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Evaluation of the National Water Program Climate Change Adaptation Strategy

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Promoting Environmental Results

Through Evaluation

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Joel Corona of the Office of Water provided critical assistance and background information throughout the course of this study. Britta Johnson and Carl Koch of EPA's Office of Policy Evaluation Support Division provided technical support and advice for the evaluation.

This report was developed under the Program Evaluation Competition, sponsored annually by EPA's Office of Policy. Program Evaluation is one of the performance management tools EPA uses to assure itself, the public, and other interested stakeholders that EPA programs are protecting human health and the environment effectively and efficiently. The information obtained through program evaluations can shed light on whether EPA programs are meeting their goals and objectives, provide the evidence and road map needed to replicate successes, and identify those aspects of EPA programs needing improvement. To access copies of this or other EPA program evaluations, please visit EPA's Evaluation Support Division's website at http://www.epa.gov/evaluate.

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EXECUTIVE SUMMARY

The *National Water Program Strategy: Response to Climate Change* was first published in 2008. OW created one of the first climate change strategies in the Agency, and is considered a model for other emerging efforts within the federal government. The 2008 Strategy describes the likely effects that climate change will have on water resources and implications for EPA's Office of Water (OW) and the National Water Program (NWP). In 2012, OW developed an updated strategy that describes NWP's long-term goals for sustainably managing water resources in light of climate change. It is intended as a roadmap to guide future program work and inform the Agency's annual planning process. In late 2012, OW's Immediate Office (IO), which is responsible for coordinating OW climate change work, requested support from EPA's Evaluation Support Division (ESD) to conduct a retrospective evaluation of lessons from the 2008 Strategy, and to develop a prospective measurement framework to track the progress on the 2012 Strategy. Industrial Economics, Incorporated (IEc) and its subcontractor Ross Strategic, henceforth referred to as the evaluation team, carried out the study. This report presents the results of these coordinated efforts.

EVALUATION QUESTIONS

The project was guided by the following research questions:

Evaluating Implementation of the 2008 Strategy:

- How well is climate mainstreamed into OW programs? What are the barriers to mainstreaming and how might this be better accomplished?
- What goals, implementation experience, or lessons from the 2008 Strategy could be useful to guide implementation of the 2012 Strategy?
- What goals and strategic actions in the 2012 Strategy should EPA headquarters (HQ) and regional programs prioritize?

Developing Prospective Measurement Approach for the 2012 Strategy:

- What is the measurement approach that can be used to measure adaptation progress in five areas: infrastructure, watersheds and wetlands, ocean and coastal waters, water quality, and working with tribes?
- What specific elements need to be applied to the phased approach to tracking progress outlined in the 2012 Strategy, to make it a robust measurement framework?
- What, if, any, revisions should EPA make to its baseline data collection process to ensure that data collected are meaningful and objective?
- How can OW's measurement approach inform measuring progress in the EPA-wide Adaptation Plan, and to inform development of the next Agency Strategic Plan?

DATA SOURCES AND APPROACH

This study draws on multiple data sources to inform the lessons learned related to our research questions. Key sources of information include:

- Interviews with EPA representatives from IO and from all four OW program offices and several regional offices, as well as external organizations. An EPA interview summary is presented in Exhibit ES-1 below; in total the evaluators interviewed 26 EPA staff and 4 non-EPA staff. The evaluators spoke with staff in all four OW program offices as well as staff from four different regions.
- An EPA focus group to discuss lessons from the 2008 Strategy and recommendations for implementation of the 2012 Strategy. Most focus group participants are also among the interviewees discussed above.
- Review of documents related to the NWP climate change strategies and their implementation, including EPA memoranda and other policy documents.
- Review of baseline data collected by IO to assess progress towards the strategic actions included in the 2012 Strategy.
- Review of existing literature and online publications that address climate change adaptation strategies and activities.

EXHIBIT ES-1. EPA INTERVIEW SUMMARY

EPA OFFICE/REGION	NUMBER OF INTERVIEWEES
OW/IO	5
OAR	2
OGWDW	5
OP	1
ORD	1
OST	1
OWM	4
OWOW	3
Region 1	1
Region 3	1
Region 6	1
Region 10	2
Total	**27**

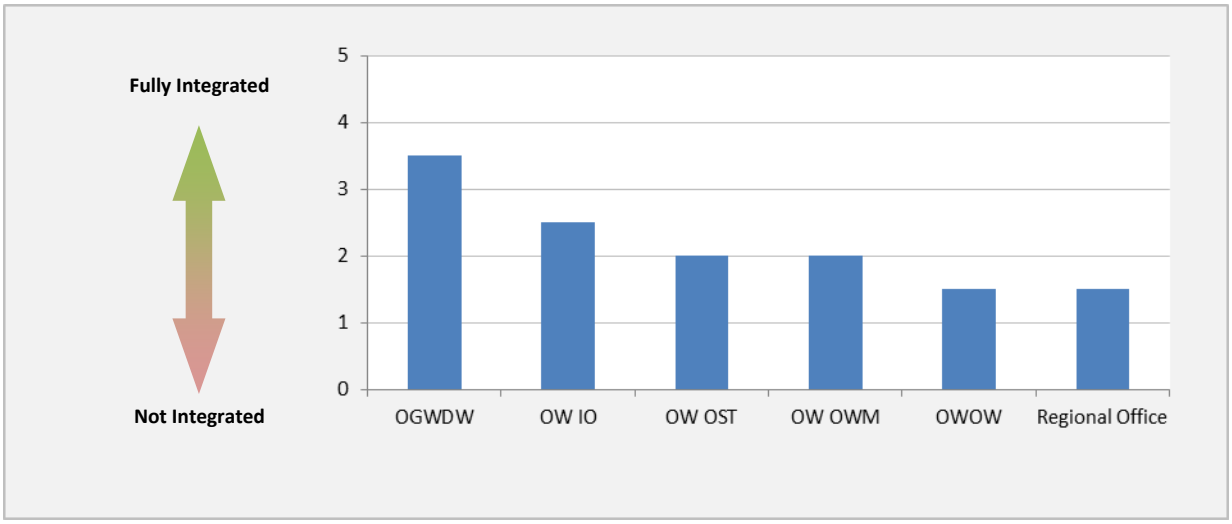
LESSONS FROM IMPLEMENTATION OF THE 2008 STRATEGY

The findings and lessons from the retrospective evaluation of the 2008 Strategy are presented in Chapter 4 and are summarized below by evaluation questions.

- **How well is climate mainstreamed into OW programs?**

Overall, evaluation participants felt that the degree of integration of climate change into the NWP is low but improving. There are a few NWP programs in which substantial integration progress has been made, but most divisions, offices, and programs are in the early stages. The evaluators framed this discussion by defining a fully mainstreamed situation as one in which climate change factors into daily routines, duties, and decision making. Evaluation participants were asked to rate their opinion of mainstreaming on a 1 to 5 scale, with 1 being "not at all" and 5 being "completely integrated." Participants were then asked to explain the rationale behind their rating. The average rating of all responses to this question was 2.5; Exhibit ES-2 below illustrates the range of responses by respondent affiliation.

EXHIBIT ES-2. EXTENT OF MAINSTREAMING ACROSS OW PROGRAMMING, PERSPECTIVES BY AFFILIATION



As shown in the exhibit above, interviewee perception is that mainstreaming is further along in OGWDW in other OW offices. Also, external interviewees perceive that OW is further along in mainstreaming, and credited OW for its willingness to begin a dialogue with state and tribal partners around climate change, but noted that progress has been slow and halting.

- **What are the barriers to mainstreaming and how might this be better accomplished?**

The evaluators found a range of barriers preventing the integration of climate change considerations into OW's daily operations. Key barriers included competing priorities, lack of resources, characteristics of climate change as an issue, organizational and structural aspects of OW, and external influences.

Many interviewees observed that in the context of severe budget and staffing constraints, it can be difficult for issues such as climate change to compete for limited time and attention. The NWP faces numerous priorities, and those which are driven by legislative, regulatory, or court-mandated requirements are often prioritized.

Several interviewees noted that the inherent complexity, uncertainty, variability, and long-term time frame of climate change were barriers to mainstreaming into the NWP. This was coupled with the overarching nature of the problem, in that climate change affects multiple sectors and exacerbates many other issues, ranging from water availability to water quality to sea level rise. Participants noted that while EPA permits are generally written for five year increments, the programs most impacted by climate change should think about setting standards over a 20 – 30 year time frame. A related barrier cited by several interviewees was the knowledge base within OW. Several interviewees noted that offices must go through the thought exercise of considering climate impacts on their core responsibilities to internalize the concept that failing to account for climate change could have severe consequences for their programs.

The lack of continuity associated with a constantly shifting roster of branch chiefs, division directors, and deputy office directors was noted as a barrier to integration. A participant in the evaluation remarked "it takes 10,000 repetitions to create muscle memory. The same is true of integrating this type of priority across an organization; it has to be part of the regular conversation."

Finally, interviewees noted that political and public support and emphasis for climate change policy is capricious and often based on reaction to major events (e.g., hurricanes, flooding). Public awareness and acceptance of climate change is still not at a favorable tipping point in some regions. Regional interviewees remarked that EPA has just begun the dialogue with states around climate change, and most environmental programs are implemented by states. They observed that in some states, state government officials face political constraints regarding their ability to recognize climate change as an issue and EPA regional offices must be sensitive to these politics. In these situations, EPA regional offices have had some success in engaging state and local partners on specific topics associated with climate change, such as storm water management needs associated with severe weather events.

Interviewees noted that climate change is better mainstreamed within voluntary programs than regulatory programs. Throughout the discussions, evaluation participants consistently brought up two programs as examples of successful integration of climate change considerations into day-to-day operations: Climate Ready Water Utilities (CRWU) and Climate Ready Estuaries (CRE) – see sidebar for program descriptions. Both programs work with a well-established network of organizations outside of EPA; in the case of CRWU, OW staff works with national utility associations and CRE taps into the expertise of organized coastal watershed groups. The CRWU program emphasize creating practicable, usable tools – filling a niche which had until then been the provenance of high level atmospheric scientists. The CRE program is well-marketed and benefits from immediate buy-in at the state level, which is critical since states can advocate for programs at EPA.

Climate Ready Water Utilities

The CRWU initiative provides several useful tools and resources for utility owners and operators. These include the Climate Resilience Evaluation and Awareness Tool (CREAT), Adaptation Strategies Guide, a searchable resource library, and an Extreme Events Workshop Planner.

http://water.epa.gov/infrastructure/watersecurity/climate/index.cfm

Climate Ready Estuaries

The Climate Ready Estuaries program works with the National Estuary Programs and the coastal management community to: (1) assess climate change vulnerabilities, (2) develop and implement adaptation strategies, and (3) engage and educate stakeholders. CRE shares NEP examples to help other coastal managers, and provides technical guidance and assistance about climate change adaptation.

http://water.epa.gov/type/oceb/cre/index.cfm

A widely held perception among interviewees was that more work is needed to integrate climate change into the regulatory side of EPA activities. Interviewees acknowledged that incorporating climate change considerations into regulatory programs and existing work requires a significant commitment of time and resources. OW's CWA and Safe Drinking Water Act (SDWA) authorities include adaptive management processes that allow updates to permits and standards based on changing conditions, of which climate change is one. Another interviewee noted, however, that until climate change is explicitly acknowledged within OW's regulatory processes, it will not be fully integrated into the NWP. For example, regulatory drivers such as NPDES regulations and SDWA regulations for carbon capture and storage have been discussed within OW but there has been no action to date.

- **What goals, implementation experience, or lessons from the 2008 Strategy could be useful to guide implementation of the 2012 Strategy?**

The evaluation team distilled several findings and associated lessons on the overall effectiveness of the *National Water Program Strategy: Response to Climate Change* (the 2008 Strategy)—as both a document and a process—for affecting change in and through the NWP. Key findings are highlighted below.

- ***Strategy use, influence, and value:*** Despite resource constraints and competing priorities, the NWP has made significant progress in responding to climate change since 2008 in both voluntary and regulatory program areas. The evaluators found evidence that significant progress has been made since 2008 in understanding the potential impacts of climate change to the NWP and in taking responsive actions to support mitigation and adaptation efforts by diverse partners. However, most evaluation participants stated that while progress to date has been substantial, major work lies ahead to integrate climate change into NWP programs. Although the 2008 Strategy is widely regarded as a pioneering effort to take on the task of addressing climate change within a major EPA program office, overall the individuals interviewed for this evaluation reported that the 2008 Strategy was not a significant driver of this activity by OW divisions and programs. Many interviewees indicated that the strategy addressed actions already planned or underway, and that other drivers (such as stakeholder needs and the presence of a management-level champion) had much greater influence than the strategy effort on OW programs' progress to respond to climate change. The story is somewhat different outside of EPA headquarters. The 2008 Strategy was actively used by some EPA Regional Offices and state and tribal partners to raise awareness and motivate action, and the 2008 Strategy has been used by other EPA offices and other federal agencies to inform climate change adaptation planning. New implementation strategies—such as enhanced communications and management engagement efforts—will be needed to make the 2012 Strategy more useful in driving progress.
- ***Communication and outreach:*** Overall, the evaluators found that OW is viewed as an effective partner on climate change activities, and in some cases OW's efforts have spurred other organizations' ability to work on climate change. However, more attention to communications and outreach for the 2012 Strategy would be beneficial for implementation success. Several existing communications and outreach mechanisms, such as the National Water Program Climate Change Workgroup, the "Highlights of Progress" documents, and the NWP climate change strategy website, have been helpful for engaging EPA regional offices and partners outside of EPA. The State and Tribal Climate Change Council (STC3) was noted as an important effort to engage key external partners, although several evaluation participants indicated that there are substantial opportunities and need to expand partner engagement activities and the use of the STC3.
- ***Management support:*** Conversations with evaluation participants revealed strong high-level management support for the overall NWP climate change strategies but uneven support at the division, office, and branch manager level during implementation. Regular management support is vital to progress; finding ways to sustain management engagement with the 2012 Strategy is key.
- ***Staffing and resources:*** Overall, the evaluators found limited resources and staff for both development of the 2008 and 2012 Strategies and implementation of climate change activities. However, implementation of some climate change programs and initiatives can occur with existing resources by doing current work in a slightly different manner, while other efforts will require dedicated staff time and funding.
- ***Training and capacity building:*** The evaluators overall assessment is that additional training for EPA staff on impacts of climate change, particularly impacts on areas specific to staff members' programmatic duties, would be extremely helpful.
- ***Measurement:*** The evaluators found that OW divisions and offices outside of IO found little value in 2008 Strategy measurement activities, and did not find evidence that measurement informed decisions or motivated action. This finding informed the evaluator's suggested measurement approaches presented in this report.

- **What goals and strategic actions in the 2012 Strategy should EPA headquarters (HQ) and regional programs prioritize?**

IO is currently developing prioritization criteria in order to effectively allocate resources toward climate related activities. Key criteria under consideration include: urgency, risk, geographic scale, programmatic scale, and probability of occurrence. OW could use these criteria to prioritize activities identified in the 2013 Implementation Plan. The evaluators encountered a broad range of perspectives on prioritization of the strategic actions described in the 2012 Strategy. Interviewees did not advocate for prioritization of particular strategic actions; instead, they provided a suite of prioritization schemes for OW consideration. For example, offices that work directly with partner organizations or associations, such as utilities, tend to prioritize those activities developed jointly with partners. Some participants focused on regulatory changes to implement the Strategy; some respondents suggested prioritizing strategies connected to existing EPA authorities such as TMDLs; and still others suggested prioritizing climate change guidance in the use of EPA categorical grants, performance partnership grants (PPGs) and CW and DW SRF programs.

PROSPECTIVE MEASUREMENT APPROACH FOR 2012 STRATEGY

In Chapter 5, the evaluation team provides options for measurement approaches for IO to consider for measuring progress on the 2012 Strategy. These options are informed by several factors, including the goals of the 2012 Strategy and its phased approach to adaptive management; feedback from interviewees on the 2008 Strategy regarding measurement limitations; feedback from interviewees on options for measuring progress on the 2012 Strategy; and adherence to core principles of robust performance measurement. The evaluation team summarizes findings and lessons learned for this evaluation question below, organized by evaluation question:

- **What is the measurement approach that can be used to measure adaptation progress in five areas: infrastructure, watersheds and wetlands, ocean and coastal waters, water quality, and working with tribes?**

The 2012 Strategy contains 53 strategic actions in the five vision areas (infrastructure, watersheds and wetlands, coastal and ocean waters, water quality, and working with tribes) and cross-cutting areas of program support. In the 2012 Strategy, OW adopted a seven-phased approach to adaptive management, described below, that show progress towards achieving stated goals and strategic actions described in the 2012 Strategy:

1. **Initiation:** Conduct a screening assessment of potential implications of climate change to mission, programs, and operations.
2. **Assessment:** Conduct a broader review to understand how climate change affects the resources in question. Work with stakeholders to develop an understanding of the implications of climate change to the mission, programs, and operations.
3. **Response Development:** Identify changes necessary to continue to reach program mission and goals. Develop initial action plan. Identify and seek the research, information, and tools needed to support actions. Begin to build the body of tools, information, and partnerships needed to build capacity internally and externally.
4. **Initial Implementation:** Initiate actions in selected priority programs or projects.
5. **Robust Implementation**: Programs are underway and lessons learned are being applied to additional programs and projects.

6. **Mainstreaming**: Climate is an embedded component of the program.
7. **Monitoring and Adaptive Management:** Continue to monitor and integrate performance, new information, and lessons learned into programs and plans.

The seven phases of adaptive management could be used in two different ways to assess progress:

1. To assess progress on goals, which are mostly outcome-based. Outcomes are changes in awareness, behavior, or condition that result from EPA activities.
2. To assess OW's progress on implementing strategic actions, which are mostly EPA outputs. Outputs are products or services that EPA provides, such as technical assistance, trainings, and decision-support tools.

At this stage of climate change adaptation, the evaluators suggest that OW programs should be accountable for outputs, and learn from outcomes. Thus, we suggest that OW apply the seven phases to track progress towards goals articulated the 2012 Strategy by undertaking an "outputs plus priority outcomes approach" described below and in Chapter 5.

- **What specific elements need to be applied to the phased approach to tracking progress outlined in the 2012 Strategy, to make it a robust measurement framework?**

IO needs to develop objective criteria for each phase of adaptive management to facilitate consistent measurement. For example, if the goal selected is reduce water infrastructure vulnerability to climate change risks, criteria may be defined as shown in Exhibit ES-3. Note that Phases 1-3 are likely be assessed in terms of producing outputs and may be closely linked to existing strategic actions contained in the 2012 Strategy. Phases 4 and later are intended to track outcomes; tracking outcomes will require data collection from EPA partners such as state and local governments. Note that we suggest that IO set specific, quantitative thresholds for meeting each stage, but determining appropriate thresholds will require pilot testing.

EXHIBIT ES-3. ILLUSTRATIVE CRITERIA FOR AN OUTPUTS PLUS PRIORITY OUTCOMES APPROACH

PHASE	CRITERIA FOR ASSESSING PROGRESS ON REDUCING WATER INFRASTRUCTURE VULNERABILITY
1-Initiation	OW conducted a screening assessment to identify the potential implications of climate change for water infrastructure.
2-Assessment	OW has conducted a broad review to better understand how climate change affects water infrastructure, including consulting water utilities.
3-Response Development	In collaboration with partners, OW has developed and distributed information, guides, and tools to assist water utilities in undertaking adaptation, efficiency, and demand/supply management measures.
4-Initial Implementation	At least 30% of water utilities have conducted initial planning steps and updated planning documents to address climate change risks and *a few* water utilities have undertaken substantive, on-the-ground adaptation, efficiency, and demand/supply management measures.
5-Robust Implementation	At least 30% of water utilities have undertaken substantive, on-the-ground efficiency, and demand/supply management measure, and of water utilities that have identified adaptation measures to be implemented in the short-term, at least 30% have undertaken substantive, on-the-ground adaptation measures.
6-Mainstreaming	At least 70% of water utilities have undertaken substantive, on-the-ground efficiency, and demand/supply management measures and have integrated climate change considerations into their normal processes and operations, and of water utilities that have identified adaptation measures to be implemented in the short-term, at least 70% have undertaken substantive, on-the-ground adaptation measures.
7-Monitoring and Adaptive Management	The water utility sector, independently or in conjunction with OW or other federal agencies, has implemented mechanisms to monitor and evaluate water utility progress, identify lessons learned, incorporate new climate data into planning, and continually improve performance on climate planning and programming.

For each goal, IO will need to identify if the phase of adaptive management has been met, based on the specific criteria defined. For example, the evaluation team's review of baseline data indicates progress on the above goal, using the illustrative criteria, may be as described in Exhibit ES-4 below.

The evaluation team recommends piloting the outputs plus priority outcomes approach with a few priority goals. Given this, the evaluators do not see a reason to aggregate across results, at least not in the near term. However, if IO aggregates results, it needs to be very careful in applying any weighting (implicitly or explicitly). IO needs to be clear in all assumptions, and any weighting should be deliberate and transparent. Note that if results are aggregated without explicit weighting, then all results are implicitly given equal weight.

EXHIBIT ES-4. PROGRESS TOWARDS GOALS

PHASE	CRITERIA FOR ASSESSING PROGRESS ON GOALS (Green = Phase Has Been Met, Yellow = Phase May Be Met, Orange = Phase Not Yet Met)
1-Initiation	OW conducted a screening assessment to identify the potential implications of climate change for water infrastructure. *(Met)*
2-Assessment	OW has conducted a broad review to better understand how climate change affects water infrastructure, including consulting water utilities. *(Met)*
3-Response Development	In collaboration with partners, OW has developed and distributed information, guides, and tools to assist water utilities in undertaking adaptation, efficiency, and demand/supply management measures. *(In Progress/ May be met)*
4-Initial Implementation	At least 30% of water utilities have conducted initial planning steps and updated planning documents to address climate change risks ***and*** *a few* water utilities have undertaken substantive, on-the-ground adaptation, efficiency, and demand/supply management measures. *(In Progress/ May be met)*
5-Robust Implementation	At least 30% of water utilities have undertaken substantive, on-the-ground efficiency, and demand/supply management measures ***and o***f water utilities that have identified adaptation measures to be implemented in the short-term, at least 30% have undertaken substantive, on-the-ground adaptation measures. *(Not yet met)*
6-Mainstreaming	At least 70% of water utilities have undertaken substantive, on-the-ground efficiency, and demand/supply management measures and have integrated climate change considerations into their normal processes and operations ***and o***f water utilities that have identified adaptation measures to be implemented in the short-term, at least 70% have undertaken substantive, on-the-ground adaptation measures. *(Not yet met)*
7-Monitoring and Adaptive Management	The water utility sector, independently or in conjunction with OW or other federal agencies, has implemented mechanisms to monitor and evaluate water utility progress, identify lessons learned, incorporate new climate data into planning, and continually improve performance on climate planning and programming. *(Not yet met)*

Exhibit ES-5 below presents the advantages and disadvantages of the outputs plus priority outcomes approach. These considerations are also discussed in Chapter 5.

EXHIBIT ES-5. PROS AND CONS OF THE OUTPUTS PLUS PRIORITY OUTCOMES APPROACH

ADVANTAGES	DISADVANTAGES
Approach tracks progress on key goals: goes beyond assessing outputs to assessing the state of climate change adaptation in the field, which is ultimately what matters. Identifying key outcomes (particularly using the logic model framework) would be a helpful step in clarifying OW's priorities on climate change adaptation.	Difficulty of collecting data from external partners. Uncertainty about attributing progress on goals to EPA actions because the approach involves assessment of progress on activities outside of EPA's direct sphere of influence. Lack of buy-in from OW staff for an approach that includes outcomes. Criteria for each vision area would need to be carefully defined by expert program staff, and then pilot tested.

Above, we have illustrated the key elements for robust measurement vis-à-vis the outputs plus priority outcomes approach. Chapter 5 provides more detail on this approach, and notes several alternatives for measuring outcomes. Chapter 5 also details an alternative approach to measurement that would cover outputs only.

- **What, if, any, revisions should EPA make to its baseline data collection process to ensure that data collected are meaningful and objective?**

The evaluation team reviewed the approach that IO took in measuring progress on the 2012 Strategy to date, as presented in the *2012 Highlights of Progress* report. We documented several data quality and consistency challenges with reported data. Moving forward, we recommend that IO take steps to adhere to key tenets of data quality and consistency described in our recommendations (see below). Core among these, IO will need to develop data reporting templates, clear instructions for reporting, and institute a quality control plan. The evaluation team also noted several issues regarding assumptions, implicit weighting factors, and transparency with IO's previous approach. Thus, we recommend that IO take a different approach to measurement moving forward, as described above.

- **How can OW's measurement approach inform measuring progress in the EPA-wide Adaptation Plan, and to inform development of the next Agency Strategic Plan?**

One of this project's original evaluation questions asked:

> **How can OW's measurement approach inform measuring progress in the EPA-wide Adaptation Plan, and to inform development of the next Agency 4-year Strategic Plan?**

After conducting the evaluation, the evaluation team, in conjunction with EPA, decided to reframe this question to ask:

> **How can lessons learned *from this evaluation* inform measuring progress in the EPA-wide Adaptation Plan, and inform development of the next Agency 4-year Strategic Plan?**

Lessons Learned on Measurment Relevant to the Agency-wide Adaptation Plan

A central goal of the EPA-wide Adaptation Plan is to strengthen the capacity of EPA staff and partners across the country to anticipate and respond to the effects of climate change. Strengthening capacity will help EPA staff and partners integrate climate adaptation into everyday work by providing them with needed data, information, and tools. The Adaptation Plan includes a list of ten priority actions that the Agency will take to integrate climate change adaptation into its programs, rules, and operations:

1. Fulfill Strategic Measures in *FY 2011–2015 EPA Strategic Plan*
2. Protect Agency facilities and operations
3. Factor legal considerations into adaptation efforts
4. Strengthen adaptive capacity of EPA staff and partners through training
5. Develop decision-support tools that enable EPA staff and partners to integrate climate adaptation planning into their work
6. Identify cross-EPA science needs related to climate adaptation
7. Partner with tribes to increase adaptive capacity
8. Focus on most vulnerable people and places
9. Measure and evaluate performance

10. Develop Program and Regional Office Implementation Plans (the OW 2012 Strategy serves as the implementation plan for OW)

Following the release of the agency-wide Adaptation Plan, each EPA office and region is required to develop an implementation plan and will need to track progress on it. OW's 2012 Strategy is its implementation plan in response to the agency-wide Adaption plan. Overall, we recommend that OW strive to measure progress on a few priority outcomes, at least on a pilot basis. Other EPA offices could go through a similar process of using logic models to select priority outcomes, and developing measures, criteria, and data collection strategies relevant to those priority outcomes. As with OW, we recommend that programs pilot this approach with mature programs, where outcomes may be apparent and mechanisms for measurement (e.g., grant reporting requirements, or regulations that incorporate reporting mechanisms) may be available.

