	
			Inform decision making (DM): CC does inform DM, but whether we can say that VAs contribute is uncertain.	
		51	Support adaptation measures: The utility seems to be adapting to CC information, so it might be fair to say that on an overall basis, its CC studies are leading to adaptation.	Reviewed report to ensure that conclusions did not imply existence of formal vulnerability assessment for all utilities (i.e., Spartanburg).

		52	More specific about actions and decisions The major suggestion I would make for improving the report is to be more specific about which utility actions and decisions deal with climate change impacts and adaption and focus the comments across the cases on them. In particular, I think it might have been a good addition to the report to create in the summary a process chart to explain the decisions and adaptations about climate change and how vulnerability assessments inform them.		Beyond the scope of the report as described above and in additional material in the Executive Summary and Introduction
		53	The report does a fairly good job of explaining how utilities adapted for each case, and I admit that it is difficult to trace the influence of a particular study (such as a vulnerability assessment) through the chain of decision making. By the same time, as the report was about how utilities assessed their vulnerability to climate change, it might be that we are looking for the results of combinations of studies, rather than the influence of a vulnerability assessment study <i>per se</i> .		A comment, no response required.
		54	At the same time, as a researcher I have become aware of our propensity to look for positive signs that our work is being noticed and used by decision makers and I think it is up to us to go the extra mile to prove how planning studies are used by identifying precise decisions and/or actions that were influenced. In the study at hand, for example, all four utilities were quite familiar with climate change, so our task here is to chase down the extent to which vulnerability assessments influenced that awareness and the actions that stem from it. So, it might help the report if it could be more specific about how the utilities did their vulnerability assessments and about how these activities influenced awareness, decisions and adaptation. I think the report did a good job on this in general, but think the more specific we are, the better the results.		References have been added to a 2010 companion report completed by EPA Office of Water that describes in more detail the types of approaches used by water utilities to assess vulnerability. New material was also added in Executive Summary and Introduction emphasize that the report is not intended to be evaluative or judgemental.
		55	Again, in line with my and NRDC's comments, I again suggest more emphasis be placed on why utilities did what they did and how beneficial were the results.		New material was added to the Executive Summary and Introduction emphasizing that the report is not intended to be evaluative or judgemental.
		56	Fundamentally I have two related recommendations: 1) better citations both from within the utilities themselves (especially from the interviews) and perhaps a broader literature review on utility adaptation practices, especially from an international perspective, and 2) more direct conclusions on the lessons learned from the utilities and the benefits realized. Specifically the process-level experiences that the utilities went through. This information would be very helpful to other utilities.		A broader review on utility adaptation practices is outside the scope of this effort, but additional references to the companion EPA report do point the reader to more information on the technical aspects of VAs. New material in Executive Summary and Introduction emphasizes that evaluation is beyond the scope of this report. Much of the research was conducted through interviews. And much of the utilities' work is not published and citable. We have provided references wherever possible.
Page(s)	Line(s)		Specific Comments		
			Specific Comments EPA/600R-10/077A		
		57	Generally this is an excellent report on how four water utilities are responding to climate change. Most of these comments are editorial. Comments are by page number-line number.		A comment, no response required.
vi	bottom of page		explain "bottom-up" approach as first time reader has seen.		Added footnote
viii	top of page		2040 not 2004.		Corrected in manuscript
viii	middle		increased Hudson salinity will also impact water supply.		Unclear that this is true since water is not extracted from the Hudson for water supply purposes.
3	Table 3		increased temperature also threat as increases demand.		In most cases, changes in demand were not as significant as supply, thus it is not listed as "key".
5	14		refer to Figure 2 so reader will understand geography.		Corrected in manuscript
6	18		evaporation from what ? reservoir surface ?		Corrected in manuscript
7	Figure 2		difficult to read.		Unable to obtain higher resolution graphic. Suggest that graphic be enlarged in final production version, to the extent possible.

8	6	treated drinking water from where ?	Corrected in manuscript
9	7	define SDI.	Corrected in manuscript
10	2	Suggest there be consistency in units throughout entire report – English or metric.	Units are consistent with source material
10	15	I think first reference to CA DWR – define.	Corrected in manuscript
12	2	this is I think is fresh water flooding. Throughout the report at times it is not clear if it is freshwater river flooding, drainage flooding or coastal surge flooding.	Flooding better categorized throughout document
12	14	should be coastal flooding.	Flooding better categorized throughout document
14	17	Define W-E model.	Acronym defined
15	33	this is initially unclear if temperature increases in water source or wastewater discharge water bodies.	Clarified
18	19	Refer early on to Figure 3. Also, it should be stated why Catskills are important. Reader does not know it is one of sources of NYC supply.	Revisions made
20	1	Instrument or just Measurements.	Corrected
25	1	This is somewhat general comment, but I think it should be mentioned that one of reasons NYC has been so relatively successful has been the leadership of the Mayor on this issue. As is well known, leadership at some level is very important to success and the opportunities agencies have to undertake adaptation planning. In some of the case studies, leadership is mentioned, in others it is not. It should be consistently described.	Only SPU touches on leadership. While the authors agree with the point, they are not certain we should include a conversation about leadership as it moves into the realm of intentionality, political motivations, and other subjects
26	5	included AS WELL ? the	The intent of this comment is unclear, but document has been reviewed in its entirety
27	9	I was not aware the IPCC had methods for calculating probabilities and I think generally does not encourage it. I could be wrong.	This is correct. Statement has been reworded.
28	28	word un should be ?	Corrected
28	32	drainage flooding.	Flooding better categorized throughout document
29	22	These are very high urban water rates (eg 167 gpd). Are these peak demands ?	Numbers are consistent with the totals and citations
36	1	all aquifers are underground.	Corrected
36	32	appears to be annual precipitation.	Corrected
39	20	Again, here leadership is shown to be important.	Only SPU touches on leadership. While the authors agree with the point, they are not certain we should include a conversation about leadership as it moves into the realm of intentionality, political motivations, and other subjects
43	1	these are conservative operating (need this word) assumptions.	Corrected
43	5	eliminate word Other.	Corrected
43	15	add the word operating.	Corrected
50	3	I think this is first mention of DHEC.	First mention is previously, on p 47