Alternatively, other EPA offices could to continue to use existing measures, and track progress on them in light of climate change. Using this approach, it would be important to understand the potential for climate change to affect existing measures. It may be necessary to collect contextual information to make it possible to understand the extent to which climate change is making it more difficult to meet targets for existing goals. The evaluation team does not make a recommendation on which of these approaches is preferable; however, we do think that any such approach should be pilot tested for a few outcomes or measures.

Whatever approach other offices choose to take in measuring progress on climate change adaptation, we recommend they keep the following general lessons on measurement in mind from this evaluation:

- Focus on a few priorities;
- Weigh the merits of measuring outputs vs. outcomes;
- Be transparent about assumptions and weighting; and
- Ensure data quality.

Lessons Learned on Measurement for the Next Strategic Plan

The current Strategic Plan's emphasis is to mainstream climate change into operations by 2015; the evaluation team believes the three measures of mainstreaming that the Agency adopted are clear, concise, and measurable. In the next Strategic Plan, once EPA has demonstrated the ability to mainstream climate change into operations, the current three measures will no longer be as relevant.

To develop new measures, we recommend that EPA engage in fundamental strategic planning, and grapple with the particular value that the Agency can add with regard to climate change adaptation. Using a logic model approach with a particular focus on EPA's role and key external influences relative to key audiences and desired outcomes, may help the Agency focus in on where investment in climate change adaptation is most warranted.

Given the priority actions identified in the Adaptation Plan, and EPA's key strengths and institutional capabilities, three key areas of EPA expertise may include providing data, decision-support tools, and training to partners related to climate change adaptation. Further work is needed to define a few specific measures that are relevant across the agency, plan for data collection associated with these measures, and determine the degree of EPA's contribution to outcomes achieved.

CONCLUSIONS AND RECOMMENDATIONS

The 2008 and 2012 OW climate change strategies are important milestones in the continued evolution of the NWP. The evaluators—and many of the people we interviewed as part of this evaluation—anticipate that recognition of the value of these early efforts to understand and address challenges

posed by climate change will grow as real impacts to on the ground water resource management become more apparent. The NWP's climate change strategy work is maturing, entering the seventh year since the Climate Change Workgroup was launched in 2007. At the same time, continued resource and staffing pressures and the lack of statutory drivers weaken the ability of climate change considerations to compete for limited NWP time and attention.

The evaluation findings suggest that fresh implementation approaches are needed to reignite enthusiasm for implementation of the 2012 Strategy. More attention is needed in several critical areas: reinvigorating NWP management and staff commitment to the Climate Change Strategy; create management practices that keep climate change integration front and center; empower EPA staff and state, tribal and local partners; and clarify the purpose of measurement and pilot a measurement approach that includes outcomes. Recommendations for IO for moving forward in implementing the 2012 Strategy include the following:

EXHIBIT ES-6. RECOMMENDATIONS SUMMARY

Reinvigorate NWP management and staff commitment to the Climate Change Strategy.

1. Clarify the purpose of the 2012 Strategy.
2. Clarify commitments and roles associated with the 2012 Strategy.
3. Seek buy-in for the 2012 Strategy among OW management and staff.

Create management practices that keep climate change integration front and center.

4. Schedule regular management-level strategic discussions adaptation and Strategy implementation.
5. Ask key climate change questions relentlessly up and down the management chain.
6. Shift the balance of implementation focus toward "customer service" and learning.
7. Recognize and reward climate change integration progress.

Empower EPA staff and state, tribal, and local partners.

8. Focus education and training support on connecting climate change to practical work.
9. Expand engagement on the strategy with State, Tribal, and local partners.
10. Attract and plan for resources.

Clarify the purpose of measurement and pilot a meaurement approach that includes outcomes.

11. Seek buy-in for measuring progress on Strategy implementation.
12. Consider adopting an outputs plus priority outcomes measurement approach.
13. Within the measurement approach selected, acknowledge the iterative and evolving nature of this work.
14. Ensure data quality and consistency in collecting measurement data.

Reinvigorate NWP management and staff commitment to the Climate Change Strategy.

1. **Clarify the purpose of the 2012 Strategy**. Clarifying the purpose of the 2012 Strategy, and communicating that purpose within OW, is critical for informing strategy implementation, identifying reporting and measurement needs, and understanding how measurement data will be used and communicated. The evaluation team heard conflicting rationales for the 2008 and 2012 strategies; some OW staff view the strategies as encompassing only goals and activities that are within EPA's purview, whereas others view the documents as more broadly encompassing goals and activities that involve EPA's partners. Also, it is not clear to OW staff if the strategy is primarily an internal planning document, or primarily a document for communicating OW's vision and goals to external audiences. Notably, during interviews on implementation of the 2008 Strategy, staff indicated that the previous strategy was more successful as an external communications document than as an internal planning document.
2. **Clarify commitments and roles associated with the 2012 Strategy**. Much of the current language in the 2012 Strategy discussing coordination and collaboration with EPA's partners is vague. It is not clear what EPA's specific roles or investment will be as distinct from partners. IO should clarify EPA roles; this is essential for successful strategy implementation, as well as for measurement. Also, IO needs to harmonize goals and strategic actions at the national and regional levels. While not all national goals and strategic actions will apply to all regions, having two sets of goals and actions is unwieldy and confusing.
3. **Seek buy-in for the 2012 Strategy among OW management and staff.** Lack of buy-in for both the 2008 and 2012 strategies is apparent at both the managerial and staff levels. The evaluation team heard that managers rarely reference the strategy as part of day-to-day business, and that they do not participate in the workgroup designed to coordinate implementation of the strategy. Staff indicated that the strategy is viewed as an IO strategy, that priorities for staff time and funding are not informed by the strategy, and that the strategy lacks a connection to daily work. Notably, some staff interviewed indicated that they were not aware of strategic actions that had been officially assigned to their purview; other staff indicated that they disagreed with the inclusion or wording of certain strategic actions in the 2012 Strategy.

   While there is no single magic bullet for attaining buy-in, a few key decisions could go a long way:

- OW should prioritize specific goals. IO should involve program office and regional staff in this prioritization in a meaningful way. Resource decisions should be tied to the priorities.
- Managers should keep climate change as a front and center topic with their staff; they should regularly discuss how the office's daily work relates to and is informed by climate change, and to the climate change priorities selected as part of the strategic planning process. Managers should also re-engage with the workgroup and attend meetings regularly instead of relying on designees.
- OW should engage in open discussions with EPA's Office of Policy and Office of Administration and Resource Management to develop a pilot initiative for Senior Executive Service (SES) candidates and managers that encourages and supports the development of climate change "champions." This pilot could provide focused assessment criteria and professional development guidance for advancing climate change as a cross-cutting issue under the "leading change" SES assessment area.

Create management practices that keep climate change integration front and center.

4. **Schedule regular management-level strategic discussions adaptation and Strategy implementation.** OW should create more opportunities for meaningful strategic discussions among management on climate change, its implications for water programs, and efforts to mainstream climate change considerations into voluntary and regulatory programs. While much can be handled at the staff level, there is no substitute for periodic management engagement on strategic topics. It will be important to think carefully about the framing of management level discussions so they are viewed as appropriate and to recognize that some issues may be relevant to some divisions, offices, and programs but not others. An option for creating space is to designate one monthly climate change workgroup meeting every 3 to 6 months for management-level discussions. Another opportunity for strategic discussions is to include time for such discussions on other management meeting agendas. Potential strategic discussions could include:

   - Given current resource constraints, how can we best incentivize progress on mainstreaming climate change within voluntary and regulatory programs?
   - What type of measurement system can best support our efforts over the long-term to respond to climate change? How can we build toward such a system in the near and mid-term?
   - What scenarios do we see for how climate change may impact local integrated water resource management and governance? What do these scenarios mean for EPA water programs?
   - How might evolving scientific understanding and emerging climate change impacts (e.g., ocean acidification) affect the NWP?
   - What strategic priorities or emergent opportunities are important to address?
   - What are we learning from climate change integration efforts to date?
   - What types of support, information, tools, and resources are needed to drive more rapid progress in responding to climate change?

   A suggested support tool for these discussions is a concise (less than 10 pages) adaptation of the 2012 Strategy Executive Summary to serve as a stand-alone resource to guide management discussions. Soliciting input from managers on concise information that could be added to this document will make it more useful to them.

5. **Ask key climate change questions relentlessly up and down the management chain.** One tried and true approach to breathe life into strategy implementation efforts is to ensure that managers at the top consistently ask a set of simple and clear questions. These questions keep the strategy present and send clear signals that the topic is important and must be considered in routine program planning and decisions. Questions could include:

   - Have you considered climate change and its impacts (in your program, plans, analyses, or decision process)?
   - How is climate change likely to affect your program's ability to deliver results and meet goals? How confident are you about this?
   - What work is needed to improve understanding of how climate change will affect your program or to integrate climate change considerations into your program? How can we help support these efforts?

- What is your current understanding of the outstanding adaptation issues and needs, and the opportunities to address them?
- Which of those opportunities do you think are the most important to address- do you have resources to do so? How can we support these efforts?

6. **Shift the balance of implementation focus toward "customer service" and learning.** Much of the strategy implementation process is currently viewed as an obligation by divisions, offices, and branches in the NWP. Take steps (including those described in recommendations below) to ask managers and staff in the NWP what they need and how IO can best support mainstreaming of climate change across programs. Foster a culture of learning around the strategy; ask managers and staff what they are learning from efforts underway. Consider periodic deployment of a web-based survey to solicit information from NWP staff to understand the state of climate change awareness, informational needs and questions, and staff-level perceptions of opportunities, accomplishments, and lessons. Compile and communicate input received and consider ways to be responsive to them. Set a clear tone that IO recognizes the challenges of integrating climate change but that the need will only intensify and IO wants to support program offices on this journey.
7. **Recognize and reward climate change integration progress.** Many evaluation participants noted that recognition and modest incentives can go a long way to inspire and encourage managers and staff to take extra steps to advance climate change efforts. IO should build on the "highlights of progress" efforts to showcase accomplishments and lessons, and consider modest opportunities to capture and share successes within and external to EPA in newsletters, intranet postings, staff meetings, and other venues. IO could consider incentives such as "climate champion" badges and other forms of recognition. Although some of these ideas may sound frivolous, their cumulative effect can be powerful and can motivate people to keep the strategy - and the goals and actions that it encompasses - present in the workplace.

Empower EPA staff and state, tribal, and local partners.

8. **Focus education and training support on connecting climate change to practical work.** While general presentations and discussion of climate change and climate impacts can raise awareness, they can also fall flat if they fail to help people answer the question: "What does this mean for me and the work that I do?" More work is needed to help answer this question in divisions, offices, branches and programs across the NWP. All hands meetings and training sessions have their advantages, but they will miss key opportunities if they do not connect broader issues to practical work. One way to explore these connections is to create space during webinars and presentations for direct discussion on this question. Creating space for interaction can also provide insights into managers' and staff members' questions about climate change. A periodic survey could support these efforts. Shifting webinar formats to use real-time polling and facilitated peer exchange can also make education, training, and communication efforts more relevant to participants. EPA's State and Local Climate and Clean Energy Program in the Office of Air is a leader within the Agency in using these approaches. OW should also work closely with the Office of Policy team supporting the Agency-wide Climate Adaptation strategy in exploring innovative ways to conduct education, training, and communications. Interaction may lead to identification of new adaptation opportunities.
9. **Expand engagement on the strategy with State, Tribal, and local partners.** Interest in climate change adaptation and mitigation appears to be growing at the state and local level. Even in jurisdictions where there are political constraints to talking about climate change, local officials are increasingly interested in responses to related issues such as extreme weather, ocean acidification,

and integrated water resource management needs. Preliminary evidence suggests that the 2008 and 2012 Strategies have been useful tools for engaging state, tribal, and local partners in discussions and joint planning and projects to respond to climate change. There are significant opportunities to expand these discussions and increase communications between NWP partners about activities, accomplishments, lessons, needs, and challenges. Broader discussions on the response to climate change with external partners can build on existing program and regional office relationships and discussions. OW can encourage coordination with national partners such as the Association of State Drinking Water Agencies and the Association of State Wetland Managers to leverage resources and communication opportunities.

10. **Attract and plan for resources.** IO should explore opportunities to assemble even a modest reserve of resources to support or seed priority climate change related projects. Programs could compete for these resources on a periodic basis and applications could be selected by peers in the NWP. Engage senior managers in discussions to identify creative opportunities to attract limited resources to support high priority activities. IO could explore opportunities to expand the use of pilot projects to test integration approaches with limited funds, and to capture and share lessons from existing pilots and examine resource-efficient ways to expand successful approaches.

Clarify the purpose of measurement and pilot a meaurement approach that includes outcomes.

11. **Seek buy-in for measuring progress on Strategy implementation.** Attaining buy-in for measuring the outcomes of the 2012 Strategy is first predicated on attaining buy-in for the strategy itself, and also on clarifying the purpose of the strategy. However, currently OW staff are skeptical about measurement, and IO cannot implement a meaningful measurement effort without the support and engagement of staff in the program offices and regions. IO should take several steps specific to measurement to increase program office and regional support. IO should communicate with offices and regions about what it plans to do with measurement data, and how data will be aggregated and communicated. IO should provide assurances that measurement data will not be used as justification for cutting budgets. Finally, if IO pursues an outcome approach, it should pursue measurement primarily for a small set of outcomes, discussed below.

12. **Consider adopting an outputs plus priority outcomes measurement approach.** IO will need to weigh the costs and benefits of potential measurement approaches. Measuring progress on strategic actions is largely an output-based approach, and in and of itself, cannot measure progress on the ultimate goal of fostering climate change adaptation on the ground. As such, the evaluation team recommends pursuing the outputs plus priority outcomes approach. Specifically, we suggest that IO pilot this approach with no more than a few priority outcomes given resource constraints.

    To select outcomes for piloting an outputs plus priority outcomes approach, IO should consider selecting outcomes with an existing mechanism for data collection, such as programs with a grant component. IO may want to focus on more mature efforts, such as CRWU or CRE, where outcomes are more likely be present. IO should develop a data collection and measurement plan in collaboration with partners, such as the State/Tribal Council, and test the plan for a few years. At the conclusion of the pilot, IO and its partners should assess progress, determine lessons learned, and contemplate scaling up the approach to include more outcomes.

    Focusing measurement on a few priority outcomes will serve to investigate proof of concept before scaling up a measurement approach. Trying to implement a comprehensive outcome-based approach from the outset may inadvertently add more confusion than insight; as noted by

interviewees, there is a real danger that overinvestment in measurement could result in loss of staff support for tracking progress on climate change adaptation.

13. **Within the measurement approach selected, acknowledge the iterative and evolving nature of this work.** The seven stages of adaptive management make sense conceptually, but as a practical matter, EPA will need to revisit each stage on a regular basis. A more cyclical framework may provide a better model, with the reach of EPA's activities expanding over time to a wider circle of partners.

14. **Ensure data quality and consistency in collecting measurement data.** The baseline data OW collected illustrate challenges of data consistency and quality that are important to address in any measurement system. Moving forward, IO needs to develop data collection templates, instructions, and a quality control plan that ensure high quality data. Key steps include:

    - Clearly communicate the data collection plan to all stakeholders involved.
    - Identify specific data to be provided, including units, within data collection templates and instructions. Also indicate the specific data to be provided by specific stakeholders. Do not use open-ended questions to collect measurement data.
    - Require data collection at regular interviews (e.g., annually), and on specific outputs and/or outcomes previously agreed upon. IO should not accept reports of outputs or outcomes that were not included in the measurement plan, at least not as a substitute for previously agreed upon metrics.
    - Clarify the time period for activities to be reported on. IO should not accept reports of activities conducted and/or outcomes realized prior to the reporting period. Similarly, IO should not accept descriptions of future activities to satisfy reporting requirements.
    - Consider developing an online reporting system to facility easier reporting, review, and storage of measurement data.
    - Assign an individual or team within IO to review data submitted; check for completeness, consistency, clarity, and adherence to reporting instructions. Follow up with reporting entities for revisions where necessary.

CHAPTER 1 | INTRODUCTION AND BACKGROUND

The *National Water Program Strategy: Response to Climate Change* was first published in 2008. It describes the likely effects that climate change will have on water resources and implications for EPA's Office of Water (OW) and the National Water Program (NWP). Four years later, OW developed an updated strategy that describes NWP's long-term goals for sustainably managing water resources in light of climate change. The *National Water Program 2012 Strategy: Response to Climate Change* (the 2012 Strategy) reflects current climate change adaptation efforts underway nationwide and is intended as a roadmap to guide future program work and inform the Agency's annual planning process.

In 2012, OW's Immediate Office (IO), which is responsible for coordinating OW climate change work, requested support from EPA's Evaluation Support Division (ESD) through EPA's Program Evaluation Competition to conduct a retrospective evaluation of the implementation of the 2008 Strategy and to develop a prospective measurement framework to track the progress on the 2012 Strategy. ESD offered support to OW through EPA's Program Evaluation Competition; ESD's support included contractor assistance provided by Industrial Economics, Incorporated (IEc) and its subcontractor Ross Strategic (hereafter referred to as the evaluation team or the evaluators).

The remainder of this chapter provides background information the 2008 and 2012 strategies and their implementation. Subsequent chapters of the report are organized as follows:

- Chapter 2 presents logic models for the 2012 Strategy.
- Chapter 3 discusses the evaluation methodology.
- Chapter 4 presents findings and lessons from the retrospective evaluation of implementing the 2008 Strategy.
- Chapter 5 presents findings and lessons for implementing the 2012 Strategy.
- Chapter 6 presents conclusions and recommendations.

Several appendices follow the main text and provide additional project detail.

NWP AND CLIMATE CHANGE: EARLY EFFORTS

In March 2007, then EPA Assistant Administrator (AA) for Water Benjamin Grumbles issued a memorandum to EPA Office of Water (OW) Office Directors, Regional Water Division Directors, and Great Waterbody Program Office Directors on Climate Change and the NWP.[1] The memorandum launched a NWP Climate Change Workgroup, charged with developing a climate change strategy for the NWP, and requested each OW Office Director to name a senior manager to serve on the workgroup. The workgroup met throughout 2007 and into 2008 to develop program response actions in the areas of mitigation, adaptation, and research. In September 2008, OW published the results in the document: *National Water Program Strategy: Response to Climate Change*.[2] NWP was one of the earlier Federal programs to develop a strategy to address mitigation and adaptation to climate change (see Exhibit 1-2 for timeline).

[1] http://www.ecy.wa.gov/programs/wq/partnership/03_15_07/epamemo.pdf

[2] http://water.epa.gov/scitech/climatechange/upload/2008-National-Water-Program-Strategy-Response-to-Climate-Change.pdf

2008 Strategy Development

The focus of the 2008 Strategy was on raising awareness about NWP vulnerabilities to climate change and immediate actions OW and its partners could take to reduce the risks of floods, droughts, and other climate change impacts. Initial drafts of the 2008 Strategy contained 60 to 70 strategic actions, but given resource constraints, the Climate Workgroup narrowed the list to 44 key near-term actions that could be accomplished with existing resources. AA Grumbles requested commitments from management and staff to implement the 2008 Strategy, and an OW staff member was designated as the lead for each strategic action. The Climate Workgroup continued to meet monthly; however, senior executive participation transitioned to staff level participation over time.

2008 Strategy Implementation

During the first two years of implementation, IO staff contacted each strategic action lead semi-annually to check on progress toward the key actions. OW documented results from 2008 in a progress report dated January 2009.[3] OW released a second progress report in January 2010 covering activities during 2009.[4] The second report was accompanied by a report on progress and highlights from 2007–2009 related to implementation of the 2008 Strategy and EPA's Regional and Large Aquatic Ecosystem Program highlights.[5]

EXHIBIT 1-1. EFFORTS ACROSS THE FEDERAL GOVERNMENT ON CLIMATE CHANGE ADAPTATION

In 2009, the Obama Administration convened the Interagency Climate Change Adaptation Task Force, a body comprising senior leadership from more than 23 federal departments, agencies, and offices. On October 5, 2009, President Obama signed Executive Order 13514 directing the Task Force to report to him within one year on what Federal agencies are currently doing to support a national climate change adaptation strategy, and what more the Federal Government should be doing. On March 4, 2011, the White House Council on Environmental Quality (CEQ) issued a set of Implementing Instructions for Federal Agency Adaptation Planning. The instructions informed agencies on how to integrate climate change adaptation into their planning, operations, policies, and programs. Agencies were required to include initial adaptation plans as part of their annual Strategic Sustainability Performance Plans, which are submitted to OMB. On February 7th, 2013 agencies released their most recent Sustainability Plans.

All Federal agency plans are available at http://sustainability.performance.gov/

EPA's draft Climate Change Adaptation Plan is available at: http://epa.gov/climatechange/impacts-adaptation/fed-programs.html.

In October 2009, Principal Deputy AA for Water Mike Shapiro signed the charter for the State and Tribal Climate Change Council (STC3) of the NWP.[6] Among the key goals of the STC3 was to "disseminate information to State and Tribal governments concerning implementation of the *National Water Program Strategy: Response to Climate Change* and engage States and Tribes in this implementation process."[7]

[3] http://water.epa.gov/scitech/climatechange/upload/2008-Implementing-the-National-Water-Program-Strategy-Response-to-Climate-Change-Progress-Report.pdf

[4] http://water.epa.gov/scitech/climatechange/upload/2009-Implementing-the-National-Water-Program-Strategy-Response-to-Climate-Change-Progress-Report.pdf

[5] http://water.epa.gov/scitech/climatechange/upload/2007-2009-Regional-and-Large-Aquatic-Ecosystems-Program-Highlights.pdf

[6] http://water.epa.gov/scitech/climatechange/upload/State-Tribal-Climate-Change-Council-Charter-10-2-09.pdf

[7] *Ibid.*

In August 2010, OW issued a *Key Action Update* to indicate the status of the 44 key actions from the 2008 Strategy, reflect on challenges, and examine new opportunities.[8] The *Key Action Update* was an interim step toward development of a new NWP strategic plan for climate change, scheduled for release in 2012.

In late 2010 and 2011, OW shifted its reporting strategy to annually solicit information on broader programmatic accomplishments related to climate change, rather than progress related to the 44 near-term actions from the 2008 Strategy. OW's third progress report, published in December 2011, was markedly different from its predecessors in both length and format, and more closely resembled the *2007–2009 Highlights of Progress* report. [9] Whereas previous progress reports analyzed the 44 key actions and measured progress towards each, the third progress report broadly described OW's climate-related activities under each of the five goal areas from the 2008 Strategy (Mitigation of Greenhouse Gases, Adaptation to Climate Change, Climate Change Research, Water Program Education on Climate Change, and Management of Climate Change). Some activities described in the third progress report were not clearly connected to the 44 actions contained in the 2008 Strategy.

2012 STRATEGY

In 2010 the Climate Change Workgroup began developing a new climate change strategy for the NWP. OW intended the new strategy take a longer term view than the previous strategy (approximately 20 -- 30 years) and provide a more robust framework to guide management system development, action planning, and assessment of progress. OW also intended the 2012 Strategy as a framework under which OW programs would perform annual (or biannual) action planning and make commitments.

On April 2, 2012 EPA released a draft of the 2012 Strategy for a 45-day public comment period; in May the Agency held a public webinar to provide an overview of the 2012 Strategy's contents and outline the process for submitting comments on the draft strategy. EPA received forty-four sets of comments during the public comment period. The STC3 also provided feedback on the 2012 Strategy and is expected to continue to provide feedback throughout its implementation. The final 2012 Strategy was published in December 2012,[10] as was a summary of public comments received.[11]

The 2012 Strategy was organized around a series of visions, goals, and strategic action areas. The vision areas are as follows:

1. Infrastructure
2. Wetlands and Watersheds
3. Coastal and Ocean Waters
4. Water Quality
5. Working with Tribes

[8] http://water.epa.gov/scitech/climatechange/upload/2010-2011-National-Water-Program-Climate-Change-Strategy-Key-Action-Update-August-2010.pdf

[9] http://water.epa.gov/scitech/climatechange/upload/2010-2011-Implementing-the-National-Water-Program-Strategy-Response-to-Climate-Change-National-and-Regional-Highlights-of-Progress.pdf

[10] http://water.epa.gov/scitech/climatechange/upload/epa_2012_climate_water_strategy_full_report_final.pdf

[11] http://water.epa.gov/scitech/climatechange/upload/EPA-NWP-2012-Climate-Strategy-Public-Comment-Summary.pdf

Goals included under the 2012 Strategy include items such as sustainably managing water resources, maintaining a network of healthy watersheds and habitat corridors, and incorporating climate resilience into watershed restoration (for a full listing of goals and strategic actions by vision area, see Exhibit 3-3 in Chapter 3). In addition to the five vision areas and associated goals and strategic actions, the 2012 Strategy identifies three cross-cutting areas of program support (communication/collaboration, measuring outcomes, and research) and related goals and strategic actions. Together the five vision areas and three cross-cutting areas of program support encompass 19 goals and 53 strategic actions. In t 2012 Strategy identifies goals and strategic actions for each of eight climate regions defined by the U.S. Global Change Research Program. In the 2012 Strategy, OW also adopted a seven-phased approach to adaptive management, described below, that show progress towards achieving stated goals and strategic actions described in the 2012 Strategy:

1. **Initiation:** Conduct a screening assessment of potential implications of climate change to mission, programs, and operations.
2. **Assessment:** Conduct a broader review to understand how climate change affects the resources in question. Work with stakeholders to develop an understanding of the implications of climate change to the mission, programs, and operations.
3. **Response Development:** Identify changes necessary to continue to reach program mission and goals. Develop initial action plan. Identify and seek the research, information, and tools needed to support actions. Begin to build the body of tools, information, and partnerships needed to build capacity internally and externally.
4. **Initial Implementation:** Initiate actions in selected priority programs or projects.
5. **Robust Implementation**: Programs are underway and lessons learned are being applied to additional programs and projects.
6. **Mainstreaming**: Climate is an embedded component of the program.
7. **Monitoring and Adaptive Management:** Continue to monitor and integrate performance, new information, and lessons learned into programs and plans.

2012 Strategy Implementation To-Date

In October 2012 Deputy Assistant Administrator Mike Shapiro sent a memorandum to the NWP Office Directors and Regional Water Division Directors requesting information on implementation to date. In November and December 2012, OW collected baseline information from HQ and regional contacts on progress to-date implementing strategic actions identified in the 2012 Strategy, and actions planned for Fiscal Year 2013. Progress on achieving the goals and strategic actions and progress toward implementing regional strategies will be compiled and reported annually. The final *FY2013 Climate Change Implementation Action Plan* was distributed internally in early 2013. In March 2013, EPA published the *2012 Highlights of Progress* report summarizing the accomplishments of the NWP in 2012.[12] This is the first progress report organized around the vision areas described in the 2012 Strategy.

A timeline for OW's climate change strategy work, and related milestones, is included below.

[12] http://water.epa.gov/scitech/climatechange/upload/Final-2012-NWP-Climate-Highlights-Report-3-18-13.pdf

EXHIBIT 1-2. EPA OFFICE OF WATER CLIMATE CHANGE STRATEGY TIMELINE

2007

- **March:** EPA Assistant Administrator Ben Grumbles launches an OW Climate Workgroup to develop the first OW climate change strategy. The Workgroup meets monthly from this time to present.

2008

- **September:** *2008 National Water Program Strategy: Response to Climate Change* released.

2009

- **January:** *National Water Program Strategy: Response to Climate Change Progress Report for 2008* released (first progress report of the 2008 Strategy).
- **October:** EPA launches the State and Tribal Climate Change Council of the NWP (STC3).
- **October:** President Obama signed an Executive Order directing the Interagency Climate Change Adaptation Task Force to develop a report with recommendations for how the Federal Government can strengthen policies and programs to better prepare the Nation to adapt to the impacts of climate change.

2010

- **January:** *National Water Program Strategy: Response to Climate Change Progress Report for 2009* released (second progress report of the 2008 Strategy).
- **February:** *Highlights of Progress 2007-2009: Implementing the NWP Strategy: Response to Climate Change* released.
- **April:** OW Climate Change Workgroup began developing a new climate strategy for the NWP.
- **August:** *National Water Program Climate Change Strategy: Key Action Update for 2010-2011* released.

2011

- **June:** EPA Administrator issued a policy statement on climate change adaptation directing EPA to complete its Draft Climate Change Adaptation Plan.
- **December:** *National Water Program Strategy: Response to Climate Change, 2010-2011 National and Regional Highlights of Progress* released (third progress report of the 2008 Strategy).

2012

- **October:** Michael Shapiro sent a memo to all NWP Office Directors and Regional Water Division Directors requesting implementation activities defined for 2013 and reporting on progress in 2012.
- **December:** EPA publishes *National Water Program 2012 Strategy: Response to Climate Change*.

2013

- **March:** EPA publishes *2012 Highlights of Progress: Responses to Climate Change by the National Water Program*.

CHAPTER 2 | LOGIC MODELS

As a first step in developing performance measures for government programs, evaluators typically develops a logic model that describes how the program is intended to work. In particular, logic models demonstrate how program resources and activities are designed to influence key audiences to affect desired changes in understanding or awareness, behavior, and ultimate conditions.

The 2012 Strategy includes a vision for each of the five areas (and multiple goals associated with each vision area). Since the reach of the 2012 Strategy is so comprehensive, the evaluation team modified its typical approach to developing a logic model and has identified series of roles that EPA seeks to fulfill to support each of its vision areas, rather than identifying specific program resources and activities. The team then identified the primary audiences that Office of Water (OW) seeks to influence (e.g., states, tribes, local authorities, or utilities) to achieve its goals. And finally, the logic models illustrate the desired outcomes: changes in audience awareness and behavior that will lead to the desired conditions if OW's strategy is successful. (See Exhibit 2-1.)

EXHIBIT 2-1. ORGANIZATION OF THE 2012 STRATEGY LOGIC MODELS

Developing logic models are helpful to inform the development of performance measures. Changes in awareness, behavior, and conditions can translate into outcome measures. While implementing outcome measures can be a challenge, which is discussed in Chapter 5, they are necessary to understand program impact.

For the OW Strategy, it is important to note that external factors likely contribute to (or prevent) desired changes in behavior and conditions, given that OW's direct sphere of influence for implementing the 2012 Strategy is limited, as illustrated with dotted lines on the logic models. The logic models identify examples of external influences on the audiences OW seeks to affect, in a light green box on each model. Measures based on changes in audience behavior cannot, in isolation, indicate the degree to which OW's work led to the desired changes in behavior. By understanding the other factors outside of OW control that shape the behaviors of key audiences, OW can consider where it has the most influence and what roles it is best able to serve.

Exhibits 2-2 through 2-6 show the logic models that the evaluators developed for each of the five areas. Note that they represent a simplified model of how the 2012 Strategy is intended to work. For a complete articulation of OW's visions, goals, and strategic actions related to the NWP's Response to Climate Change, see the full 2012 Strategy document.

Logic models typically include a depiction of the connections between the various components, e.g., how specific OW actions will affect particular audiences to lead to specified changes in awareness, behavior, and conditions. We displayed such connections in the Area 1 logic model for infrastructure as an example. We developed tables that describe the connections for the other logic models (see Appendix A. While implementation of the 2012 Strategy will likely include feedback loops (e.g., changes in behavior of one key audience may affect changes in awareness for another key audience), for the sake of simplicity we have only shown linear relationships from left to right on the logic model (i.e., from OW's vision and goals, to roles influencing audiences, to changes in awareness, behavior, and conditions).

EXHIBIT 2-2. AREA 1 LOGIC MODEL: INFRASTRUCTURE

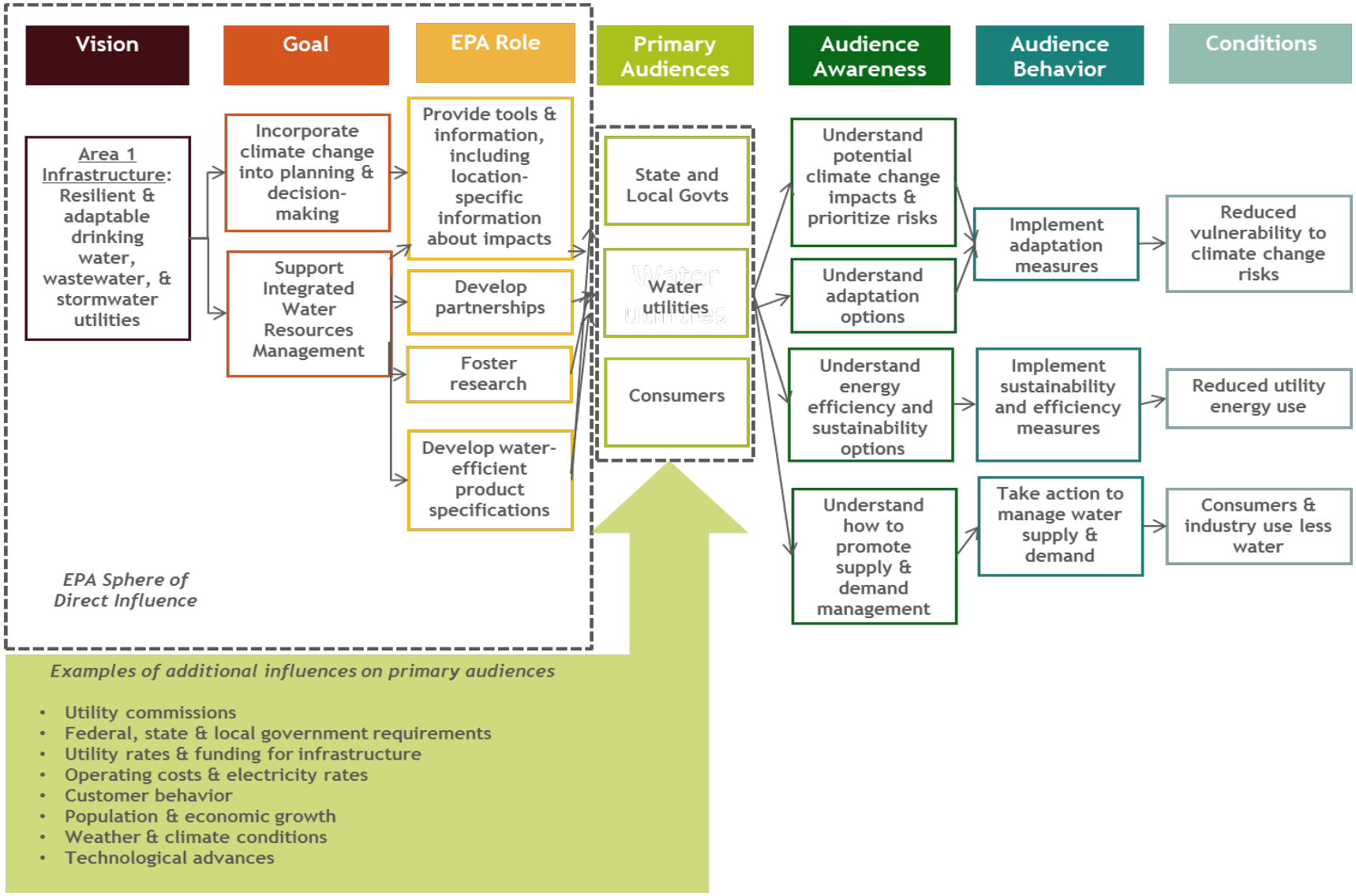


EXHIBIT 2-3. AREA 2 LOGIC MODEL: WATERSHEDS AND WETLANDS

EXHIBIT 2-4. AREA 3 LOGIC MODEL: COASTAL AND OCEAN WATERS

Area 3 Coastal and Ocean: Ocean and coastal environment protected against climate change and against unintended adverse consequences of responses to climate change.

EPA Sphere of Direct Influence

Support collaborations creating and sharing of information and best practices

Develop partnerships that assist effective adaptation action for coastal and ocean environments

Ensure that mitigation and adaptation measures are environmentally sound

Adjust EPA programs to incorporate shifting environmental conditions and other emerging threats

Foster partnerships, collaborations, and information sharing

Provide technical assistance

Promote best practices for climate-readiness planning

Develop climate-readiness guidance for federal programs, agencies, and authorities

Develop environmental safety criteria for offshore renewables and CCS

EPA's NWP and NEP programs

U.S. National Ocean Council

Regional ocean organizations

State and local watershed organizations

Coastal communities and planners

Coastal infrastructure owners and operators

Examples of additional Influences on primary audiences:

- *Shoreline development and real estate trends*
- *Weather, tidal, and climate conditions*
- *Technological advances (particularly CCS, renewables, and IT)*
- *Offshore navigational dredging*
- *Renewable portfolio standards*
- *Competing planning considerations*
- *Emerging climate threats*

Understand strategies for incorporating adaptation into federal policies & programs

Aware of adaptation options

Aware of relevant partners & opportunities to collaborate/ share information

Mindful of the potential hazards that offshore renewables and CCS may pose to coastal and ocean resources

Integrate adaptation considerations into policies & programs at the federal level

Incorporate climate change & adaptation considerations into regional, state & local programs & plans

Engage in collaborative partnerships that ensure information-sharing and prevent duplication of efforts

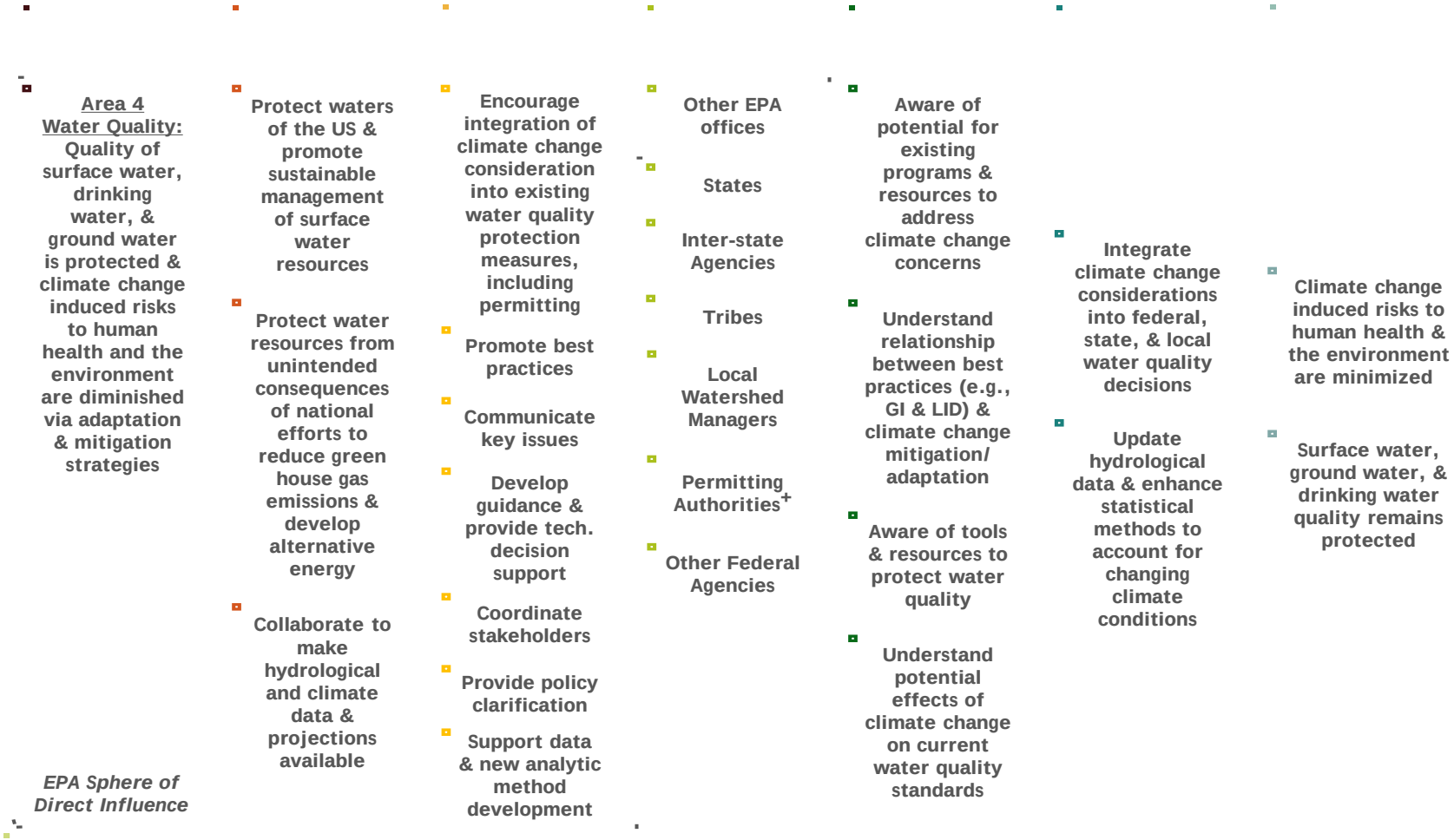
Adjust offshore renewables and CCS permitting criteria to consider adverse effects to ocean & coastal resources

Climate-change-induced risks to coastal and ocean ecosystems and infrastructure are minimized

Coastal and ocean environments continue to provide current levels of ecosystem services and socioeconomic benefits

Coastal and ocean infrastructure and ecosystems are protected against adverse effects of climate change adaptation and mitigation efforts

EXHIBIT 2-5. AREA 4 LOGIC MODEL: WATER QUALITY

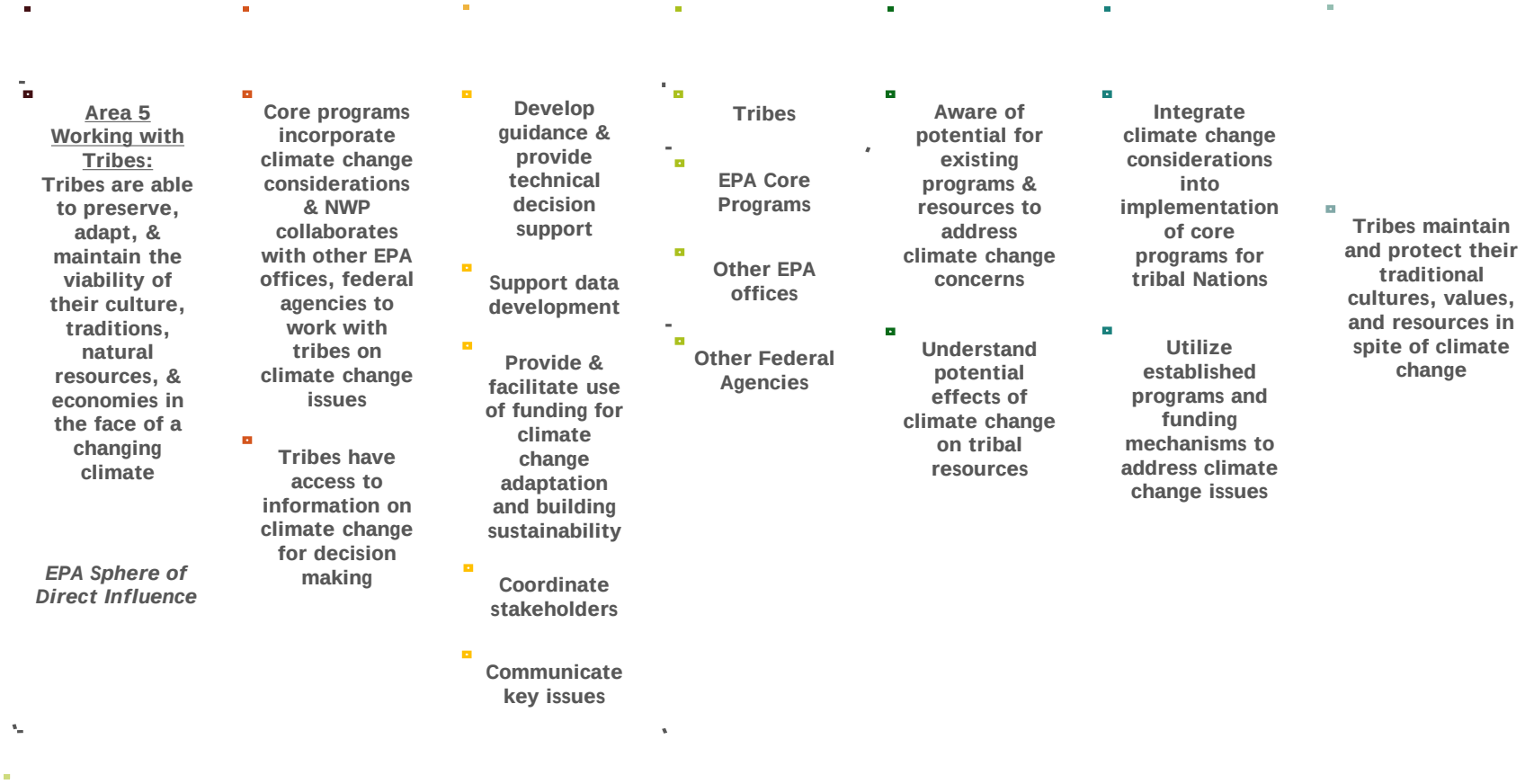


Examples of additional influences on primary audiences:

- **Federal, state, & local government requirements**
- **Weather & climate conditions**
- **Economic considerations**

[+]In cases where EPA has not granted a state primacy, permitting authorities may fall under the Agency's direct sphere of influence.

EXHIBIT 2-6. AREA 5 LOGIC MODEL: WORKING WITH TRIBES



Examples of additional influences on primary audiences:

- Federal, state, & local government requirements
- Weather & climate conditions
- Economic considerations
- Technological developments
- Perspectives of community members

CHAPTER 3 | METHODOLOGY

This evaluation sought to address the following research questions:

Evaluating Implementation of the 2008 Strategy:

- How well is climate mainstreamed into OW programs? What are the barriers to mainstreaming and how might this be better accomplished?
- What goals, implementation experience, or lessons from the 2008 Strategy could be useful to guide implementation of the 2012 Strategy?
- What goals and strategic actions in the 2012 Strategy should EPA headquarters (HQ) and regional programs prioritize?

Developing Prospective Measurement Approach for the 2012 Strategy:

- What is the measurement approach that can be used to measure adaptation progress in five areas: infrastructure, watersheds and wetlands, ocean and coastal waters, water quality, and working with tribes?
- What specific elements need to be applied to the phased approach to tracking progress outlined in the 2012 Strategy, to make it a robust measurement framework?
- What, if, any, revisions should EPA make to its baseline data collection process to ensure that data collected are meaningful and objective?
- How can OW's measurement approach inform measuring progress in the EPA-wide Adaptation Plan, and to inform development of the next Agency 4-year Strategic Plan?

The evaluation team used several methods to address these questions, including review of existing literature and data, phone interviews, and a focus group. An EPA interview summary is presented in Exhibit 3-1 below; in total the evaluators interviewed 27 EPA staff and 4 non-EPA staff. The evaluators spoke with staff in all four OW program offices as well as staff from four different regions. More details on interviews are provided later in this chapter.

The evaluation team undertook a literature review based on information sources provided by EPA as well as other sources identified through online research. The following key EPA reports were referred to extensively for both the retrospective and prospective components of the evaluation:

- EPA. 2012. *National Water Program 2012 Strategy: Response to Climate Change*. U.S. Environmental Protection Agency, Office of Water, Washington, DC
- EPA. 2008. *National Water Program Strategy Response to Climate Change.* EPA 800-R-08-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC
- EPA. 2011. *National Water Program Strategy: Response to Climate Change*, 2010-2011 National and Regional Highlights of Progress. U.S. Environmental Protection Agency, Office of Water, Washington, DC
- EPA. 2010. Implementing the *National Water Program Strategy: Response to Climate Change*. Progress Report for 2009. U.S. Environmental Protection Agency, Office of Water, Washington, DC

- EPA. 2010. *EPA Regional and Large Aquatic Ecosystem Programs, Highlights of Progress 2007-2009, Implementing the NWP Strategy: Response to Climate Change.* U.S. Environmental Protection Agency, Office of Water, Washington, DC
- EPA. 2009. *Implementing the National Water Program Strategy: Response to Climate Change. Progress Report for 2008.* U.S. Environmental Protection Agency, Office of Water, Washington, DC

EXHIBIT 3-1. EPA INTERVIEW SUMMARY

EPA OFFICE/REGION	NUMBER OF INTERVIEWEES
OW/IO	5
OAR	2
OGWDW	5
OP	1
ORD	1
OST	1
OWM	4
OWOW	3
Region 1	1
Region 3	1
Region 6	1
Region 10	2
Total	**27**

The evaluation methodology is discussed in more detail below. First we discuss the methodological approach used for the retrospective evaluation, followed by a discussion of the approach used for the prospective measurement component.

METHODOLOGICAL APPROACH FOR THE RETROSPECTIVE EVALUATION

Data Sources: Retrospective Evaluation

The retrospective evaluation used multiple data sources: 1) interviews with EPA representatives and representatives of organizations external to EPA, 2) a focus group to further discuss lessons from the 2008 Strategy and recommendations for implementation of the 2012 Strategy, and 3) a review of existing literature related to the NWP climate change strategies and there implementation, including EPA memoranda and other policy documents.

Interviews with EPA Representatives and Representatives of Organizations External to EPA

The evaluation team conducted a series of discussions with EPA OW staff as well as representatives from organizations outside of EPA with a connection to OW's climate change strategy. OW staff from EPA HQ and regional offices provided insights on "vertical" implementation (i.e., dissemination and implementation of strategy from OW HQ to regional offices) and "horizontal" implementation (i.e., dissemination and implementation of strategy across OW offices) of the 2008 Strategy. Representatives from external organizations provided additional perspective on OW's implementation activities. Interviewee affiliations and number of interviewees are summarized in Exhibit 3-2 below.

EXHIBIT 3-2. RETROSPECTIVE EVALUATION: INTERVIEW SUMMARY

EPA INTERVIEWEE AFFILIATION	NUMBER OF INTERVIEWEES
OW- IO	5
OW – OST	1
OW – OGWDW	5
OW – OWM	4
OW- OWOW	3
OAR	2
OP	1
ORD	1
Region 1	1
Region 3	1
Region 6	1
Region 10	2

EXTERNAL INTERVIEWEE AFFILIATION	NUMBER OF INTERVIEWEES
Association of State Drinking Water Agencies (ASDWA)	1
Association of State Wetland Managers (ASWM)	2
Port Gamble S'Klallam Tribe	1

A set of evaluation questions were included in a set of discussion guides tailored to each group of participants (EPA staff, federal partner agency staff, State-Tribal Climate Change Council, and other EPA partners and stakeholders). Each evaluation participant received a discussion guide prior to his or her interview.

Supplemental Focus Group Information Collection

In addition to phone interviews with evaluation participants, the evaluators conducted a half-day focus group in Washington, D.C. on Monday, March 25. The group consisted of representatives from IO, OWM, OGWDW, OWOW, OWM, Region 1, and OST. Eight out of the nine focus group participants were also interviewed individually by the evaluation team. The purpose of the focus group meeting was to provide a structured opportunity for selected OW policy staff and managers to reflect together about lessons from implementation of the 2008 Strategy, and to jointly explore potential recommendations for improving implementation of the 2012 Strategy. The focus group was timed to occur after most of the data collection was completed by the evaluators. This enabled the evaluators to explore with the focus group potential findings from interviews that may diverge from the perspectives raised in the focus groups. It also provided a valuable opportunity for the evaluators to better understand potential issues and trade-offs inherent to the framing of various types of recommendations.

Additional Literature Review

In addition to the key references noted above, the evaluation team consulted the following literature for the retrospective evaluation:

- EPA. 2009. *Charter for EPA State-Tribal Climate Change Council of the National Water Program.* U.S. Environmental Protection Agency, Office of Water, Washington, DC
- EPA. *Climate Change and the National Water Program.* Memorandum from Assistant Administrator for Water Benjamin Grumbles

Also, during the course of the evaluation, discussion participants also suggested additional documents, some of which were provided to the evaluation team:

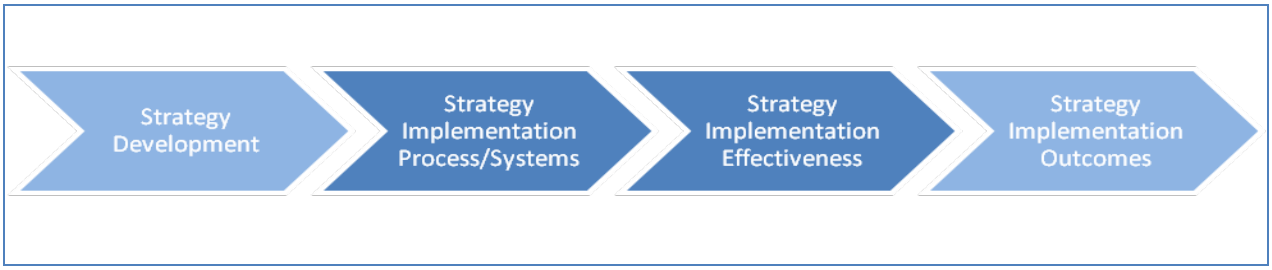
- Summary of comments from ASDWA on draft 2012 NWP Climate Change Strategy

- Agendas and minutes from OW Climate Change Workgroup
- Memorandum from Deputy Assistant Administrator Mike Shapiro "Reporting of Climate Change Progress and Development of FY13 Climate Change Implementation Action Plan"

Data Analysis: Retrospective Evaluation

The evaluation questions were considered in the context of basic strategy development and implementation cycle, as illustrated in Exhibit 3-3 below. The questions in the evaluation focused on the strategy implementation process/systems and effectiveness. The evaluation did not explicitly focus on the strategy development process; although the evaluators captured and shared some findings related to the strategy development process that interviewees indicated may affect the success of strategy implementation. Similarly, the evaluation did not focus on the extent to which implementation of the 2008 Strategy resulted in specific outcomes related to climate change and adaptation, except to the extent that interviewees indicated that specific outcomes (or lack thereof) informed understanding of the effectiveness of the strategy or influenced actions or decisions under the National Water Program.

EXHIBIT 3-3. STRATEGY DEVELOPMENT AND IMPLEMENTATION CYCLE



In addition to strategy implementation effectiveness and strategy implementation process/systems, the evaluators explored perspectives on the degree to which climate change is integrated into the National Water Program (NWP). To the extent possible, the evaluators also solicited perspectives on the connections between strategy implementation effectiveness, strategy implementation process/systems, and climate change integration. Finally, the evaluators collected perspectives on whether and how actions should be further prioritized for implementation under the 2012 Strategy.

The evaluators analyzed collected information question-by-question to develop findings and recommendations. The evaluators analyzed discussion notes and identified common perspectives and notable outliers with respect to the topics discussed. They examined patterns across discussions to identify whether, for example, lessons learned are specific to certain circumstances or perspectives. Where possible and appropriate, the evaluators summarized findings in quantifiable terms (such as all, many, most, only one) to provide a sense of scope or scale of thematic findings.

To the extent possible, information provided by evaluation participants was supplemented by information in existing written materials. Instances where written information and information from discussions contradict each other is noted and analyzed. Inconsistencies between EPA and external personnel's perspectives is also noted and analyzed, as are differences in responses across divisions and offices within EPA. The evaluators' final conclusions are based on the entire set of data sources, including an analysis both within and across the overarching topic areas. In the sections that follow, the terms "evaluation participant(s)", "participant(s)", and "interviewee(s)" are used interchangeably to refer to the individuals who provided their perspectives to the evaluators.

METHODOLOGICAL APPROACH TO PROSPECTIVE PERFORMANCE MEASUREMENT

Data Sources: Prospective Measurement Approach

The prospective analysis drew upon multiple data sources to inform the lessons learned related to our research questions on measurement. Key sources of information include: (1) baseline data collected by OW to assess progress towards the strategic actions included in the 2012 Strategy, (2) phone interviews with EPA representatives from all four program offices and in IO, and (3) a review of existing literature and online publications that address climate change adaptation strategies and activities. OW gathered the strategic action baseline data, while the evaluation team gathered the remaining data conducted all the analyses. The following text describes these data sources in greater detail. It should be noted that proposed measurement approaches and lessons learned discussed in this chapter are also informed by feedback provided by participants in the retrospective evaluation of the 2008 Strategy, and specifically feedback from focus group participants and interviewees.

Baseline Data Collected by IO

In November and December 2012, IO collected baseline information from HQ and regional contacts on progress to-date implementing the 53 strategic actions identified in the 2012 Strategy in the five vision areas (infrastructure, watersheds and wetlands, coastal and ocean waters, water quality, and working with tribes) and cross-cutting areas of program support, and actions planned for Fiscal Year 2013. For each strategic action, HQ offices and regions were directed to 1) report on recent progress, outputs/outcomes, milestones achieved, and key partners; 2) report on current activities underway; and 3) assess which of the seven phases best described progress toward implementing the strategic action.

The baseline data submitted is anecdotal in nature. Nine regions and seven offices/divisions submitted baseline data for 46 of the 53 strategic actions; for most strategic actions regions and offices/divisions reported three or fewer related activities. Appendix B shows the count of activities submitted and the reporting HQ offices and regions for each strategic action. Note: as part of the baseline data collection OW also asked regions to report on a separate set of strategic actions for each climate region in the Geographic Region section of the 2012 Strategy. The evaluation team did not review this information as part of our assessment because it was not directly related to the evaluation questions, which primarily focused on measuring progress in the five vision areas.

Interviews With EPA Representatives

The evaluation team conducted a separate set of interviews with OW staff and managers to discuss approaches to measuring progress on climate change adaptation. We conducted interviews with one or two representatives working on each vision area in the 2012 Strategy, and we also interviewed a representative IO for a broader perspective related to all five vision areas. Many of these participants were also interviewed for the retrospective evaluation. Interviews specific to each vision area focused on how to measure progress towards the strategic actions and towards the adaptive management phase for each vision area. During the interviews, we also: addressed ways to collect data from stakeholders outside of EPA; gathered feedback on our preliminary assessment of progress in each vision area; and made specific inquiries about baseline data submissions. The broad interview related to all five vision areas focused on OW's needs and challenges related to measuring progress on climate change adaptation, and the interests and concerns of groups within OW related to measurement. Exhibit 3-4 provides a summary of the EPA OW offices that participated in each interview.

EXHIBIT 3-4. PROSPECTIVE EVALUATION: INTERVIEW SUMMARY

VISION AREA	OW OFFICES REPRESENTED
Area 1: Infrastructure	OGWDW, OWM
Area 2: Watersheds and Wetlands	OGWDW, OWOW
Area 3: Coastal and Ocean Waters	OWOW, OST
Area 4: Water Quality	OST, IO
Area 5: Working with Tribes	IO
All Areas	IO

Additional Literature Review

In addition to the key references noted above, the evaluation team reviewed the following documents from the UK government related to measuring climate change adaptation:

- Adapting to Climate Change: Guidance notes for NI188, 2010
- Measuring Adaptation to Climate Change – A Proposed Approach, 2010
- Adapting to Climate Change: A Guide for Local Councils, 2010
- Adapting to Climate Change in the UK: Measuring Progress – Adaptation Sub-Committee Progress Report, 2011

The evaluation team reviewed these documents because the UK government preceded EPA in defining key steps in the process of climate change adaptation, and developing a general approach for assessing the extent to which government agencies and their partners are undertaking those steps. The UK government developed an approach to gauge progress of local areas in:

- Comprehensively assessing the risks and opportunities of climate change;
- Developing an adaptation strategy and action plan that identifies risks and priority areas;
- Taking action in priority areas; and
- Implementing, assessing, and monitoring the actions on an ongoing basis. [13]

EPA's proposed framework with seven phases of adaptive management echoes the UK concept of measuring progress in the process of climate change adaptation.

In addition, the evaluation team reviewed several reports and online resources that describe progress on climate change adaptation. The names of the resources reviewed are shown in Exhibit 3-5, and a summary of each resource is provided as Appendix C. In both Exhibit 3-5 and Appendix C, we categorize the resources by their primary author (i.e. EPA Resources, Other Federal Government Resources, State and Local Resources, Other Resources). Appendix C indicates the vision areas that each resource addresses.

[13] UK Department for Environment, Food, and Rural Affairs, 2010. Adapting to Climate Change: Guidance notes for NI188, March 2010. Available at: http://www.defra.gov.uk/environment/climate/sectors/local-authorities/; and http://archive.defra.gov.uk/corporate/about/with/localgov/indicators/documents/ni188-guidance.pdf.

EXHIBIT 3-5. SUMMARY OF EXISITING REPORTS/RESOURCES REVIEWED

RESOURCE CATEGORY	RESOURCE TITLE (AUTHOR)
EPA Resources	Climate Ready Estuary Projects—Where you live—2008 – 2012 (EPA)* CREAT analytics data (EPA)* EPA Coastal Area Impacts and Adaptation (EPA)* EPA's Water Infrastructure Website (EPA)* Workshop Proceedings on Water Infrastructure Sustainability and Adaptation to Climate Change (EPA)
Other Federal Government Resources	Addressing Climate Change in Long-Term Water Resources Planning and Management (DOI and U.S. Army Corps of Engineers) National Climate Assessment, Adaptation Section - draft 2013 (National Climate Assessment and Development Advisory Committee) NOAA Coastal Climate Adaptation and Action Plans (NOAA)*
State and Local Resources	Climate Change Adaptation for Maryland Water Utilities (Maryland DOE) Climate Change Handbook for Regional Water Planning (California DWR) Confronting Climate Change - An early analysis of water and wastewater adaptation costs (Association of Metropolitan Water Agencies) Managing an Uncertain Future – Climate Change Adaptation Strategies for California's Water (California DWR) Preliminary Report of the Interagency Climate Adaptation Team (Minnesota PCA) State and Local Adaptation Plans (Georgetown Climate Center)* The Oregon Climate Change Adaptation Framework (Oregon DOE)
Other Resources	Adaptation Planning – What U.S. States and Localities are Doing – 2009 (Pew Center for Global Climate Change/Center for Climate and Energy Solutions) Climate Change Adaptation Plan for Coastal and Inland Wetlands in the State of Michigan - 2012 (The Association of State Wetland Managers, Inc.) Climate Change Adaptation: What Federal Agencies Are Doing – 2012 (Center for Climate and Energy Solutions) State Wetland Climate Change Adaptation Summaries – 2010 (The Association of State Wetland Managers, Inc.) StormSmart Coasts (StormSmart Coasts Network)* Swinomish Climate Change Initiative – Climate Adaptation Action Plan (Swinomish Indian Tribal Community) The Role of Coastal Zone Management Programs in Adaptation to Climate Change (Coastal States Organization) Tribal Climate Change Project (University of Oregon)* Tribes & Climate Change (Institute for Environmental Professionals)* Yurok Tribe and Climate Change: An Initial Prioritization Plan (Kathleen Sloan and Joe Hostler – Yurok Tribe Environmental Program)

*indicates website

Data Analysis: Prospective Measurement Approach

To explore developing a performance measurement framework, the evaluation team conducted a qualitative analysis of responses to the interview questions, the strategic action baseline data submitted by the HQ offices and regions, and the existing reports and resources regarding progress on climate change adaptation. The specifics of the approach vary for the evaluation questions and are described below:

a) **What is the measurement approach that can be used to measure adaptation progress in five areas: infrastructure, watersheds and wetlands, ocean and coastal waters, water quality, and working with tribes?**

b) **What specific elements need to be applied to the phased approach to tracking progress outlined in the 2012 Strategy, to make it a robust measurement framework?**

To develop the lessons learned related to these questions, we analyzed OW's baseline data for the strategic actions, assessed input from interviews with EPA staff and managers, and reviewed existing

publications relevant to climate change adaptation. In addition, we assessed OW's progress on the seven phases of adaptive management, based on the criteria OW established in the 2012 Strategy and the baseline data submitted by HQ offices and regions.

What, if, any, revisions should EPA make to its baseline data collection process to ensure that data collected are meaningful and objective?

The evaluation team reviewed and assessed each strategic action baseline data submission to develop lessons learned for this evaluation question. We considered the format of the baseline data collection template as well as the content of the submissions. Based on this review, we developed recommendations to improve data quality in future collection efforts.

How can OW's measurement approach inform measuring progress in the EPA-wide Adaptation Plan, and inform development of the next Agency 4-year Strategic Plan?

To address this evaluation question, we identified lessons learned from this evaluation effort that inform other offices' effort to develop implementation plans for the EPA-wide Adaptation plan, and that inform development of the next EPA Strategic Plan.

CHAPTER 4 | LESSONS LEARNED FROM EVALUATION OF 2008 STRATEGY IMPLEMENTATION

In this chapter, we describe findings and lessons from a retrospective evaluation of the 2008 Strategy. The purpose of the retrospective evaluation is to gather perspectives about how EPA OW could improve implementation of the NWP's climate change strategy. Key questions addressed in this evaluation are:

- How well is climate mainstreamed into OW programs? What is the status of mainstreaming, what are the primary mainstreaming barriers, and are there examples of successful mainstreaming?
- What goals, implementation experience, or lessons from the 2008 Strategy could be useful to guide implementation of the 2012 Strategy?
- What goals and strategic actions in the 2012 Strategy should headquarters and regional programs prioritize?

FINDINGS AND LESSONS

How well is climate change mainstreamed into the NWP?

The evaluators' overall assessment is that mainstreaming of climate change in the NWP has begun but is generally at an early stage with substantial opportunity for integration remaining. EPA OW appears to be generally viewed as any early leader and pioneer within the U.S. Government in responding to climate change, although there is a perception within and external to OW that other agencies and programs are catching up. A few OW programs and regional offices are regarded as being further along with mainstreaming due in part to the needs of key stakeholders and presence of management-level champions. The following section explores the status of efforts to mainstream consideration of climate change throughout programs and activities in the NWP and provides examples of successful mainstreaming programs. These findings provide lessons for implementing the 2012 Strategy, which are further explored in the recommendations section of this report.

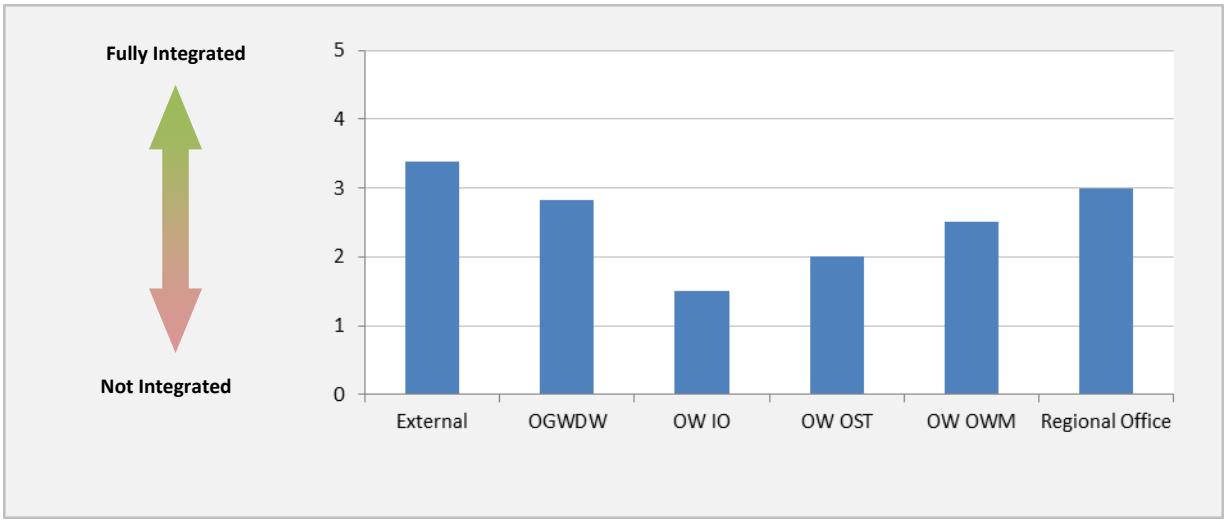
Mainstreaming Status

Overall, the evaluators found that the degree of integration of climate change into the National Water Program is low but improving. External interviewees credited OW for its willingness to begin a dialogue around climate change but noted that progress has been slow and halting.

In addition to determining the value and influence of the 2008 Strategy, the retrospective evaluation gathered feedback on interviewees' impression of the degree to which climate change is integrated (or "mainstreamed") into the NWP. The evaluators framed this discussion by defining a fully mainstreamed situation as one in which climate change factors into daily routines, duties, and decision making. Evaluation participants were asked to rate their opinion of mainstreaming on a 1 to 5 scale, with 1 being "not at all" and 5 being "completely integrated". Participants were then asked to explain the rationale behind their rating.

The average rating of all responses to this question was 2.5; Exhibit 4-1 below illustrates the range of responses by respondent affiliation.

EXHIBIT 4-1. EXTENT OF MAINSTREAMING ACROSS OW PROGRAMMING, PERSPECTIVES BY AFFILIATION

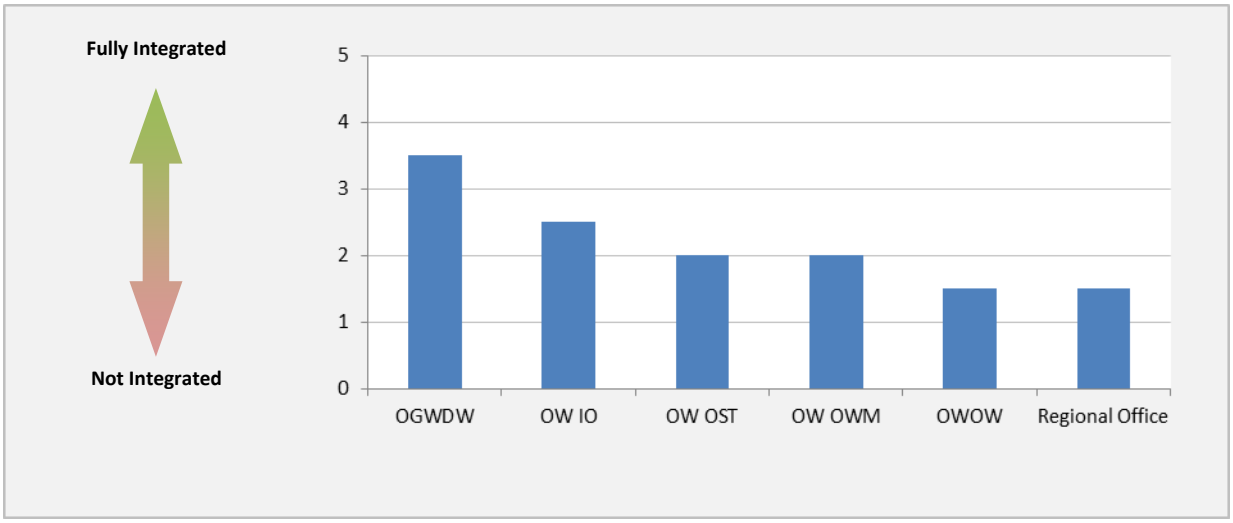


Evaluation participants generally indicated that climate change is not at the forefront of OW staff concerns. One OW staff member noted that although climate change appears to be a significant issue for the IO, prioritizing projects with climate change components is not being emphasized at the staff level. There was a sense among many evaluation participants that integration of climate change into the NWP was following a positive trend but as yet it is at a nascent stage of development. Participants acknowledged the difficulty in integrating climate change into daily OW operations, given the magnitude and cross-cutting nature of the problem. At the same time, several interviewees mentioned that the very attributes that make climate change a complicated challenge - significant magnitude coupled with cross-cutting application - also created a unique opportunity to advance cooperation across OW divisions and encourage collaboration on groundbreaking, cost-effective solutions.

Interviewees outside of EPA rated OW's climate change integration efforts between 1 and 4, with a mean rating of 3.4. External interviewees that gave a higher rating noted that OW is more consistently referring to climate change as a background issue when discussing other topics, and grant applications often include either a mandatory climate change component or the flexibility to address climate considerations. External interviewees that rated OW's integration efforts as 1 to 2 observed that OW has consistently signaled, through the 2008 Strategy and 2012 Strategy, that it is keenly interested in tackling climate change; however, OW's actual ability to incorporate climate change into specific areas covered under the Clean Water Act is less clear, not only to outside entities but also, it seems, within OW itself. External interviewees commented that OW appears willing to consider these types of discussions but EPA has not to date deciphered the legal boundaries around incorporating climate change considerations.

Respondents were also asked to provide feedback on the status of climate mainstreaming within their division or regional office. The results of these responses are illustrated in Exhibit 4-2 below.

EXHIBIT 4-2. EXTENT OF MAINSTREAMING WITHIN EACH OFFICE



Some participants observed greater progress within specific OW offices (for example, OGWDW), whereas most OW offices were rated, on average, as having a low degree of mainstreaming. Regional offices reported a wide variation in regional investment in climate change. Other OW offices reported a wide range of integration among divisions and offices, although mainstreaming climate change is generally recognized as an important goal.

Mainstreaming Barriers

The evaluators found a range of barriers preventing the integration of climate change considerations into OW's daily operations. Key barriers included competing priorities, lack of resources, characteristics of climate change as an issue, organizational and structural aspects of OW, and external influences.

Many interviewees observed that in the context of severe budget and staffing constraints, it can be difficult for issues such as climate change to compete for limited time and attention. The NWP faces numerous priorities, and those which are driven by legislative, regulatory, or court-mandated requirements are often prioritized.

Several interviewees noted that the inherent complexity, uncertainty, variability, and long-term time frame of climate change were barriers to mainstreaming into the NWP. This was coupled with the overarching nature of the problem, in that climate change affects multiple sectors and exacerbates many other issues, ranging from water availability to water quality to sea level rise. Participants noted that while EPA permits are generally written for five year increments, the programs most impacted by climate change should think about setting standards over a 20 – 30 year time frame.

A related barrier cited by several interviewees was the knowledge base within OW. One interviewee noted that offices must go through the thought exercise of considering climate impacts on their core responsibilities to internalize the concept that failing to account for climate change could have severe consequences for their programs.

One participant noted that OW still lacks a strategic perspective on mainstreaming climate change into existing programs, noting that the 2008 Strategy and 2012 Strategy more closely resemble workplans or reporting mechanisms rather than true strategies. The interviewee remarked, "If you are building an overarching strategy for climate change in OW, the document should be no more than ten pages long."

An external interviewee observed that the NWP has many responsibilities rooted in engineering and OW's institutional knowledge and expertise is based in engineering (e.g., building wastewater treatment plants). An issue such as climate change impacts watershed ecology and biology, which requires a different set of knowledge and expertise.

Several interviewees commented on the difficulty in breaking down institutional silos and changing the mindset of program staff to think of themselves and their work as fitting into part of a larger organization.

The lack of continuity associated with a constantly shifting roster of branch chiefs, division directors, and deputy office directors was noted as a barrier to integration. A participant in the evaluation remarked "it takes 10,000 repetitions to create muscle memory. The same is true of integrating this type of priority across an organization; it has to be part of the regular conversation." In addition, participants noted multiple initiatives emerging from IO, including urban waters, integrated water resource management (IWRM), and several programs aimed at promoting energy efficiency in the water sector. Each initiative requires a significant set of resources and participants noted no clear signal on which was most important; and if they are all important there is only so much that can be done for each, and not much will be accomplished.

One participant noted that OW's CWA and Safe Drinking Water Act (SDWA) authorities include adaptive management processes that allow updates to permits and standards based on changing conditions, of which climate change is one. Another interviewee noted, however, that until climate change is explicitly acknowledged within OW's regulatory processes it will not be fully integrated into the NWP. For example, regulatory drivers such as NPDES regulations and SDWA regulations for carbon capture and storage have been discussed within OW but there has been no action to date. One participant posed the question "Can OW consider the carbon sequestration potential of a wetland when making a permit decision?", and noted that the ability to provide a clear response to these and other questions will send a strong signal about OW's commitment to integrating climate change. [14] In addition, drinking water regulations are also often tied to state or local regulatory structures around water availability, water rights, and water withdrawal rates, which further complicates OW's ability to add climate change to the regulatory lexicon.

Interviewees noted that political and public support and emphasis for climate change policy is capricious and often based on reaction to major events (e.g., hurricanes, flooding). Public awareness and acceptance of climate change is still not at a favorable tipping point, and the perception persists in some quarters that EPA is a "job killing" regulatory agency. Interviewees added that this obstacle is exacerbated by current economic conditions, with public and political attention concentrated on lowering the unemployment rate and

> *"We are still suffering from some crazy torturing of language due to climate change skeptics; this is why we now call it climate change rather than global warming. The external conversation is still unclear, and in some cases we still have to approach it more obliquely than we prefer."*
>
> *- OW Manager*

[14] The 2012 Strategy includes 7 strategic actions related to regulatory programs, including significant degradation as part of Section 404 wetland permitting; however, the 2012 Strategy is silent on integrating climate change into any new or planned rulemakings. In March 2013 OW released a "Highlights of Progress" document on NWP response to climate change. The highlights included integration of climate change into 2012 HQ Wetland Program Development Grants RFP announcement.

http://water.epa.gov/scitech/climatechange/2012-National-Water-Program-Strategy.cfm

encouraging growth. Furthermore, the public at large perceive the impacts of climate change will occur far in the future, lowering the sense of urgency to take action.

Despite more frequent and damaging storm events, the utility sector still perceives climate impacts as something that can be dealt with within regular operations. Utilities have to explain to their board of local elected officials why they need to take action on climate change; they need the knowledge base to explain climate projections and uncertainty in order to make a compelling case. Climate models are very good at the macro level but often lack the ability to translate impacts down to the local scale. This type of information is critical for local planners to be effective.

Regional interviewees remarked that EPA has just begun the dialogue with states around climate change, and most environmental programs are implemented by states. They observed that in some "red" states, state government officials face political constraints regarding their ability to recognize climate change as an issue and EPA regional offices must be sensitive to these politics. In these situations, EPA regional offices have had some success in engaging state and local partners on specific topics associated with climate change, such as storm water management needs associated with severe weather events.

Mainstreaming Successes

The evaluators found greater flexibility in voluntary OW programs as opposed to regulatory programs; Climate Ready Water Utilities (CRWU) and Climate Ready Estuaries (CRE) were frequently cited as positive examples of integrating climate change considerations into the NWP. At the EPA regional level, participants cited Region 1 as a strong example of successfully integrating climate change into operations.

Interviewees' examples of mainstreaming successes fell broadly into three categories: voluntary programs, regulatory programs, and programs targeting non-climate related outcomes. Examples of each type of success are described in greater detail below.

Throughout the discussions, evaluation participants consistently brought up two programs as examples of successful integration of climate change considerations into day-to-day operations: Climate Ready Water Utilities (CRWU) and Climate Ready Estuaries (CRE) – see sidebar for program descriptions. Both programs work with a well-established network of organizations outside of EPA; in the case of CRWU, OW staff works with national utility associations and CRE taps into the expertise of organized coastal watershed groups. The CRWU program emphasize creating practicable, usable tools – filling a niche which had until then been the provenance of high level atmospheric scientists. At least one participant commented that because CRWU is mostly focused on its own constituencies, there is little interaction with the rest of OW. This effectively limits

Climate Ready Water Utilities

The CRWU initiative provides several useful tools and resources for utility owners and operators. These include the Climate Resilience Evaluation and Awareness Tool (CREAT), Adaptation Strategies Guide, a searchable resource library, and an Extreme Events Workshop Planner.

http://water.epa.gov/infrastructure/watersecurity/climate/index.cfm

Climate Ready Estuaries

The Climate Ready Estuaries program works with the National Estuary Programs and the coastal management community to: (1) assess climate change vulnerabilities, (2) develop and implement adaptation strategies, and (3) engage and educate stakeholders. CRE shares NEP examples to help other coastal managers, and provides technical guidance and assistance about climate change adaptation.

http://water.epa.gov/type/oceb/cre/index.cfm

communications around creative tools and approaches that could potentially provide value to other OW offices. The CRE program is well-marketed and benefits from immediate buy-in at the state level, which is critical since states can advocate for programs at EPA.

Participants characterized states in Region 1 as having a strong environmental ethic, with member states in close proximity reinforcing the importance of coordination. Region 1 Administrators dating back to at least 2001 have been interested in climate change issues; Regional Administrator Robert Varney created a team to work on climate-related issues, calling it an "energy" team in deference to political conditions. His successor, current Region 1 Administrator Curt Spalding is concerned with climate change and previously worked for environmental organizations on coastal and estuarine issues. Region 1 academic institutions with significant climate expertise were also cited as strong contributors to the overall regional emphasis on climate change, and recent significant climate events reinforce the need for climate change action and keep the issue at the forefront of citizens' concerns. As one participant noted: "Every year there has been a 'case study' of climate change impacts: Hurricane Irene, flooding in Rhode Island, New Hampshire, Maine, Hurricane Sandy, variability in snowfall, blizzards. Residents are seeing these issues and seeing the vulnerability to climate change."

A widely held perception among interviewees was that more work is needed to integrate climate change into the regulatory side of EPA activities. Interviewees acknowledged that incorporating climate change considerations into regulatory programs and existing work requires a significant commitment of time and resources. Examples of initial efforts to incorporate climate change into OW regulatory programs include:

- Region 10 is in the midst of a pilot nonpoint source TMDL for the Nooksack River as an example of incorporating climate change into daily program operations. Pilot project partners include the University of Washington Climate Impacts Group, Nooksack Tribe staff, Lummi Nation staff, EPA ORD - Corvallis, and Washington State Department of Ecology. As the pilot concludes, Region 10 hopes to identify elements that can be replicated in other TMDL processes.[15]
- In 2010 OWM hired a contractor to develop an analysis of the NPDES program with recommendations on how the program could respond to climate change. The contractor concluded that there was significant flexibility under NPDES to incorporate climate change. A few interviewees expressed disappointment that the results of the analysis have not been widely shared and that there does not appear to be significant follow-up work in recent months.[16]

Although not directly addressing climate change, WaterSense, Green Infrastructure, and programs focused on water utility energy efficiency were also mentioned as success stories for mainstreaming of climate change considerations, since both programs provide climate benefits. One participant noted

[15] This example is also described in the 2012 "Highlights of Progress" document.

[16] The 2012 "Highlights of Progress" document notes that the 2012 version of the NPDES Permit Writers' Manual includes new text for consideration of climate change:

- Section 5.2.2.7: Apply Additional Regulatory Considerations in Calculating Thermal Discharge Limits – Clean Water Act Section 316(a) Variance: Permitting authorities should be aware that the effects of global climate change could alter the thermal profile of some receiving waters making the historical record of thermal conditions less representative of future conditions.

- Section 6.2.4.2: Receiving Water Critical Conditions Receiving Water Upstream Flow: Modelers should be aware that the effects of climate change could alter historical flow patterns in rivers and streams, making these historical flow records less accurate in predicting current and future critical flows.

that OWM's stormwater program within the Green Infrastructure Program provides a great dual benefit of improved stormwater management within the urban atmosphere while allowing certain climate considerations to be used as those types of green infrastructure adaptation measures/improvements are put in place. Participants also mentioned greater receptivity to green infrastructure concepts – particularly those concepts that emphasize system resiliency – in coastal communities where the sense of climate impacts is much more imminent. Region 10 also reported that it chose to incorporate climate change and sustainability into the CW SRF program as part of its on-site review process, particularly for facility planning. Oregon DEQ has been receptive to this concept and has invested in circuit riders to provide information and expertise to small communities in the state. Region 10 is working with the national EPA SRF coordinator to revise the SRF annual review guidance to include climate adaptation.

What goals, implementation experience, or lessons from the 2008 Strategy could be useful to guide implementation of the 2012 Strategy?

This section includes findings (and associated lessons) on the overall effectiveness of the *National Water Program Strategy: Response to Climate Change* (the 2008 Strategy)—as both a document and a process—for affecting change in and through the NWP. Where appropriate, the section includes reflections and findings related to the 2012 Strategy, recognizing that implementation of the 2012 Strategy is just beginning.

Strategy Purpose and Focus

The evaluators' assessment is that the 2008 Strategy purpose and focus was generally appropriate and useful, although the strategy was quickly outgrown by the NWP. A key finding mentioned by several evaluation participants was that the 2008 and 2012 Strategies do not go far enough to accommodate the fundamental needs that climate change may necessitate for water resource management.

The purpose of the 2008 Strategy was to bring attention in the NWP to the issue of climate change and to drive near-term efforts to expand understanding and action within EPA, while also demonstrating EPA's climate change commitment to external audiences. The structure and focus of the 2008 Strategy clearly reflects this purpose. First, the strategy documents diverse "climate impacts on water resources" to raise awareness of climate change's relevance to water programs. Second, the strategy organizes 44 near-to-mid-term "key actions" under five goals. While two of the goals (and key actions under them) focus on direct efforts to support climate change mitigation and adaptation activities, the other three address research, education, and management systems to enhance NWP capacity to respond to climate change.

> *"The 2008 Strategy was EPA's first attempt at doing this. It was a good first try, but clearly a first try."*
>
> *- External Interviewee*

Language in the 2008 Strategy suggests that it was intended to serve a diverse set of audiences—both internal to and external to the OW. The strategy made the case for expanding understanding and capacity within EPA to respond to climate change across its water programs, and included commitments from EPA programs to advance progress towards these goals. The strategy also stated its intent with regard to external audiences: "This document expresses the National Water Program's commitment to work in cooperation with national partners, State and local government, and public and private stakeholders to understand the science, develop tools, and implement actions to address the impacts of climate change on water resources."[17]

Most evaluation participants regarded the 2008 Strategy as "a good first effort." The document

[17] 2008 Strategy, p. iii.

described the relevance and importance of climate change to the NWP and provided a consolidated list of near-term actions to advance progress in responding to climate change. While some evaluation participants regarded the 2008 Strategy more as "a workplan," it did signal EPA's commitment to address the topic, backed by specific near-term actions, to internal and external audiences. Evaluation participants widely observed that the limitations of the 2008 Strategy were recognized by OW leadership. This was reflected by activities, beginning in 2010, to engage representatives from across the NWP in developing a new strategy which could provide a longer-term framework for responding to climate change.

> *"The 2012 Strategy shows how our approach is evolving. It is more forward thinking. It has more buy-in from people. The content is more in tune with what we are doing and where we are heading."*
>
> - *OW Staff Member*

While the 2012 Strategy retains the main overall purpose and audiences as the 2008 Strategy, it shifts its focus to providing a longer-term road map for responding to climate change. In doing so, the 2012 Strategy reads less like a workplan and is more clearly designed to serve as a framework under which annual planning can occur.[18] Many evaluation participants regarded this shift in focus away from including specific commitments as an important evolution in order for the 2012 Strategy to be useful over a longer time horizon. However, some evaluation participants observed that in practice, some of the strategic actions in the 2012 Strategy are overly specific or worded in a way that makes it difficult to plan actions and conduct reporting under. A few participants noted that the vision statement and the ten principles in the 2012 Strategy provide an important starting point for on-going strategic discussions that will be important for the NWP in the years to come.

Some evaluation participants stated that they believe that the 2008 and 2012 Strategies "miss the mark" in not going far enough to accommodate and address the fundamental needs that climate change may necessitate at the national and local levels. For example, a few participants noted that more attention is needed to frame a strategic vision for what it may mean for climate change to be "mainstreamed" into the NWP, and to set in motion management-level discussions to explore this topic in a meaningful way. Some participants also observed that the strategies do not adequately focus on the fundamental changes in water resource management and governance that will be needed at the local level due to climate change and it does not adequately address EPA's role in supporting such transitions. For example, a few participants noted that despite references in the strategies to integrated water resource management (IWRM), the strategies do not explore the fundamental idea that climate readiness will require new and unprecedented levels of coordinated governance and action at the local level, addressing integrated management of water quantity and quality across watersheds and areas supported by shared aquifers. These participants argued that even if the strategy does not clearly articulate a vision for how these issues could be addressed; it needs to do more to frame and drive such discussions.

Strategy Use, Influence, and Value

Despite resource constraints and competing priorities, the evaluators found that the NWP has made significant progress in responding to climate change since 2008 in both voluntary and regulatory program areas. Evidence suggests that the 2008 Strategy has not been a significant driver of activity

[18] This shift is clearly articulated in the Memorandum from Michael Shapiro to National Water Program Office Directors, "Reporting of Climate Change Progress and Development of FY13 Implementation Action Plan," October 17, 2012.

by EPA water programs, although it was valuable in providing a clear signal within and external to EPA that climate change mitigation and adaptation have important implications for the NWP.

The evaluators found evidence that significant progress has been made since 2008 in understanding the potential impacts of climate change to the NWP and in taking responsive actions to support mitigation and adaptation efforts by diverse partners. Review of strategy progress reports and "highlights of progress" reports, complemented by evaluation interviews, shows that substantial progress has been made across each of the goals in the 2008 Strategy and in areas not explicitly addressed by the strategy. Although evaluation participants commonly noted more rapid progress being made in voluntary programs, the evaluators also found substantial evidence of progress in exploring how climate change considerations fit into regulatory programs. This progress has been noteworthy to many evaluation participants given the context of severe budget constraints and numerous competing priorities since 2008.

Most evaluation participants stated that while progress to date has been substantial, major work lies ahead. Many participants noted the NWP is in the early stage of a long-term journey to respond to climate change. Additional findings related to the status of efforts to "mainstream" climate change into EPA water programs are presented later in this chapter.

While progress has been made in responding to climate change, the evaluators found very little evidence that the 2008 Strategy played a role in motivating or driving this progress. Across nearly every OW division and program, evaluation participants reported that the strategy (and its implementation) has not had a substantive and discernible influence on program activities and direction.

> *"The strategy does not in any way shape or form drive my decisions* on what I do and don't do."
>
> *- OW Manager*

Evaluation participants offered several explanations to support their perception of the strategy having little or no influence on OW activities and decisions. First, most participants stated that the lack of new resources to support strategy implementation (and the erosion of staff and budget resources overall) translated into offices and programs pursuing actions that, while related to the strategy on paper, they already had planned to undertake in response to stakeholder needs and program plans. Second, many participants noted that despite a strong general commitment to address climate change by OW leadership, climate change has not been integrated as a recurring and salient issue to be addressed in routine discussions up and down the management chain within OW and within EPA management. Third, some participants mentioned that since the strategy resides outside of mainstream EPA planning and accountability systems, it has weaker influence on actions and decisions than if it was incorporated into the Agency's routine planning. Fourth, many participants indicated that the length of 2008 Strategy was a barrier and that most OW staff had not read it. Several participants noted that the document length could also pose challenges for the success of the 2012 Strategy. Some evaluation participants argued that a 10-page version of the 2012 Strategy is needed to make the strategy accessible. A few participants suggested that the Executive Summary of the 2012 Strategy could be adapted into a useful document for NWP managers, but that some additional information may need to be incorporated. For example, one participant suggested including some "framing questions" to guide

> *"Climate change does not always compete well against other priorities vying for management attention. Until we get good at asking about how climate change matters in every discussion, the strategy won't have real influence in EPA."*
>
> *- OW Manager*

on-going management-level strategic discussions about the mainstreaming of climate change into water programs (voluntary and regulatory), challenges, and opportunities.

With the above caveat about making a shorter version of the strategy available, most evaluation participants indicated that the 2012 Strategy is "good enough" and subsequent attention should focus on how to use the strategy implementation process to yield the greatest value for the NWP. Most participants stated that attention should focus on getting management-level input on and buy-in to a shared vision for 2012 Strategy implementation—and to a set of implementation activities that support this vision.

Many evaluation participants cautioned that based on the experience of implementing the 2008 Strategy, leadership attention is needed to ensure that the 2012 Strategy does not become a bureaucratic exercise with little influence on real actions or decisions. While some division, office, and branch-level managers are clearly bought in to addressing climate change, interviewees generally indicated that the 2008 Strategy and its implementation process did not succeed in driving or inspiring meaningful on-going discussions on program strategy within or between OW water programs. While this is not surprising given resource constraints and competing priorities, lessons from the 2008 Strategy implementation experience (discussed later in this chapter) suggest steps that could be taken to make the 2012 Strategy more influential within the NWP. It is important to note, however, that even if the strategy does not have a major influence on strategic direction and actions within OW, it can and has been useful in other ways, such as a tool for engaging external partners.

The evaluators found that the 2008 Strategy has been used to engage state and tribal partners in discussions about the implications of climate change for water resource management. For example, some EPA Regional Office representatives indicated that the strategy has supported their efforts to raise climate change as an issue with state and tribal representatives within their jurisdictions. Similarly, some state and tribal partners reported that the strategy has prompted discussions and reflection among state and tribal water program managers, even among representatives from jurisdictions in which discussion of climate change is constrained by politics. Several evaluation participants stated that more attention should be given to engaging with States, tribes, local governments, and other partners as part of 2012 Strategy implementation.

> *"The strategy enables us to say, 'look, this is an issue we are wrestling with too. We are committed to working with you on this important issue.'"*
>
> *- EPA Regional Office Representative*

The evaluators found evidence that the 2008 Strategy has informed adaptation thinking and planning among other EPA offices (outside of OW) and among other federal agencies. Several federal officials outside of the NWP commented that the 2008 and 2012 Strategies have informed climate change strategy development and action planning within their own organizations. Several officials also reported that they have appreciated opportunities to have conversations with OW managers and staff involved in the strategy work and (in some cases) to observe Climate Change Workgroup discussions.

As mentioned above, framing the 2012 Strategy as a longer-term "road map" to respond to climate change addresses some key limitations of the 2008 Strategy. However, fresh thinking on implementation and renewed leadership engagement are needed to make the 2012 Strategy relevant and useful within the NWP. Several evaluation participants observed that the strategy could be used to create openings (a reason and time for discussions) to discuss questions among EPA managers that may not otherwise get explored as quickly or thoroughly, such as:

- What are the common challenges we are experiencing as we work to incorporate climate change into our voluntary and regulatory programs?
- What lessons are we learning?
- Where do we need to prioritize activity, or to push harder and faster?
- Do we believe that the sum of our efforts are sufficient (given EPA's roles) to address the potential scale of the challenges posed by climate change? If not, what should we do about that?
- What does climate change mean for how local actors will need to manage and make decisions about integrated water resource management in the future? What will this mean for EPA's programs?

Management Support

Conversations with evaluation participants revealed strong high-level management support for the overall NWP climate change strategies but uneven support at the division, office, and branch manager level during implementation.

Many participants noted strong initial and consistent support for climate change integration from IO, starting with former Assistant Administrator for Water Benjamin Grumbles, who commissioned the National Water Program Climate Change Workgroup. Some interviewees noted that OW took a lead role at EPA in dealing with climate change during a less favorable political environment, and several evaluation participants outside of OW noted that OW has been considered a model for how to integrate climate change considerations into other EPA offices. One interviewee remarked that the early leadership demonstrated by OW on climate change, at the least, set the precedent for OW staff to openly discuss the issue. A significant number of participants also noted continued support for climate change activities under current Deputy Assistant Administrator for Water Michael Shapiro and Assistant Administrator for Water Nancy Stoner.

Interviewees noted the initial high-level participation in the OW Climate Change Workgroup and subsequent delegation of workgroup participation and roles to staff. While some interviewees believed this progression made sense as the workgroup transitioned from focusing on strategic direction and messaging to specific actions and updates, many also identified this as a challenge to keeping management informed and engaged with the importance of the work and to engaging them on strategic issues related to climate change.

Despite the continued support of senior OW management for addressing climate change, participants indicated uneven support at the division, office, and branch manager level. Evaluation participants observed that while division, office, and branch managers in certain parts of OW demonstrated their commitment during the 2008 Strategy development processes, that commitment has waned during strategy implementation. Interviewees noted varying reasons for lack of support from managers, although the primary reason cited is resource and staffing constraints. Interviewees stated that the flow of resources to programs and projects is the most significant indicator of management prioritization, and without additional resources to support OW's climate change strategy, management support has been inconsistent. One factor connected to resources is the competition climate change considerations face from a host of other priorities vying for limited organizational time and attention. Lack of knowledge of climate change impacts to specific programs was cited as another reason for lack of support at the division, office, and branch manager level; one interviewee noted that there is "not a lot of management buy-in to implementation. Some management doesn't even know how climate is going to affect their program, so they might disregard the work their staff is doing."

Interviewees cited OGWDW management as strong proponents of climate change within their office, noting that OGWDW has diverted significant resources to climate-related activities. As one OGWDW staff member noted "We are one of the few divisions, if not the only, that is actually doing that." A significant number of interviewees also identified climate activities within OGWDW as an example of successful climate change integration (further information is provided in a subsequent report section on mainstreaming successes).

Despite current funding challenges and competition with core responsibilities, several interviewees remarked that management support remains critical if OW is to continue to make progress addressing climate change. Management support for integrating climate change considerations may vary from office to office but could include activities such as advocating for and assigning staffing and resources for climate change-related activities, encouraging staff to look at climate change considerations in their current scope of work, and integrating climate change as a standing discussion topic during regular OW management and budget meetings.

Staffing and Resources

Overall, the evaluators found limited resources and staff for both development of the 2008 and 2012 Strategies and implementation of climate change activities. However, implementation of climate change programs and initiatives can occur with existing resources by doing current work in a slightly different manner.

For development of the 2008 and 2012 Strategies, it was primarily staff that worked on the day-to-day development and kept their managers informed on progress. Interviewees noted that slightly different staffing methods were used in the creation of the 2008 and 2012 Strategies. While both were led by assigned IO staff, staff in other OW offices participated more during the 2012 Strategy development process than the 2008 Strategy development process. The 2008 Strategy was written in large part by IO staff with review and comment by other OW office staff, while the 2012 Strategy was a collaborative effort from the outset. Staff in different parts of OW collaborated on developing and reviewing the strategies through the workgroup. This work was considered somewhat of an "add-on" to the regular duties of these staff members. Beyond limited staff time, there were no additional resources allocated to the development of the strategies.

The shift to involving more staff across OW in the development of the 2012 is generally regarded as a positive development that has potential to expand "ownership" of the 2012 Strategy and to build a broader group of climate change champions across the NWP. In practice, this appears to be somewhat true among staff-level participants involved in developing the strategy, although the evaluation team did not find evidence indicating that this involvement has enhanced management support for the 2012 Strategy at the division and office levels. Some interviewees observed that lack of clarity around how their input was incorporated into the 2012 Strategy may be a factor in undermining the ability of participation in strategy development to translate into perceived ownership of the strategy.

The few staff members working exclusively on climate change are dedicated and put forth significant effort. Interviewees working on climate-related activities noted their personal commitment to the subject as a driver for beginning and continuing this work, even in a resource-limited era. Those individuals who worked on the development of the 2008 and 2012 Strategies or implementation of climate change activities noted that they often do so outside of their primary responsibilities.

Most interviewees noted that OW staff and management are primarily focused on core responsibilities, including court mandated deadlines and other immediate concerns which restrict the ability to

undertake the type of holistic, long-term strategic planning required to integrate climate change considerations into most programs. Lack of resources was cited by interviewees as a factor in limiting the number of key actions listed in the 2008 Strategy. Initially the strategy contained 60-70 key actions but once it was clear that there would be no additional resources to support the activities, the number was reduced to 44.

Some interviewees compared the challenge in integrating climate change considerations to other cross-cutting issues such as children's health and environmental justice. These issues connect with multiple aspects of different programs across EPA but are not built into programs' critical missions. Given the nature of integrating climate change considerations, limited budget and staffing resources, and the federal budget situation overall, interviewees conceded that climate change programs will likely be among the first to suffer from budget reductions. Interviewees noted that the two climate-focused initiatives considered as compelling examples successful integration within OW are projected to see budget reductions in the near future.

Some interviewees, both inside and outside of OW, held a strong opinion that there are yet unrealized opportunities to integrate climate change considerations into existing programs without additional resources. For example, interviewees noted that OW could consider the effects of changing water levels or temperatures on permit conditions using scenarios and models that incorporate updated information from current climate models. Interviewees noted that further opportunities exist to more strategically integrate climate change considerations into OW programs and offices without additional resources, but acknowledged that this would requires a significant shift in thinking around OW's traditional operations. Other evaluation participants countered that integration of climate change considerations into existing programs and activities can sometimes require significant investments in staff time, and in some cases, specialized technical assistance or extramural resources for consultant analyses.

> *"For me, one of the lessons learned is that we need to do a better job of helping people understand that although there are some things that do require more resources, there are an awful lot of things that we could be doing with existing resources but doing them in a slightly different way that would allow for them to account for climate change."*
>
> *- EPA Official*

Communication and Outreach

The evaluators found that more attention to communications and outreach for the 2012 Strategy would be beneficial for implementation success. Several communications and outreach mechanisms, such as the National Water Program Climate Change Workgroup, the "Highlights of Progress" documents, and the NWP climate change strategy website, are important pieces of an overall communications and outreach strategy.

In addition to the original memo from former Assistant Administrator for Water Benjamin Grumbles commissioning the National Water Program Climate Change Workgroup and the 2008 Strategy, IO released several memos associated with requests for review of components of the strategy during the drafting process. Most interviewees' recollections of communication from the front office identified communication around drafts of the Strategies as opposed to implementation. In addition, IO communicated with points of contact for specific key actions in the 2008 Strategy for reporting and measurement purposes.

Interviewees suggested that further communication around the 2012 Strategy would be useful to ensure successful implementation. They also suggested that integrating climate change into the NWP would require communications efforts around knowledge-building as well as communicating about the strategy.

Examples of climate change communication activities from individual offices include an all-hands meeting in OWOW and webinars offered through OWM and OST. The all-hands meeting was led by OWOW staff with participation by front office staff connected to the 2008 Strategy. The main purpose was to describe OWOW's specific commitments in the strategy. Most of the communication around the 2008 and 2012 Strategies is conducted with the climate change leads of individual OW offices through the workgroup.

The workgroup acts as the main communication mechanism for climate change activities. The workgroup is a venue for offices and regions to share information on activities underway at HQ and in the regions. Regional interviewees observed that the workgroup provides an important communications mechanism for work that is going on in other regions and headquarters that they would not know of otherwise.

Some interviewees noted that the online presence from the climate change website is a great tool and that it will continue to serve as such if it is kept current. Interviewees observed that the website is focused more on external communications as opposed to educating staff internally about OW's strategy or climate change efforts.

> *"The NWP Climate Change Workgroup meets monthly and receives updates from regions and guest presentations. Since there is no formal climate division within EPA, this is how communication occurs."*
>
> *- OW Staff Member*

Both EPA and external interviewees noted that the 2008 and 2012 Strategy and the "Highlights of Progress" documents showed a commitment by EPA, and OW in particular, to address climate change. The strategies allowed the regions to engage on tackling climate change issues more directly and were a way for them to have conversations about these issues with states and partners. Regional staff also noted that the strategies are also an important signal of support for the various topics contained therein.

Training and Capacity Building

The evaluators overall assessment is that additional training for EPA staff on impacts of climate change, particularly impacts on areas specific to staff members' programmatic duties, would be extremely helpful.

After releasing the 2008 Strategy, OW created training slides with an overview of the water cycle, a definition of climate change, how climate change fits into the water cycle, and the impact of climate change on water resources. The slides were posted on a previous version of the climate change website and used as part of the Water Quality Standards Academy. There were also various webinars on climate change produced by individual OW offices (OST, OWM), the OAR's State and Local Climate and Energy program, and the Office of Policy. Because it was recently released there has not yet been significant training associated with the 2012 Strategy; several interviewees noted the new strategy provides an opportunity for OW to engage its staff with training and education.

Interviewees perceived a greater degree of climate change knowledge among staff members that worked on the 2012 Strategy and a lesser degree of knowledge among staff who have yet to engage with climate change as part of their work. OW hosts periodic brownbag sessions related to climate change, but these are only communicated to the people on the climate change distribution list and not office-wide. Some interviewees noted that the organizational nature of OW – specifically, the "silo" mentality of vertical barriers between offices and programs – impacts how individuals think about climate change and that providing a larger watershed perspective could be useful in training and implementation of climate-related initiatives. These interviewees noted that regions could help OW

learn how to solve problems from a watershed perspective. Some interviewees noted that additional training could focus on: 1) educating a larger number of OW staff, including managers, on climate change science at a general level, and 2) educating OW staff and managers on how climate change could impact their programs and day-to-day responsibilities.

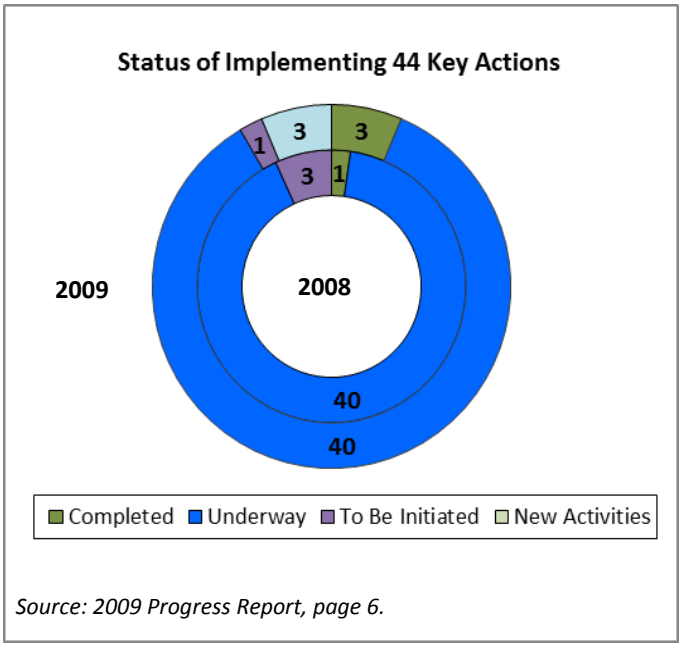
Interviewees noted that for the most part, OW staff have a basic understanding of climate change and agree on its importance, but there is a lack of understanding on how to integrate climate change considerations into core programs and day-to-day activities. EPA has begun to address this with some training, including a January 2013 webinar in conjunction with the US Global Change Research Program (UWGCRP) to introduce EPA staff to the national climate assessment scenarios and sea level rise scenarios, which addressed how to use the information in decision-making. There are other voluntary opportunities to receive additional training, with webinars presented by OW OST and IO as well as the OAR's state and local climate webinar series. It remains unclear, however, how many OW staff participate in these opportunities. Some regional interviewees noted effective strategies such as leveraging webinars to provide basic instruction and knowledge, followed by discussion sessions about how the information presented connects with relevant work in the region. Interviewees noted that managers also need to be aware of climate change effects, and asking staff for this information in the context of regular responsibilities is an important step in normalizing climate into daily activities.

Measurement

The evaluators found that OW divisions and offices outside of IO found little value in 2008 Strategy measurement activities and the evaluators did not find evidence that measurement informed decisions or motivated action.

Measurement of progress under the 2008 Strategy focused primarily on qualitative descriptions of activities and outputs undertaken by EPA relevant to the five specific goals and forty-four key actions articulated in the strategy. In some cases, quantitative measures were used to complement descriptions of outputs. For example, to assess the influence of the 2008 Strategy, IO measured the number of subscribers to the EPA Climate Change and Water News e-newsletter.[19] Similarly, the Climate Ready Estuaries program measured the number of times relevant reports were downloaded from the EPA website.[20] In a few instances, EPA programs included outcome-focused measures previously developed to address program-related needs. For example, EPA's WaterSense

EXHIBIT 4-3. IMPLEMENTATION STATUS CHART



Source: 2009 Progress Report, page 6.

[19] U.S. EPA, *Implementing the National Water Program Strategy: Response to Climate Change – Progress Report for 2009*, p. 38, http://water.epa.gov/scitech/climatechange/upload/2009-Implementing-the-National-Water-Program-Strategy-Response-to-Climate-Change-Progress-Report.pdf.

[20] Ibid, p. 26.

program included measures of total water and cost savings from the use of WaterSense labeled products.[21]

Progress under the 2008 Strategy was also measured in aggregate at the key action level, as summarized in the 2008 and 2009 Progress Reports. IO coded the progress under each key action as completed, underway, to be initiated, or new activities, and counts were generated summing the number of key actions in each status category (see Exhibit 4-3). Although these aggregated metrics were not prepared after 2009, the 2010-2011 Key Action Update includes a table categorizing the status of specific Key Actions as completed, ongoing, initiated, proposed, or deleted.[22]

The focus on measuring outputs under the 2008 Strategy was expected by most evaluation participants, given the strategy's focus on near-term actions and the scope of data available to support measurement related to the strategy.

Most evaluation participants indicated that the measurement approach under the 2008 Strategy was not structured to support or inform learning or decisions at the office, division, or program levels. Numerous evaluation participants observed that this accountability focus to measurement is challenging—and potentially counter-productive—in the combined context of:

> *"Intentions are good, but the measurement approach creates busy work – it doesn't enhance the value of our work."*
>
> *- OW Staff Member*

- Uncertain and declining budget and staffing resources;
- Lack of statutory drivers or court-orders requiring the National Water Program to address and measure progress on its response to climate change;[23] and
- The Strategy and measurement activities residing outside of the Agency's mainstream strategic planning processes and measurement systems.

Several evaluation participants observed that the 2008 and 2012 Strategies face similar challenges for measurement and accountability to those experienced by other cross-cutting EPA initiatives such as environmental justice and children's health.

> *"There has been a very vibrant debate between OWIO and program offices over the difference between - and value of- aspirational goals versus measurable metrics [for cross-cutting issues like climate change], especially in extremely resource-constrained times. That debate gets played out in this context frequently."*
>
> *- OW Manager*

Many interviewees talked about the importance of transparency and demonstrating tangible commitment and progress to key partners and the public on climate change. However, most perceived that the 2008 Strategy (and the early 2012 Strategy) measurement approach felt more like "bean counting" as implemented. They generally argued that other approaches are better suited to support transparency and demonstrate commitment and progress externally given the current context bulleted above. For example, as discussed below in the reporting section, several division and regional Office participants indicated that the qualitative "measurement" of "bright spots"

[21] Ibid, p. 9.

[22] This discussion of measurement approach is specific to the 2008 Strategy; discussion of the measurement approach that IO employed to date for the 2012 Strategy is contained in Chapter 5.

[23] It is important to note that requirements supporting federal agency adaptation planning are strengthening. See sidebar on page 2 of this report.

captured in the Highlights of Progress reports was a more useful example of measurement to demonstrate commitment and progress to partners. Essentially, the participants argued for developing illustrative success stories in lieu of comprehensive measurement.

> *"I think there are a lot of people throughout the offices that are not comfortable with that approach. But others want to know: Where are we?"*
>
> *- OW Staff Member*

Several evaluation participants outlined how even a subtle accountability-focused measurement approach in the current context can frame the measurement process as "a least common denominator" obligation rather than one that inspires action within and outside of the Agency. Several OW division and office representatives discussed perceived fears that failure to meet commitments in the strategy could have a negative impact on future program budget allocations or personnel performance reviews. Even though the practical risk of this occurring was downplayed, participants stated that "no one wants to look bad" in a measurement system, particularly given external budget and staffing circumstances and competing priorities that are outside their sphere of control.

In the context of severe budget pressures and weak strategy drivers, the output and accountability-focused measurement approach tacitly encourages divisions and offices to be very conservative in the commitments they propose under the strategy. The evaluators also heard reports of some office representatives spending significant time shepherding the wording of their office's commitments (and the implied measures of progress they would set) through the strategy development and action planning processes. These factors appear to have fueled internal perceptions of the strategy as an obligation instead of as a tool for achieving progress. The framing of the 2012 Strategy somewhat mitigates against this by moving commitments from the strategy to an annual action planning process; however, the initial measurement approach under the 2012 Strategy does not appear to have "reset" broadly held perceptions of "bean counting" in the context of budget reductions.

> *"I know that that is hard to do but pushing [measurement] in the direction of outcomes would really begin to make it real in terms of intellectual commitment as well as bureaucratic commitment."*
>
> *- OW Manager*

Several evaluation participants recognized the challenge of designing a robust and meaningful measurement system—one that informs and drives progress in responding to climate change—given the current context. While there are no easy answers, the evaluation team summarizes some ideas in the recommendations section, drawing on ideas from evaluation participants.

> *"Short term, qualitative [measurement and] reporting is the best that we are able to do…unless there's a huge influx of funds and regulatory capacity…."*
>
> *- OW Staff Member*

As implied in the previous discussion, measurement activities under the 2008 Strategy (and to date under the 2012 Strategy) were largely perceived to be for the benefit of IO. The evaluators did not find evidence that divisions, offices, or programs in the National Water Program outside of IO have used measurement information collected under the strategy to inform decisions or motivate action. Several division and office representatives also raised questions about how useful the measurement information supporting the 2008 Strategy actually was in practice to inform IO decisions and actions. The qualitative summaries included in the brochure-like 2008-2009 and 2010-2011 *Highlights of Progress* fact sheets and report are a notable exception. Several regional office participants talked about how these materials and the information in them have been useful for informing state and other partners about EPA's commitment and activities to respond to climate change. Evaluation participants

outside of EPA did not report much familiarity with the measurement approach and information for the 2008 Strategy, indicating that the strategy itself has been the main information they have interacted with and used to inspire and motivate action.

A few evaluation participants acknowledged the potential value of measures that address behavior change among partners and target audiences or that address outcomes relevant to the strategy. Such measures would likely be important if measurement under the strategy were to be useful for informing program-level decision making. However, these participants were quick to raise cautions about the time and resources needed to collect information to support such measures, if the data were accessible at all. Paperwork Reduction Act requirements and the potential need for Information Collection Requests (ICRs) were also identified as challenges to expanding measurement approaches to address behavior change and outcomes. One participant also raised the concern that it would likely be difficult to determine the contribution or attribution of progress to EPA programs and activities, and that outcome measures might show that climate mitigation and adaptation actions, while valuable and important, are not of a scale commensurate to address evolving impacts and challenges. The evaluators acknowledge these as legitimate concerns, and they are addressed in Chapter 5 and in discussion of options for measurement approaches moving forward.

> *"I think everyone is in a really tough position now because we don't want to be negative. We want to step up and show many of the good things we're doing—but the way that some of the strategic actions are written, we can't report to them. This is problematic."*
>
> *- OW Staff Member*

Overall, based on the feedback received on the 2008 Strategy, the evaluators found that IO will need to lead important internal discussions with offices and regions to cultivate a clear and aligned vision for how future measurement activities could best be structured to achieve progress in realizing the vision and goals of the 2012 Strategy. Clarifying the use and value of measurement information will be vital to this vision.

Reporting

The evaluators found a broad range of staff time devoted to reporting under the 2008 Strategy. In addition, most reports prepared under the 2008 Strategy were not designed to meet the needs of audiences outside of IO and were not likely to be read by many people.

Some division and office representatives reported minor amounts of time (e.g., a few hours) required to support annual reporting under the 2008 Strategy whereas others reported a substantial time commitment (e.g., multiple days). Interviewees suggested several reasons for this variation. First, the number of key actions assigned to program offices varied. Second, EPA regional offices were given a fair degree of discretion in what they chose to report on under the strategy. Third, the number of program staff that reporting leads needed to coordinate with to collect information varied substantially across offices and divisions. Fourth, the level of detail of information collected and provided by reporting leads varied. One reporting lead suggested that it would have been helpful and potentially more efficient to have an example of the appropriate level of detail expected in the periodic requests for progress reporting under the strategy.

> *"We have the capacity to take a fairly simple exercise and make it so complicated."*
>
> *- OW Manager*

In general, the reports produced under the 2008 Strategy support the accountability and output-focused approach taken with the measurement system discussed above. As a result, most evaluation

participants indicated that they see IO as the primary audience for the reports prepared under the strategy. Given the length of most reports prepared under the strategy, many participants questioned whether IO is deriving sufficient value from the reports to warrant the effort required to develop them. A few evaluation participants noted that it is not necessarily clear who the intended audience is for reports produced under the strategy—IO, managers and staff throughout EPA, state and tribal partners, industry and NGO representatives, or the interested public writ large. They suggested that more work is needed to clarify the priority audiences, their specific needs, and then determine what types of reports or other materials are needed to support these information flows.

As mentioned in the Measurement Section, several regional office representatives noted that the Highlights of Progress documents—particularly the shorter versions with photos and graphics—were useful for sharing with broader audiences. Other evaluation participants reflected that they appreciated the opportunity to report on climate change-related activities and accomplishments in which their programs were engaged that did not necessarily fit under specific key actions. They indicated that standard progress reports were not necessarily conducive "for reporting what their office or division was excited about in a way that that others would find interesting and engaging."

> *"Reporting information seems like it goes into a black hole. We don't get more or less resources because we are doing great or lousy. There are no rewards or punishment for how good or bad you do. There aren't follow-up discussions."*
>
> *- OW Staff Member*

Evaluation participants outside of OW pointed to the Climate Ready Estuaries Program 2012 Progress Report as a useful example of a progress report accessible to external partner audiences.[24] They noted the use of visuals (e.g., graphics and photos) and engaging narrative and also noted that the report discusses key lessons from program activities, and not just descriptions of activities. They suggested that this type of approach can be powerful for recognizing and inspiring internal action and for engaging external partners, demonstrating progress, and talking openly about issues and challenges.

Evaluation and Learning

The evolution from the 2008 Strategy to the 2012 Strategy reflects considerable organizational learning by OW.

As discussed under the Strategy Effectiveness section, the evaluators found evidence that the development and implementation experience with the 2008 Strategy provided a context for learning that strengthened the vision and goals framework developed for the 2012 Strategy. Many evaluation participants observed that the 2008 Strategy was a good first step and signaled that among EPA's National Program Offices, the National Water Program was ahead of the curve on thinking about climate change and adaptation. The 2012 Strategy is generally seen as an important evolution in the National Water Program's thinking around climate change.

Evaluation participants indicated that more work is needed to accelerate learning and improvement in how the strategy—as an artifact and as a process—can be used to drive more rapid mainstreaming of climate change within diverse voluntary and regulatory programs across the National Water Program.

Many evaluation participants appreciate that IO has sought to evaluate implementation of the 2008 Strategy and that the focus is on identifying lessons to inform future implementation activities. A few participants noted that the timing for the evaluation might have been more appropriate if conducted

[24] Report available at: http://water.epa.gov/type/oceb/cre/upload/CRE_2012Report_122612a.pdf

before the 2012 Strategy was released. They encouraged IO to be open to exploring lessons raised in the evaluation, even if these lessons signal the need for changes to the initial implementation approach used for the 2012 Strategy.

Alignment with Other Federal Agency Climate Plans

OW created one of the first climate change strategies in the Agency and the evaluators found that OW is considered a model for other emerging efforts within the federal government.[25]

OW is participating in a broader inter-agency task force to create climate plans for federal agencies affected by climate change. One interviewee familiar with the process noted that the OW plan and the inter-agency task force plan show remarkable alignment given differences in scale and program priorities.

Ongoing parallel climate change planning processes can provide support for the 2012 Strategy. These other plans reinforce the importance of integrating climate change considerations into the NWP and can be used to help staff and managers understand its priority status within the Agency. OW can also learn from other federal agencies' implementation processes, once they have reached this stage.

Some interviewees also noted that to truly integrate climate change considerations into the NWP, these efforts needed to not just be laid out in a separate strategy, but be integrated into the NWP's strategic plan.

External Partnerships and Engagement

Overall, the evaluators found that OW is viewed as an effective partner on climate change activities, and in some cases OW's efforts have spurred other organizations' ability to work on climate change.

The 2008 and 2012 Strategies contain actions internal to OW but also ways to support external partners including states, tribes, and local governments. These partners have been engaged both by the regions who work directly with them and by certain programs within OW that work with them on a more regular basis, such as those that work with estuaries and utilities.

Regions were often identified as having conducted significant outreach with states and other partners on the 2008 Strategy and/or climate change in general. Media organization partners that participated in the State-Tribal Climate Change Council (STC3) also conducted outreach on the 2008 Strategy with their members. In addition to states, interviewees identified outreach with groups like the NE Regional Ocean Council, Gulf of Maine Council, and regional meetings of basin commissions and state water directors.

Region 1 states have independently pressed for climate action, especially with high profile events such as Hurricane Sandy. Conversely, states in other regions cannot discuss climate change due to the local political environment, but they are able to engage in planning around events and initiatives related to drought, wildfires, and emergency preparedness.

Interviewees identified OW as an important partner that has coordinated well on climate change activities. OW is seen as a model because of its early efforts to strategize incorporation of climate change considerations.

Regional interviewees noted that OW's climate change strategy provides a tool to educate states and other partners and has given credence to pursue implementation of climate change mitigation and adaptation activities.

[25] Alignment across the OW strategies, EPA Strategic Plan, and EPA Adaptation plan is discussed in more detail in the previous chapter.

While interviewees made it clear that OW and the regional offices did conduct some outreach related to the 2008 Strategy, some interviewees noted that OW could have a better dialogue with states on the strategy. Even regions that have conducted some outreach noted that this could be improved; one mentioned that he was not sure of the lead climate change person to reach out to in each state.

The STC3 initially met on regular basis but meeting frequency has declined. Many interviewees identified this as a place where OW could foster further engagement. Interviewees both within EPA and externally, noted that the STC3 is useful but does not have a clearly defined role at this point. They suggested that EPA could use this group in a more effective manner, which it might mean reconstituting it with broader membership for greater engagement.

EPA also has an opportunity to engage with inter-agency work and workgroups. Some regions have done this on a regional basis and collaborate with other federal agencies in their interactions with states. This could be expanded to other regions. Some interviewees noted that this would be an effective way to leverage resources available for adaptation activities.

Interviewees noted that the strategy references EPA's role as creating tools and providing information to fill gaps and enable states and other stakeholders to apply the tools to take action. Interviewees noted that when these tools are produced or information becomes available, EPA can also utilize these opportunities to engage with external partners and stakeholders on concrete climate change adaptation and mitigation solutions. One interviewee said that this "reminds everyone that [the strategy is] a real living document that EPA is taking seriously and provokes people to go back and think about the strategy in context."

Many interviewees noted that having the strategy as an agenda item for meetings occasionally was another way to keep it visible and on the minds of both EPA staff and external partners. This could be practiced with groups such as the STC3, regional internal and external meetings, and even within OW.

What goals and strategic actions in the 2012 Strategy should EPA headquarters and regional programs prioritize?

A final piece of the retrospective evaluation was to gather interviewee perspectives on prioritization of strategic actions in the 2012 Strategy. This section presents findings on prioritization for OW's consideration in the context of OW's current climate related prioritization activities.

The evaluators encountered a broad range of perspectives on prioritization of the strategic actions described in the 2012 Strategy. Interviewees did not advocate for prioritization of particular strategic actions; instead, they provided a suite of prioritization schemes for OW consideration.

Offices that work directly with partner organizations or associations, such as utilities, tend to prioritize those activities developed jointly with partners. These priorities reflect what the partners want and will use, and in the absence of regulations these offices will work with target audiences to see what types of voluntary efforts will gain the most traction. One interviewee noted that for actions involving external partners, priority should be placed on educating partners on what impacts will affect them, how to respond to those impacts, and how to perform vulnerability assessments.

Some respondents noted that regulations are already implemented under a wide variety of climactic conditions, and for now that may sufficient. But as the variant increases and parameters change, there may be a need for regulatory change. Other respondents suggested prioritizing climate change guidance in the use of EPA categorical grants, performance partnership grants (PPGs) and CW and DW SRF

programs. Respondents also suggested prioritizing strategies connected to existing EPA authorities such as TMDLs because these will be most effective and will have definite environmental protection outcomes.

Evaluation participants suggested several concepts to consider when designing a prioritization framework:

- Use scientific research to inform the prioritization strategy. For example, a recent OW – NOAA meeting may lead to some joint action on ocean acidification based on recent scientific findings.
- It is more effective to work harder to maximize implementation effectiveness from ongoing successful programs such as CRWU and CRE rather than ask staff to drop everything and work on a different strategy.
- Prioritization should be placed on decisions and actions that have longer term impacts, such as the SRF program and other water infrastructure investments.
- Prioritize strategies/actions that benefit the entire agency; it is easier to get buy-in if offices realize they do not have to do everything on their own.
- Prioritize based on the scale of impact (high, medium, or low) and add a filter for likelihood of occurrence; this will avoid the need to refer to availability of resources.
- Include an explicit statement that prioritization will not result in diversion of resources from other areas; instead, as resources become available they will be targeted toward priorities.
- Before prioritization can occur, EPA must make hydrological and climate information available at the watershed/aquifer scale to the IWRM councils.
- EPA should use a shotgun approach: Try to launch as many things as possible and see which ones gain traction.
- Prioritize actions in coastal programs, as they will feel the most immediate significant impacts.

IO is currently developing prioritization criteria in order to effectively allocate resources toward climate related activities. Key criteria under consideration include: Urgency, risk, geographic scale, programmatic scale, and probability of occurrence. OW could use these criteria to prioritize activities identified in the 2013 Implementation Plan.

CHAPTER 5 | PERFORMANCE MEASUREMENT FOR THE 2012 STRATEGY

In this chapter, we describe findings and lessons learned related to developing performance measures for the *National Water Program 2012 Strategy: Response to Climate Change.* Specifically, we address lessons learned related to the following topics and questions:

Measurement Approach:

- What is the measurement approach that can be used to measure adaptation progress in five areas: infrastructure, watersheds and wetlands, ocean and coastal waters, water quality, and working with tribes?
- What specific elements need to be applied to the phased approach to tracking progress outlined in the 2012 Strategy, to make it a robust measurement framework?
- What, if, any, revisions should EPA make to its baseline data collection process to ensure that data collected are meaningful and objective?

Informing Agency-Wide Plans:

- How lessons learned from this projects evaluation of OW's approach inform measuring progress in the EPA-wide Adaptation Plan, and inform development of the next Agency 4-year Strategic Plan?

FINDINGS AND LESSONS

This section begins by describing how OW has measured progress to date on the 2012 Strategy, and the advantages and disadvantages of this approach. The evaluators then answer each of the evaluation questions in turn, with particular emphasis on the first question, where we lay out two alternative measurement approaches that could be used to track adaptation progress and variations on those approaches. We conclude by discussing how lessons learned from this evaluation can inform Agency-wide efforts to track progress on climate change adaptation.

OW's Approach to date in Measuring Progress on the 2012 Strategy

As part of the 2012 Strategy, the OW said it would "adopt a phased approach to track programmatic progress towards Strategic Actions" and develop outcome measures.[26] The 2012 Strategy addresses 19 goals across 5 vision areas and includes 53 strategic actions that will help achieve the goals (see Exhibit 5-1).[27]

OW collected baseline information on progress to date on strategic actions related to climate change adaptation. The IO asked HQ offices and regions submitting baseline data to assess which of the seven phases best described progress toward implementing the strategic action (although not all HQ offices and regions provided this information).

[26] 2012 Strategy, Goal 18 (Tracking Progress and Measuring Outcomes), Strategic Action 52

[27] The 2012 Strategy also includes goals and strategic actions for each climate region; these are not included in this report.

The IO used the baseline information on strategic actions to develop its *2012 Highlights of Progress* report,[28] which includes an assessment of progress at the goal (not strategic action level). To prepare the report, IO examined the baseline data and assessments of progress at the strategic action level, and then followed up with HQ offices and regions to resolve questions. The IO then assigned one of the seven phases of adaptive management to each goal and an associated score of "1" through "7." For example, goals deemed to be at the phase of "initiation," received a score of "1," goals at the phase of "assessment" received a score of "2," and so on through the seven phases of adaptive management, up to a possible score of "7" for each goal. The IO then summed the scores assigned across the 19 goals. This process resulted in a 2012 baseline assessment of a score of 42 out of a total possible score of 133 (19 goals with the potential to achieve a score of "7" for each strategic action equates to a total potential score of 133).

This approach of developing a single numeric score for progress on all goals is appealing in its apparent simplicity. However, in the evaluation team's view, this approach requires a number of implicit assumptions that may not be merited and in some cases are not what the IO intended:

- Assigning scores at the goal level, rather than the strategic action level, weights the importance of the strategic actions relative to achieving the goal, although the criteria for weighting are not explicit.
- Assigning a numeric score of "1" to "7" for the seven steps of adaptive management effectively assumes that each step in adaptive management is of equal importance.
- Assigning a numeric score of "1" to "7" for the seven steps of adaptive management implies that goal can be at only one "step" in the process, whereas the evaluation team's research indicates that implementation of strategic actions is not completely linear.
- Summing the scores for all goals together assumes that each goal is equally important and thus contributed equally to the score.
- Presenting the assessed total score in the context of the total possible score assumes that all seven phases of adaptive management are relevant to every goal (i.e., it would be feasible for each goal to reach the phase of monitoring and adaptive management, and thus receive a score of "7.")

Thus, in the evaluation team's view, the simple result of this process (a single score compared to a potential score) obscures the many subjective decisions and implicit weighting factors used to develop the score. In the next section, we propose two alternative approaches to track progress on adaptive management which the evaluation team believes are more transparent and rigorous.

[28] See http://water.epa.gov/scitech/climatechange/2012-National-Water-Program-Strategy.cfm for a copy of the report: *2012 Highlights of Progress: Responses to Climate Change by the EPA National Water Program.*

EXHIBIT 5-1. OW VISION AREAS, GOALS, STRATEGIC ACTIONS, AND EPA OFFICES RELATED TO CLIMATE CHANGE ADAPTATION

GOALS AND STRATEGIC ACTIONS		LEAD OFFICE (& PARTNERS)
VISION AREA 1: INFRASTRUCTURE: In the face of a changing climate, resilient and adaptable drinking water, wastewater, and stormwater utilities (i.e., the water utility sector) ensure clean and safe water to protect the nation's public health and environment by making smart investment decisions to improve the sustainability of their infrastructure and operations and the communities they serve, while reducing greenhouse gas emissions through greater energy efficiency.		
Goal 1: Build the body of information and tools needed to incorporate climate change into planning and decision making.	**SA1:** Improve access to vetted climate and hydrological science, modeling, and assessment tools through the Climate Ready Water Utilities program.	OGWDW (OWM)
	SA2: Assist wastewater and water utilities to reduce greenhouse gas emissions and increase long-term sustainability with a combination of energy efficiency, co-generation, and increased use of renewable energy resources	OWM (OGWDW)
	SA3: Work with the states and public water systems, particularly small water systems, to identify and plan for climate change challenges to drinking water safety and to assist in meeting health based drinking water standards.	OGWDW
	SA4: Promote sustainable design approaches to provide for the long-term sustainability of infrastructure and operations.	OWM (OGWDW)
Goal 2: Support Integrated Water Resources Management to sustainably manage water resources.	**SA5**: Understand and promote through technical assistance the use of water supply management strategies.	OWM (OGWDW)
	SA6: Evaluate and provide technical assistance on the use of water demand management strategies.	OWM (OGWDW)
	SA7: Increase cross-sector knowledge of water supply climate challenges and develop watershed specific information to inform decision making.	OW IO (All OW Offices)
VISION AREA 2: WATERSHEDS & WETLANDS: Watersheds are protected, maintained, and restored to provide climate resilience and to preserve the ecological, social, and economic benefits they provide; and the nation's wetlands are maintained and improved using integrated approaches that recognize their inherent value as well as their role in reducing the impacts of climate change.		
Goal 3: Identify, protect, and maintain a network of healthy watersheds and supportive habitat corridor networks.	**SA8:** Develop a national framework and support efforts to protect remaining healthy watersheds and aquatic ecosystems.	OWOW
	SA9: Collaborate with partners on terrestrial ecosystems and hydrology so that effects on water quality and aquatic ecosystems are considered.	OWOW
	SA10: Integrate protection of healthy watersheds throughout the NWP core programs.	OWOW
	SA11: Increase public awareness of the role and importance of healthy watersheds in reducing the impacts of climate change.	OWOW

GOALS AND STRATEGIC ACTIONS		LEAD OFFICE (& PARTNERS)
Goal 4: Incorporate climate resilience into watershed restoration and floodplain management.	**SA12:** Consider a means of accounting for climate change in EPA funded and other watershed restoration projects.	OWOW
	SA13: Work with federal, state, interstate, tribal, and local partners to protect and restore the natural resources and functions of riverine and coastal floodplains as a means of building resiliency and protecting water quality.	OWOW
Goal 5: Watershed protection practices incorporate Source Water Protection to protect drinking water supplies.	**SA14:** Encourage states to update their source water delineations, assessments or protection plans to address anticipated climate change impacts.	OGWDW
	SA15: Continue to support collaborative efforts to increase state and local awareness of source water protection needs and opportunities, and encourage inclusion of source water protection areas in local climate change adaptation initiatives.	OGWDW
Goal 6: EPA incorporates climate change considerations into its wetlands programs, including the CWA 404 program, as appropriate.	**SA16:** Consider the effects of climate change, as appropriate, when making significant degradation determinations in the CWA Section 404 wetlands permitting and enforcement program.	OWOW
	SA17: Evaluate, in conjunction with the U.S. Army Corps of Engineers, how wetland and stream compensation projects could be selected, designed, and sited to aid in reducing the effects of climate change.	OWOW
Goal 7: Improve baseline information on wetland extent, condition, and performance to inform long term planning and priority setting that takes into account the potential added benefits for climate change adaptation and carbon sequestration.	**SA18:** Expand wetland mapping by supporting wetland mapping coalitions and training on use of the new federal Wetland Mapping Standard.	OWOW
	SA19: Produce a statistically valid ecological condition assessment of the nation's wetlands.	OWOW
	SA20: Work with partners and stakeholders to develop information and tools to support long term planning and priority setting for wetland restoration projects.	OWOW
VISION AREA 3: COASTAL AND OCEAN WATERS: Adverse effects of climate change along with collective stressors and unintended adverse consequences of responses to climate change have been successfully prevented or reduced in the ocean and coastal environment. Federal, tribal, state and local agencies, organizations, and institutions are working cooperatively; and information necessary to integrate climate change considerations into ocean and coastal management is produced, readily available, and used.		
Goal 8: Collaborate so that information and methodologies for ocean and coastal areas are collected, produced, analyzed, and easily available.	**SA21:** Collaborate so that synergy occurs, lessons learned are transferred, federal efforts effectively help local communities, and efforts are not duplicative or at cross-purposes.	OWOW
	SA22: Work within EPA and with the U.S. Global Change Research Program and other federal, tribal, and state agencies to collect, produce, analyze, and format knowledge and information needed to protect ocean and coastal areas and make it easily available.	OWOW

GOALS AND STRATEGIC ACTIONS		LEAD OFFICE (& PARTNERS)
Goal 9: Support and build networks of local, tribal, state, regional and federal collaborators to take effective adaptation measures for coastal and ocean environments through EPA's geographically targeted programs.	**SA23:** Work with the NWP's larger geographic programs to incorporate climate change considerations, focusing on both the natural and built environments.	OWOW (regions)
	SA24: Address climate change adaptation and build stakeholder capacity when implementing NEP Comprehensive Conservation and Management Plans and through the Climate Ready Estuaries Program.	OWOW
	SA25: Conduct outreach and education, and provide technical assistance to state and local watershed organizations and communities to build adaptive capacity in coastal areas outside the NEP and Large Aquatic Ecosystem programs.	OWOW
Goal 10: Address climate driven environmental changes in coastal areas and provide that mitigation and adaptation are conducted in an environmentally responsible manner.	**SA26:** Support coastal wastewater, stormwater, and drinking water infrastructure owners and operators in reducing climate risks and encourage adaptation in coastal areas.	OWOW
	SA27: Support climate readiness of coastal communities, including hazard mitigation, pre-disaster planning, preparedness, and recovery efforts.	OWOW
	SA28: Support preparation and response planning for impacts to coastal aquatic environments.	OWOW
Goal 11: Protect ocean environments by incorporating shifting environmental conditions and other emerging threats into EPA programs.	**SA29:** Consider climate change impacts on marine water quality in NWP ocean management authorities, policies, and programs.	OWOW
	SA30: Use available authorities and work with the Regional Ocean Organizations and other federal and state agencies through regional ocean groups and other networks so that offshore renewable energy production does not adversely affect the marine environment.	OWOW (regions)
	SA31: Support the evaluation of sub-seabed sequestration of CO2 and any proposals for ocean fertilization.	OWOW
	SA32: Participate in interagency development and implementation of federal strategies through the NOC and the NOC Strategic Action Plans.	OWOW
VISION AREA 4: WATER QUALITY: Our Nation's surface water, drinking water, and ground water quality are protected, and the risks of climate change to human health and the environment are diminished, through a variety of adaptation and mitigation strategies.		
Goal 12: Protect waters of the United States and promote management of sustainable surface water resources.	**SA33:** Encourage states and communities to incorporate climate change considerations into their water quality planning.	OWOW
	SA34: Encourage green infrastructure and low-impact development to protect water quality and make watersheds more resilient.	OWM (OWOW)
	SA35: Promote consideration of climate change impacts by National Pollutant Discharge Elimination System permitting authorities.	OWM
	SA36: Encourage water quality authorities to consider climate change impacts when developing wasteload and load allocations in TMDLs where appropriate.	OWOW

GOALS AND STRATEGIC ACTIONS		LEAD OFFICE (& PARTNERS)
	SA37: Identify and protect designated uses that are at risk from climate change impacts.	OST (OWM)
	SA38: Clarify how to re-evaluate aquatic life water quality criteria on more regular intervals; and develop information to assist states and tribes who are developing criteria that incorporate climate change considerations for hydrologic condition.	OST
Goal 13: As the nation makes decisions to reduce greenhouse gases and develop alternative sources of energy and fuel, work to protect water resources from unintended adverse consequences.	**SA39:** Continue to provide perspective on the water resource implications of new energy technologies.	OWM (OGWDW)
	SA40: Provide assistance to states and permittees to assure that geologic sequestration of CO2 is responsibly managed.	OGWDW (OWOW)
	SA41: Continue to work with States to help them identify polluted waters, including those affected by biofuels production, and help them develop and implement Total Maximum Daily Loads (TMDLs) for those waters.	OGWDW (OWOW, OWM)
	SA42: Provide informational materials for stakeholders to encourage the consideration of alternative sources of energy and fuels that are water efficient and maintain water quality.	OWM (OW IO)
	SA43: As climate change affects the operation or placement of reservoirs, work with other federal agencies and EPA programs to understand the combined effects of climate change and hydropower on flows, water temperature, and water quality.	OWM
Goal 14: Collaborate to make hydrological and climate data and projections available.	**SA44:** Monitor climate change impacts to surface waters and ground water.	OWOW (OGWDW)
	SA45: Collaborate with other federal agencies to develop new methods for use of updated precipitation, storm frequency, and observational streamflow data, as well as methods for evaluating projected changes in low flow conditions.	OW IO
	SA46: Enhance flow estimation using National Hydrography Dataset Plus (NHDPlus).	OWOW
VISION AREA 5: WORKING WITH TRIBES: Tribes are able to preserve, adapt, and maintain the viability of their culture, traditions, natural resources, and economies in the face of a changing climate.		
Goal 15: Incorporate climate change considerations in the implementation of core programs, and collaborate with other EPA Offices and federal agencies to work with tribes on climate change issues on a multi-media basis.	**SA47:** Through formal consultation and other mechanisms, incorporate climate change as a key consideration in the revised NWP Tribal strategy and subsequent implementation of CWA, SDWA, and other core programs.	OW IO
	SA48: Incorporate adaptation into tribal funding mechanisms, and collaborate with other EPA and federal funding programs to support sustainability and adaptation in tribal communities.	OW IO
Goal 16: Tribes have access to information on climate change for decision making.	**SA49:** Collaborate to explore and develop climate change science, information, and tools for tribes, and incorporate local knowledge.	OW IO
	SA50: Collaborate to develop communication materials relevant for tribal uses and tribal audiences.	OW IO

GOALS AND STRATEGIC ACTIONS		LEAD OFFICE (& PARTNERS)
CROSS-CUTTING PROGRAM SUPPORT		
Goal 17: Communicate, Collaborate, and Train.	**SA51:** Continue building the communication, collaboration, and training mechanisms needed to effectively increase adaptive capacity at the federal, tribal, state, and local levels.	OW IO
Goal 18: Track Progress and Measure Outcomes	**SA52:** Adopt a phased approach to track programmatic progress towards Strategic Actions; achieve commitments reflected in the Agency Strategic Plan; work with the EPA Work Group to develop outcome measures.	OW IO
Goal 19: Identify Climate Change and Water Research Needs	**SA53:** Work with ORD, other water science agencies, and the water research community to further define needs and develop research opportunities to deliver the information needed to support implementation of this 2012 Strategy, including providing the decision support tools needed by water resource managers.	OST (OW IO)

What approach can be used to measure adaptation progress?

Overall, the evaluators suggest that the IO move away from developing a single score across all goals and strategic actions. Instead, we suggest that the seven phases of adaptation could be used in one of two ways to assess progress:

1. **Outputs-based approach:** Assess OW's progress on implementing strategic actions, which are mostly EPA outputs. Outputs are products or services that EPA provides, such as technical assistance, trainings, and decision-support tools.
2. **Outputs plus priority outcomes-based approach:** Assess progress on goals, which are mostly outcome-based. Outcomes are changes in awareness, behavior, or condition that result from EPA activities. This approach will include assessing progress on EPA outputs in the initiation and assessment phases of adaptive management, and outcomes in the later stages of adaptive management.

The evaluation team believes outputs plus priority outcomes approach described above will best convey progress towards goals. This approach it will require identifying outcomes associated with each goal using a logic model approach, and gathering data about progress partners are making toward the goals. Note that at this stage of climate change adaptation, given the many uncertainties associated with climate change adaptation and the many factors outside of EPA's control, the evaluators suggest that OW programs should be accountable for outputs, but the focus of tracking progress on outcomes should be for learning, not accountability.

If IO does undertake an outputs plus priority outcomes approach, the summary result for each key outcome could be conveyed as shown in Exhibit 5-2, which provides an example of conveying progress toward the outcome of infrastructure resilience, within Vision Area 1 (Infrastructure). A similar table could be prepared for each priority outcome. The evaluators do not see a reason to aggregate across results, at least not in the near term. However, if IO aggregates results, it needs to be very careful in applying any weighting (implicitly or explicitly). IO needs to be clear in all assumptions, and any weighting should be deliberate and transparent.

EXHIBIT 5-2. REDUCED VULNERABILITY OF INFRASTRUCTURE TO CLIMATE CHANGE RISKS

PHASE	CRITERIA FOR ASSESSING PROGRESS ON GOALS (Green = Phase Has Been Met, Yellow = Phase May Be Met, Orange = Phase Not Yet Met)
1-Initiation	OW conducted a screening assessment to identify the potential implications of climate change for water infrastructure. *(Met)*
2-Assessment	OW has conducted a broad review to better understand how climate change affects water infrastructure, including consulting water utilities. *(Met)*
3-Response Development	In collaboration with partners, OW has developed and distributed information, guides, and tools to assist water utilities in undertaking adaptation, efficiency, and demand/supply management measures. *(In Progress/ May be met)*
4-Initial Implementation	At least 30% of water utilities have conducted initial planning steps and updated planning documents to address climate change risks ***and*** *a few* water utilities have undertaken substantive, on-the-ground adaptation, efficiency, and demand/supply management measures. *(In Progress/ May be met)*
5-Robust Implementation	At least 30% of water utilities have undertaken substantive, on-the-ground efficiency, and demand/supply management measures ***and o***f water utilities that have identified adaptation measures to be implemented in the short-term, at least 30% have undertaken substantive, on-the-ground adaptation measures. *(Not yet met)*

PHASE	CRITERIA FOR ASSESSING PROGRESS ON GOALS (Green = Phase Has Been Met, Yellow = Phase May Be Met, Orange = Phase Not Yet Met)
6-Mainstreaming	At least 70% of water utilities have undertaken substantive, on-the-ground efficiency, and demand/supply management measures and have integrated climate change considerations into their normal processes and operations ***and o***f water utilities that have identified adaptation measures to be implemented in the short-term, at least 70% have undertaken substantive, on-the-ground adaptation measures. *(Not yet met)*
7-Monitoring and Adaptive Management	The water utility sector, independently or in conjunction with OW or other federal agencies, has implemented mechanisms to monitor and evaluate water utility progress, identify lessons learned, incorporate new climate data into planning, and continually improve performance on climate planning and programming. *(Not yet met)*

As a first step in assessing progress on strategic actions, the evaluation team designated each type of strategic action (e.g., technical resources/data development; fostering partnerships/collaboration, etc.) in italics within the description of each strategic action. The evaluation team assigned each strategic action to one of five categories; proposed categories and their definitions are as follows:

- *Policy and/or Guidance Change*: The strategic action directly integrates climate change considerations into new or existing policies, including guidance documents or other policy interpretations.
- *Financial Incentive*: The strategic action encourages consideration of climate change mitigation/adaptation efforts within new or existing financial incentives, including grant and loan programs.
- *Technical Resources/Data Development*: The strategic action develops or refines data, databases, or analytical tools designed to account for climate change scenarios.
- *Technical Assistance/Training*: The strategic action provides partners with technical assistance or training needed to respond to climate change.
- *Fostering Partnerships/Collaboration*: The strategic action establishes partnerships or collaboration among EPA and its partners to address climate change.

Exhibit 5-3 presents the results of this categorization, and Appendix D identifies the assigned category for each strategic action. Overall, the evaluation team found that the majority of strategic actions were focused on providing technical assistance and training, or on providing technical resources and data development.[29]

[29] The evaluation team assigned strategic actions to the above categories according to the desired outcome of the strategic action. For example, Strategic Action 44 (Monitor climate change impacts to surface waters and ground water) is assigned to Technical Resources/Data Development because the intended outcome is for EPA to develop the resources and data necessary to effectively monitor climate change impacts to surface and ground water. The evaluation team assigned strategic actions to a single category to facilitate clarity and ease in communicating results, however in some cases more than one category may be applicable to a single strategic action. In these cases, the evaluation team used the strategic action's most fundamental desired outcome to categorize it. In addition, we only assigned strategic action to the Fostering Partnerships/Collaborations category when no other desired outcome is apparent, as fostering partnerships/collaborations is typically not an outcome in and of itself, and measuring progress on it can be challenging.

EXHIBIT 5-3. FREQUENCY OF STRATEGIC ACTIONS BY TYPE

TYPE OF STRATEGIC ACTIONS	NUMBER OF STRATEGIC ACTIONS
Technical Assistance/Training	19
Technical Resources/Data Development	17
Policy and/or Guidance Change	7
Fostering Partnerships/ Collaboration	5
Financial Incentive	2

Next, to develop a consistent and transparent outputs-based approach to assessing progress along the seven phases of adaptive management, the evaluation team used the baseline information on strategic actions and the description of the seven phases of adaptive management in the 2012 Strategy to assess progress on a sample of strategic actions. The evaluation team's process differed from OW's baseline data interpretation described above in that we conducted a centralized review for all baseline data using explicit considerations for assessing progress, namely the explanations and examples of each phase of adaptive management provided by EPA in the 2012 Strategy (see Exhibit 5-4). Note that even with explicit considerations, the process of assigning strategic actions to a phase of adaptive was subjective because of limited baseline data available. For example, where some regions or HQ offices did not submit baseline data, or where the data provided gave an incomplete picture of the work underway, the evaluation team may have concluded that work has not progressed as far as it has in reality. Thus, moving forward, it is important for IO to collect consistent and comprehensive data to be able to assess progress as objectively as possible.

EXHIBIT 5-4. CONSIDERATIONS FOR ASSESSING PROGRESS AT EACH PHASE OF ADAPTIVE MANAGEMENT (FROM THE 2012 STRATEGY)

NWP PHASES	EXPLANATION	EXAMPLES OF EVIDENCE OF ACHIEVEMENT
1. Initiation	Conduct a screening assessment of potential implications of climate change to mission, programs, and operations.	• Preliminary information is developed to evaluate relevance of climate change to the mission or program; a decision is made as to whether to prepare a response to climate change; further exploration of climate change implications has been authorized. • Accountabilities and responsibilities are assigned at appropriate levels within the organization and resources are available to develop a more in-depth assessment.
2. Assessment	Conduct a broader review to understand how climate change affects the resources in question. Work with stakeholders to develop an understanding of the implications of climate change to the mission, programs, and operations.	• Review science literature and assessments to understand how climate change affects the resources being protected (threat to mission); Engage internal staff and external stakeholders in evaluation. • Identify climate change issues and concerns and communicate with internal and external stakeholders and partners. • Identify which specific programs are threatened and what specific information or tools need to be developed. • Communicate findings to partners and stakeholders and engage them in dialogue on building adaptive capacity.
3. Response Development	Identify changes necessary to continue to reach program mission and goals. Develop initial action plan. Identify and seek the research, information, and tools needed to support actions. Begin to build the body of tools, information, and partnerships needed to build capacity internally and externally.	• Develop initial program vision and goals for responding to climate change. • Identify needed response actions or changes that will allow the organization to begin to address climate impacts on its mission. • Initiate strategies and actions in a few key areas to begin to build organizational ability to use climate information in decision processes. • Identify program partners' needs for building adaptive capacity. • Begin working with an external "community of practice" to engage in tool and program development. • Rudimentary methods are put in place to track progress. • Develop a research strategy and partnerships to obtain additional needed research.
4. Initial Implementation	Initiate actions in selected priority programs or projects.	• Make it clear within the organization that incorporating climate change into programs is critical. • Initiate actions and plans identified in Step 3. • Initiate cooperative projects with partners. • Develop a range of needed information and tools. • Begin to institute changes to incorporate climate change into core programs. • Some program partners have begun to implement response actions.
5. Robust Implementation	Programs are underway and lessons learned are being applied to additional programs and projects.	• Lessons learned are evaluated and strategies are refined. • Efforts are initiated to consider climate change in additional, or more complex, program elements. • Continue to institute institutional changes to incorporate climate change into core programs. • External communities of practice are in place to support ongoing capacity development.
6. Mainstreaming	Climate is an embedded, component of the program.	• The organization's culture and policies are aligned with responding to climate change. • All staff have a basic understanding of climate change causes and impacts. • All relevant programs, activities, and decision processes intrinsically incorporate climate change. • Methods for evaluating outcomes are in place.
7. Monitoring and Adaptive Management	Continue to monitor and integrate performance, new information, and lessons learned into programs and plans.	• Progress is evaluated and needed changes are implemented. • As impacts of climate change unfold, climate change impacts and organizational responses are reassessed.

As an illustration of how the framework could work, the evaluation team has categorized progress for strategic actions related to one goal within each vision area (see Exhibit 5-5). For each strategic action, we assessed if work within each phase of adaptive management is fully underway, partially underway, may have just begun, or may not yet have begun. The evaluation team's assessment depends not only on the nature of the activities underway, but also the extent to which multiple regions were undertaking activities. If only one to two regions reported activities underway related to a certain phase of adaptive management, The evaluation team concluded the "phase has begun," while three to five regions reporting activities within a phase indicated the "phase is partially underway," and six or more regions reporting work within a phase indicated the "phase is fully underway." Note that where a phase is fully underway, OW will loop back to reassess as new information becomes available (except in the case of the initiation phase). In other cases we did not have enough information to assess the status of the strategic action, or the phase is not applicable to the strategic action, or the strategic action is not expressed in a measurable way. The key below designates these different statuses within each phase of adaptive management. Exhibit 5-6 documents examples of activities OW has undertaken as part of each of the four strategic actions and the evaluation team's rationale for categorizing these strategic actions according to the identified phases of adaptive management.

The results of this assessment suggest, based on available data, indicate that OW is further along in supporting adaptive management for goals 1 and 3 compared to goals 11, 13, and 15, but that OW has not progressed beyond the "initial implementation" stage for any of the five goals assessed.

Note that this assessment is intended only as an illustration, as the evaluation team has made the assessment based on limited baseline information as discussed above. If OW moves forward with using this measurement approach, it should review the evaluation team's work with the description of each phase of adaptive management in mind, and modify the assessments as needed. In addition, we suggest that the IO request that HQ offices and regions review, and if necessary, update or supplement the baseline data they have provided. The IO could then implement this assessment process for the full set of strategic actions, and as part of the process, document the rationale for categorizing the SAs according to the phases of adaptive management. The IO could summarize assessment results in graphic and narrative form. If OW decides to identify priority strategic actions, then it would be necessary to apply this approach only to those strategic actions.

EXHIBIT 5-5. ASSESSMENT OF STRATEGIC ACTIONS ACCORDING TO PHASES OF ADAPTIVE MANAGEMENT, FOR FIVE SAMPLE GOALS

KEY:

↻	Phase is fully underway; for all phases except initiation, OW will loop back to reassess as new information becomes available
	Phase is partially underway
	Phase has begun
	Phase has not yet begun
?	The evaluation team does not have enough information to assess status
	Phase is not applicable to strategic action
N/A	Strategic action is not measurable

Abbreviations used in the table: Area (A); Goal (G); Strategic Action (SA)

AREA	GOAL	STRATEGIC ACTION	PHASE OF ADAPTIVE MANAGEMENT						
			1 INITIATION	2 ASSESSMENT	3 RESPONSE DEVELOPMENT	4 INITIAL IMPLEMENTATION	5 ROBUST IMPLEMENTATION	6 MAINSTREAMING	7 MONITORING & ADAPTIVE MGMT
A1: Infrastructure	G01: Build the body of information and tools needed to incorporate climate change into planning and decision making.	SA01: Improve access to vetted climate and hydrological science, modeling, and assessment tools through the Climate Ready Water Utilities program. (*technical resources/data development)*							
		SA02: Assist wastewater and water utilities to reduce greenhouse gas emissions and increase long-term sustainability with a combination of energy efficiency, co- generation, and increased use of renewable energy resources. *(technical assistance/training)*							
		SA03: Work with the states and public water systems, particularly small water systems, to identify and plan for climate change challenges to drinking water safety and to assist in meeting health based drinking water standards. *(technical assistance/training)*							
		SA04: Promote sustainable design approaches to provide for the long-term sustainability of infrastructure and operations. *(technical assistance/training)*							
A2: Watersheds & Wetland	G3: Identify, protect, and maintain a network of healthy	SA8: Develop a national framework and support efforts to protect remaining healthy watersheds and aquatic ecosystems *(technical resources/data development)*							

AREA	GOAL	STRATEGIC ACTION	PHASE OF ADAPTIVE MANAGEMENT						
			1 INITIATION	2 ASSESSMENT	3 RESPONSE DEVELOPMENT	4 INITIAL IMPLEMENTATION	5 ROBUST IMPLEMENTATION	6 MAINSTREAMING	7 MONITORING & ADAPTIVE MGMT
	watersheds and supportive habitat corridor networks	SA9: Collaborate with partners on terrestrial ecosystems and hydrology so that effects on water quality and aquatic ecosystems are considered *(fostering partnership/collaboration)*							
		SA10: Integrate protection of healthy watersheds throughout the NWP core programs (*policy and/or guidance change)*		?	?				
		SA11: Increase public awareness of the role and importance of healthy watersheds in reducing the impacts of climate change *(technical assistance/training)*							
A3: Coastal & Ocean Waters	G11: Protect ocean environments by incorporating shifting environmental conditions and other emerging threats into EPA programs	SA29: Consider climate change impacts on marine water quality in NWP ocean management authorities, policies, and programs. (*policy and/or guidance change)*							
		SA30: Use available authorities and work with the Regional Ocean Organizations and other federal and state agencies through regional ocean groups and other networks so that offshore renewable energy production does not adversely affect the marine environment. *(technical assistance/training)*							
		SA31: Support the evaluation of sub-seabed sequestration of CO2 and any proposals for ocean fertilization. *(technical assistance/training)*							
		SA32: Participate in interagency development and implementation of federal strategies through the NOC and the NOC Strategic Action Plans. *(fostering partnership/collaboration)*		?					

AREA	GOAL	STRATEGIC ACTION	PHASE OF ADAPTIVE MANAGEMENT						
			1	2	3	4	5	6	7
			INITIATION	ASSESSMENT	RESPONSE DEVELOPMENT	INITIAL IMPLEMENTATION	ROBUST IMPLEMENTATION	MAINSTREAMING	MONITORING & ADAPTIVE MGMT
Water Quality	G13: As the nation makes decisions to reduce its greenhouse gas emissions and develop alternative sources of energy and fuel, the NWP will work to protect water resources from unintended adverse consequences.	SA39: Continue to provide perspective on the water resource implications of new energy technologies. (*technical assistance/training*)							
		SA40: Provide assistance to states and permittees to assure that geologic sequestration of CO2 is responsibly managed. (*technical assistance/training*)							
		SA41: Continue to work with States to help them identify polluted waters, including those affected by biofuels production, and help them develop and implement Total Maximum Daily Loads (TMDLs) for those waters. *(technical resources and data development)*	?						
		SA42: Provide informational materials for stakeholders to encourage the consideration of alternative sources of energy and fuels that are water efficient and maintain water quality. (*technical resources and data development*)	?	?					
		SA43: As climate change affects the operation or placement of reservoirs, EPA will work with other federal agencies and EPA programs to understand the combined effects of climate change and hydropower on flows, water temperature, and water quality. (*technical resources and data a development*)	?						
Working with Tribes	G15: Incorporate climate change considerations in the implementation of core programs, and to collaborate with other EPA offices and federal agencies to work with tribes on climate change issues on a multi-media basis.	SA47: Through formal consultation and other mechanisms, incorporate climate change as a key consideration in the revised NWP Tribal strategy and subsequent implementation of CWA, SDWA, and other core programs. (*policy change*)							
		SA48: Incorporate adaptation into tribal funding mechanisms, and collaborate with other EPA and federal funding programs to support sustainability and adaptation in tribal communities. (*financial incentive change*)	?						

EXHIBIT 5-6. EXAMPLES OF WORK UNDER STRAETGIC ACTIONS & RATIONALE FOR LINKING STRATEGIC ACTIONS TO PHASES OF ADAPTIVE MANAGEMENT (AM)

STRATEGIC ACTION	EXAMPLES OF WORK UNDER STRATEGIC ACTION	RATIONALE FOR LINKING TO PHASE OF ADAPTIVE MANAGEMENT
SA01: Improve access to vetted climate and hydrological science, modeling, and assessment tools through the Climate Ready Water Utilities program.	▲ OGWDW has developed a new version of the Climate Resilience Evaluation and Awareness Tool (CREAT) that includes embedded basic and advanced video training modules and allows utilities to conduct analysis comparison scenarios for multiple time periods. Pilots were conducted in Oakland, California and Wilmington, Delaware for the updated software. ▲ OGWDW developed trainings on using the CREAT tool as part of its Climate Ready Water Utilities webinar series. ▲ For three recent pilot projects intended to increase coordination between EPA's Climate Ready Water Utilities and Climate Ready Estuaries programs, CREAT was used to conduct a joint risk assessment with watershed partners to identify current and future climate threats and adaptation options.	Rationale for linking to AM phase 2/3: EPA has developed a new version of its CREAT tool that contains embedded training modules and enables more powerful analyses. Moreover, EPA has initiated trainings on the tool and is using the tool to facilitate dialogue among internal programs and external partners about climate risks and adaptation options. These actions correspond to some of the criteria for AM phase 3, including "begin to build the body of tools, information, and partnerships needed to build capacity internally and externally" and "begin working with an external community of practice to engage in tool and program development."
SA02: Assist wastewater and water utilities to reduce greenhouse gas emissions and increase long-term sustainability with a combination of energy efficiency, co- generation, and increased use of renewable energy resources.	▲ In February 2012, OWM finalized and released the *Planning for Sustainability Handbook for Water and Wastewater Utilities* (EPA-832-R-12-001). ▲ In February 2012, OGWDW updated the CRWU Toolbox, a website that provides hundreds of climate-related resources for water utilities. ▲ During 2012, OWM conducted five webinars to educate water and wastewater utilities about the handbook and about facility energy management. ▲ In Region 1, over 100 municipal water/wastewater facilities have participated in roundtable discussions and have been trained on energy management plans. Two wastewater facilities are near zero net energy and at least four others are working on plans to reach Zero Net Energy. ▲ Region 1 has begun drafting an academic paper analyzing existing energy use by the municipal wastewater sector in MA, RI, and VT. Region 4 is developing an energy efficiency toolkit for energy efficiency for water and wastewater utilities. ▲ Region 4 developed and implemented an Energy Management Initiative (EMI) with the collaboration of the Tennessee Department of Environment and Conservation (TDEC) to work with water & wastewater public utilities in TN to save energy and reduce their Carbon footprint ▲ Region 7 supported the Kansas Department of Health and the Environment with the implementation of an asset/energy management training focused on Small Systems. ▲ Region 9 conducted a webinar program designed to help water and wastewater utilities identify and implement energy efficiency or clean energy generation projects. ▲ Region 9 continued its partnership with the U.S. Department of Energy Industrial Assessment Centers to provide 10 energy audits to wastewater treatment facilities in Region 9.	Rationale for linking to AM phase 3/4: EPA HQ and EPA regions have begun creating and disseminating a range of technical resources to assist partners in reducing greenhouse gas emissions from utility operations. Likewise, utilities have begun to take action to reduce their emissions. Nevertheless, there remains limited on the ground activity in terms of renewables, energy efficiency, and cogeneration. Therefore, phase 4 is partially underway. The actions of EPA and its partners align with some of the criteria for phase 4, including "make it clear within the organization that incorporating climate change into programs is critical," "initiate cooperative projects with partners," and "develop a range of needed information and tools."

STRATEGIC ACTION	EXAMPLES OF WORK UNDER STRATEGIC ACTION	RATIONALE FOR LINKING TO PHASE OF ADAPTIVE MANAGEMENT
	✦ During 2012, Region 9 expanded its Biogas Mapping Tool, researched biogas characteristics, and worked with California agencies and other interested entities to remove technical and regulatory barriers that currently discourage the use of biogas.	
SA03: Work with the states and public water systems, particularly small water systems, to identify and plan for climate change challenges to drinking water safety and to assist in meeting health based drinking water standards.	✦ Under EPA and USDA's Rural Development Rural Utilities Service MOA, "Promoting Sustainable Rural Water and Wastewater Systems", the two agencies co-sponsored two workshops in California and Michigan for small system managers and operators that provided training in utility management principles, based on the proven management approaches including EPA's own primer on "Effective Utility Management". Workshop attendees learned techniques to evaluate each utility's strengths and weaknesses and to improve and measure utility performance. ✦ Region 7 supported the Kansas Department of Health and the Environment with the implementation of an asset/energy management training focused on Small Systems.	Rationale for linking to AM phase 2: EPA and USDA have created an MOA to promote sustainable small water systems, and have begun doing so through a series of workshops. Region 7 has supported a partner with energy management training. These actions correspond to the criteria for AM phase 2, including "communicate findings to partners and stakeholders and engage them in dialogue on building adaptive capacity" and "work with stakeholders to develop an understanding of climate change implications."
SA04: Promote sustainable design approaches to provide for the long-term sustainability of infrastructure and operations.	✦ In February 2012, OWM finalized and released the *Planning for Sustainability Handbook for Water and Wastewater Utilities* (EPA-832-R-12-001). OWM conducted five webinars to educate water and wastewater utilities about the handbook and about facility energy management. ✦ NWP is working with the Office of Sustainable Community and 3 states (NY, MD, and CA) to identify action that can be taken to integrate EPA-HUD-DOT partnership sustainability principles into the Clean Water SRF program. ✦ Region 4 developed and implemented an Energy Management Initiative (EMI) with the collaboration of the Tennessee Department of Environment and Conservation (TDEC) to work with water & wastewater public utilities in TN to save energy and reduce their Carbon footprint. ✦ In Region 6, Dallas-Fort Worth Airport is investing $1.75 billion in changes that will utilize water efficiency, green infrastructure and green management concepts for terminals A, B, C and E. Terminal restroom changes are currently 90% complete with 230 WaterSense labeled urinals and 600 water efficient toilets and sinks installed.	Rationale for linking to AM phase 3: EPA has released a technical guidance handbook and is working with partners to identify sustainable infrastructure practices and take steps to conserve water at utilities and an airport. These actions correspond to AM phase 3 criteria, including but not limited to "begin working with an external community of practice to engage in tool and program development" and "identify program partners' needs for building adaptive capacity."
SA8: Develop a national framework and support efforts to protect remaining healthy watersheds and aquatic ecosystems.	✦ In February of 2012 the EPA released the technical guide "Identifying and Protecting Healthy Watersheds: Concepts, Assessments, and Management Approaches" This document provides a framework for supporting state efforts to protect a national framework of remaining healthy watersheds. This document was created with many partners across multiple state and federal agencies. ✦ In partnership with VA DEQ, EPA helped complete a hydrologic flow assessment with the state of Virginia in July 2012, technical document, "Virginia Ecological Limits of Hydrologic Alteration (ELOHA): Development of Metrics of Hydrologic Alteration." This document ties landscape alteration and flow alteration together and examines the effects on aquatic life. (originally classified under SA9) ✦ In 2012 OGWDW completed PWS density maps by state or HUC 12 which are available in MyWaters at "http://watersgeo.epa.gov/mwm/" – these maps identify the names and population by PWSs. (originally classified	Rationale for linking to AM phase 3/4: EPA has released a technical guide for identifying and protecting watersheds and has completing some maps, therefore it seems that EPA meeting the criteria of "beginning to build the body of tools, information, and partnerships needed to build capacity" described in AM Phase 3; in addition EPA has developed partnerships with VA and other states, thus the agency has "Initiated cooperative projects with partners" as described in AM Phase 4

STRATEGIC ACTION	EXAMPLES OF WORK UNDER STRATEGIC ACTION	RATIONALE FOR LINKING TO PHASE OF ADAPTIVE MANAGEMENT
	under SA9)	
SA9: Collaborate with partners on terrestrial ecosystems and hydrology so that effects on water quality and aquatic ecosystems are considered.	▲ OGWDW provided logistical support for several dozen state meetings on source water protection matters over the last few years. ▲ OGWDW regularly participated in interagency and public climate change forums to better understand the technical issues in meeting climate change challenges ▲ In 2009 – 2012 OGWDW met periodically with federal agencies (e.g., USACE, NOAA, USGS, USBR) to coordinate our planning for technical assistance to states and water utilities in climate change adaptation.	Rationale for linking to AM phase 2/3: EPA is meeting with partners, including states and other federal agencies, therefore it seems that the agency is "engaging partners and stakeholders in dialog" (AM Phase 2) and starting to develop an external "community of practice" (AM Phase 3). However, the baseline data does not mention "initiating cooperative projects with partners" therefore it does not appear that the Agency has yet entered AM Phase 4.
SA10: Integrate protection of healthy watersheds throughout the NWP core programs.	▲ 319 grant guidelines have been revised to include more flexibility in use of funds for protecting healthy watersheds	Rationale for linking to AM phase 4: EPA has "begun to institute changes to incorporate climate change into core programs." However, the baseline data does not describe work that would fit under AM phase 2 or 3.
SA11: Increase public awareness of the role and importance of healthy watersheds in reducing the impacts of climate change.	▲ Release of technical document http://water.epa.gov/polwaste/nps/watershed/hw_techdocument.cfm and Action Plan http://water.epa.gov/polwaste/nps/watershed/hwi_action.cfm ▲ SE region: The program participates in the Nature's Notebook project of the National Phenology Network. Nature's Notebook trains citizens to monitor how keystone plant and animal species in their own backyards or nearby wild areas are responding to climate change. Workshops to train citizen-scientists were held in 2012. ▲ SE region: The Mobile Bay National Estuary Program initiated a watershed management planning effort for Three Mile Creek just north of Mobile Alabama. The project includes a climate change vulnerability assessment and a community outreach effort to educate an EJ community regarding potential vulnerabilities.	Rationale for linking to AM phase 1: EPA HQ and one region has begun to increase public awareness, but efforts to date are limited, and there is not yet evidence of a coordinated outreach campaign.
SA29: Consider climate change impacts on marine water quality in NWP ocean management authorities, policies, and programs.	▲ HQ: OWOW issued a memo recommending consideration in listings of waters for pH impairments if appropriate. OCPD has assigned staff to monitor the issue. EPA's ocean acidification workgroup has been meeting monthly to keep interested people informed. Likewise, the workgroup is doing a screening to see what could be done with regard to acidification problems in coastal/near shore waters.	Rationale for linking to AM phase 1/2: EPA has issued a memo recommending assessment of acidification effects, and has mobilized staff to monitor the problem. Furthermore, a workgroup has begun screening potential solutions to acidification. These actions correspond to some of the criteria for AM phase 2, including "identify climate change issues and concerns and communicate with internal and external stakeholders and partners" and "communicate findings to partners and stakeholders and engage them in dialogue on building adaptive capacity." This SA does not appear to have entered AM Phase 3.
SA30: Use available authorities and work with the Regional Ocean Organizations and other federal and state agencies through regional ocean groups and other networks so that offshore renewable energy production does not adversely affect the marine environment.	▲ No action taken.	No known action to date.

STRATEGIC ACTION	EXAMPLES OF WORK UNDER STRATEGIC ACTION	RATIONALE FOR LINKING TO PHASE OF ADAPTIVE MANAGEMENT
SA31: Support the evaluation of sub-seabed sequestration of CO2 and any proposals for ocean fertilization.	▲ HQ: EPA serves on the US delegation to the London Convention and London Protocol and has supported convention activities, including a statement regarding ocean fertilization and guidance for sub seabed carbon capture and sequestration. ▲ HQ: OWOW, in coordination with OGC, OGWDW, and OAR, has formed an interagency working group with the Department of Interior/Bureau of Ocean Energy Management to address technical, regulatory, and other issues associated with offshore carbon capture and storage (sub-seabed sequestration of CO2).	Rational for linking to AM phase 1/2: EPA has provided guidance on sub seabed carbon capture to the London Convention and Protocol and has formed an interagency working group to begin addressing the technical and regulatory issues associated with carbon capture. These actions demonstrate achievement of some phase 2 criteria, including "identify climate change issues and concerns and communicate with internal and external stakeholders and partners" and "communicate findings to partners and stakeholders and engage them in dialogue on building adaptive capacity."
SA32: Participate in interagency development and implementation of federal strategies through the NOC and the NOC Strategic Action Plans.	▲ EPA has been actively involved in writing and implementing the National Ocean Council Strategic Action Plan for the last three to four years.	Rationale for linking to AM phase 4: EPA's active involvement in writing and implementing the National Ocean Council's Strategic Plan fulfills several criteria for AM phase 4, including "initiate cooperative projects with partners" and "begin to institute changes to incorporate climate change into core programs."
SA39: Continue to provide perspective on the water resource implications of new energy technologies.	▲ OW published "Principles for an Energy-Water Future" at http://water.epa.gov/action/energywater.cfmincluding the following concepts: end-user water and energy efficiency, a water-wise energy sector, an energy-wise water sector, viewing wastewater as a source of renewable resources, integrated resource planning, and maximizing social benefits. ▲ OW is engaging in dialogue with DOE	Rationale for linking to AM phase 3/4 : OW has published a guidance document that provides perspective on the water resource implications of new energy technologies, indicating that they have begun to "build the body of tools, information, and partnerships needed to build capacity" described in AM phase 3. Additionally, the publication of this document and the engagement in dialogue with DOE serves as evidence of "developing a range of needed information and tools" and "initiating cooperative projects with partners" as described in AM phase 4. Finally, this SA calls for EPA to "continue to provide perspective" meaning that EPA will have to reassess progress as new information becomes available.
SA40: Provide assistance to states and permittees to assure that geologic sequestration of CO2 is responsibly managed.	▲ OWOW works directly with stakeholders to support potential permits for CO2 sequestration under the Underground Injection Control program. ▲ OWOW plans to Participate in and present at national meetings and workshops to communicate rule requirements to ensure that states and permit applicants are able to submit Class VI permit applications that meet the Class VI requirements and ensure protection of USDWs. ▲ OWOW plans to coordinate with states interested in primacy for Class VI: developing and evaluating a regulatory crosswalk and other pieces of a Class VI primacy application. ▲ OWOW plans to conduct the formal rulemaking process for any states that finalize their primacy applications during the FY13 timeframe. ▲ Region 4 submitted comments on a Class V CO2 experimental permit application and draft UIC permit which was eventually issued by the Alabama Department of Environmental Management to Denbury Onshore. ▲ Region 4 received and reviewed post injection monitoring reports from permittees for two Class V CO2 experimental wells in Kentucky (DI state). ▲ Region 4 submitted comments to the Florida Department of Environmental Protection on a Class V CO2 experimental permit application for a proposed CO2 sequestration project near Tampa, Florida.	Rationale for linking to AM phase 4 : EPA has worked with the States and other stakeholders to support permitting of CO2 sequestration projects as described in AM phase 4. The Alabama DEM issued an experimental Class V CO2 permit application, thus meeting the AM phase 4 requirements that "some program partners have begun to implement response actions." Additionally, by a partner issuing an experimental permit, the AM phase 4 description "Initiate actions in selected priority programs or projects" has been met.

STRATEGIC ACTION	EXAMPLES OF WORK UNDER STRATEGIC ACTION	RATIONALE FOR LINKING TO PHASE OF ADAPTIVE MANAGEMENT
SA41: Continue to work with States to help them identify polluted waters, including those affected by biofuels production, and help them develop and implement Total Maximum Daily Loads (TMDLs) for those waters.	➢ No Baseline Data Received	Rationale for not assessing AM status: The evaluation team did not receive any baseline data for this strategic action.
SA42: Provide informational materials for stakeholders to encourage the consideration of alternative sources of energy and fuels that are water efficient and maintain water quality.	➢ OWM completed an Energy Management Progress Report documenting OWM and Regional efforts to assist utilities in developing energy management plans based on OWM's Energy Management Guidebook. ➢ OWM conducted three webinars on energy management for utilities and two on the Planning for Sustainability Handbook.	Rationale for linking to AM phase 3: EPA has conducted a series of webinars on energy management for utilities and planning for sustainability, indicating they have "identified program partners' needs for building adaptive capacity" as described in AM phase 3. Also, by completing an Energy Management Progress Report that documents OWM and Regional efforts to assist utilities in developing energy management plans based on OWM's Energy Management Guidebook, EPA has met the AM phase 3 criteria of "rudimentary methods are put in place to track progress."
SA43: As climate change affects the operation or placement of reservoirs, EPA will work with other federal agencies and EPA programs to understand the combined effects of climate change and hydropower on flows, water temperature, and water quality.	➢ OWM is involved with a project to develop a tool to estimate critical low flow conditions for all waters within the National Hydrography Dataset (NHD).	Rationale for not assessing AM status: The evaluation team does not have enough information about EPA's involvement in the tool to estimate critical low flow conditions for all waters within the National Hydrography Dataset (NHD) to assess progress.
SA47: Through formal consultation and other mechanisms, incorporate climate change as a key consideration in the revised NWP Tribal strategy and subsequent implementation of CWA, SDWA, and other core programs. (Policy Change)	➢ Region 1 has conducted tribal consultation with 10 federally recognized tribes in New England regarding the draft *National Water Program Climate Change Strategy*, including briefing on monthly RTOC conference calls and site visits. ➢ Region 1 Held a New England Federal Partners session at the October 2011 Regional Tribal Environmental Training Workshop to discuss federal agencies' climate change activities and services/products available to tribes.	Rationale for linking to AM Phase 2: Region 1 has worked with stakeholders and partners to develop an understanding of the implications of climate change by consulting with federally recognized tribes on the draft *National Water Program Climate Change Strategy*. Additionally, they have communicated with internal and external stakeholders and partners the New England Federal Partners Session at the 2011 Regional Tribal Environmental Training Workshop.
SA48: Incorporate adaptation into tribal funding mechanisms, and collaborate with other EPA and federal funding programs to support sustainability and adaptation in tribal communities. (Financial Incentive Change)	➢ Region 5 reports that several tribes in the region have included climate change adaptation work as a priority in their Tribal Environmental Agreements.	Rationale for not assessing AM status: The baseline data for this strategic action is too vague to determine an appropriate AM phase.

Considerations for Using an Outputs-Based Appraoch

The outputs-based measurement approach, which designates what phase of adaptive management OW has reached in implementing the strategic actions, is, in the evaluation team's view, a reasonable and feasible approach to measuring progress on the 2012 Strategy. One particular advantage of this approach is that it uses data that OW HQ offices and regions can provide, and does not require collecting data from partners outside of EPA (e.g., other federal agencies, states, local agencies, or NGOs). In addition, this measurement approach focuses on the work that OW can directly influence (i.e., the strategic actions), rather than work undertaken by partners which may be largely outside of OW's control. Moreover, this approach does not require aggregation across diverse strategic actions, and the corresponding complications of determining an appropriate weighting scheme. However, this measurement approach does raise issues and challenges, as described below.

- **Uncertain connection to progress on goals:** Measuring progress on outputs does not necessarily gauge progress on OW's goals. Since achieving the outcomes relies on the work of many external partners and factors outside of OW's control, it is possible that OW may fully implement strategic actions and yet progress on the ultimate goals may fall short. This approach says more about HQ office and regional activities than achievement of ultimate climate change adaptation goals.
- **Imperfect alignment of strategic actions and adaptive management phases:** Some strategic actions cannot be mapped well to the seven phase adaptive management framework. For example, SA39: "Continue to provide perspective on the water resource implications of new energy technologies," is framed as an ongoing activity that does not fit well with the progress from initiation to response development to implementation assumed in the seven phases of adaptive management. Other strategic actions fit within the first few phases of adaptive management, but the later phases (e.g., robust implementation, mainstreaming, and monitoring and adaptive management) do not apply. For example, SA11: "Increase public awareness of the role and importance of healthy watersheds in reducing the impacts of climate change," does not fit within the concepts of implementation, mainstreaming, or adaptive management, where the focus is on implementing programs or projects rather than raising awareness.
- **Progress through phases of adaptive management is not linear**: The seven phases of adaptive management imply that HQ offices and regions will make stepwise progress, from initiation and assessment to response development, implementation, and so on. In reality, HQ offices and regions may not conduct a thorough assessment before developing responses, and early steps in implementation (e.g., pilot projects) may in fact be part of the assessment phase, as EPA and partners work together to determine what responses are needed to climate change. In addition, HQ offices and regions will likely need to double back and reconsider earlier steps as new information becomes available. Thus while the seven phases of adaptive management presents a clear conceptual framework that makes sense overall, for any particular strategic action OW's work may not progress in a linear fashion. The scoring framework shown in Exhibit 5-4 seeks to convey the potential non-linear nature of OW's work.
- **Specific nature of the OW commitment:** Many of the strategic actions do not clearly define the specific nature of OW's commitment. They are often broadly written and do not identify specific activities that OW is planning to take. For example, in strategic actions involving partners, it is often unclear what actions OW will take relative to the other partners (e.g., providing funding, technical assistance, developing tools, etc.). Additionally, many of the strategic actions employ vague and/or ambiguous terms such as *intend*, *consider*, *encourage*, *promote*, and *collaborate*, which muddle

OW's expected outputs. To facilitate measurement, the strategic actions should clearly define OW's role and provide an anticipated output that can be used to gauge progress.

- **Audiences:** Many actions relate to partnerships or conveying information to key audiences, but those audiences are often not well defined. Often there are multiple levels of audiences NWP is trying to reach. It will be important for HQ offices and regions to identify specifically which audiences they seek to influence, to the extent possible. For example, when working on a technical document, OW Offices should articulate who they expect will read and use the document, and which partners will ultimately be influenced by the work.
- **Criteria for measuring progress**: The seven phases currently don't have clear and universally applicable criteria for meeting each phase. However, given the diversity of strategic actions, it is inherently difficult to devise a single set of criteria that applies to strategic actions in a diverse range of areas (e.g. Infrastructure & Working with Tribes). Nonetheless, this leaves measurement open to interpretation and lack of consistency. As such, using the above approach requires careful judgment to apply general descriptions associated with each phase of adaptive management included in the 2012 Strategy, combined with synthesis of information submitted on each strategic action using clear decision rules.
- **Anecdotal data**: It is difficult to gauge how much progress has been made based on examples of work, without full information about work undertaken that is relevant to each strategic action. It is not clear whether the baseline data collected to date represents a comprehensive description of HQ office and regional efforts on climate change adaptation. To use the data to measure progress, it will be important to have a comprehensive and detailed description of work completed and underway.
- **Scale**: It is difficult to gauge progress without a good sense of the full scope of work to be completed (e.g., how many partners need to be engaged, how many regions need to take action, how many guidance documents need to be written). As part of the description of work completed and underway, HQ offices and regions would ideally describe their efforts in the context of the full scope of activities they intend to complete (e.g., "we have engaged eight out of 10 identified partners.") However, it may be inherently difficult to know upfront the scope of the work needed, particularly at the assessment and response development phases.
- **Data Consistency and Quality**: The baseline data OW collected illustrate challenges of data consistency and quality that are important to address in any measurement system. For example, HQ offices and regions sometimes cited future plans or past activities as examples of current progress on strategic actions. Some HQ offices and regions also included activities that were only tangentially related to the strategic actions. Finally, the template OW used to collect baseline data was open ended, which allowed inconsistent responses. For example, HQ offices and regions could describe progress on any strategic action they chose. The template also asked about future plans instead of focusing on current progress. These challenges resulted in a baseline dataset that lacked coherence and prevented comparison among HQ offices and regions. See Appendix E for more details on these issues, and general guidance for ensuring data consistency and quality moving forward.

The evaluation team has summarized the advantages and disadvantages of an outputs-based approach, compared to an outputs plus priority outcomes based approach, in Exhibit 5-7 below.

EXHIBIT 5-7. PROS AND CONS OF THE OUTPUTS-BASED APPROACH

ADVANTAGES	DISADVANTAGES
EPA staff are more comfortable measuring progress where they have direct influence Data can be collected from internal sources only Ability to make progress on outputs is more certain If outputs are accomplished, it can generally be attributed to EPA efforts	Achieving strategic actions does not necessarily lead to achieving goals; output measures do not directly track progress on goals Some OW strategic actions do not map well to seven phases of adaptive management It is difficult to develop broadly applicable criteria for meeting each phase of adaptive management Progress through phases of adaptive management is not always linear

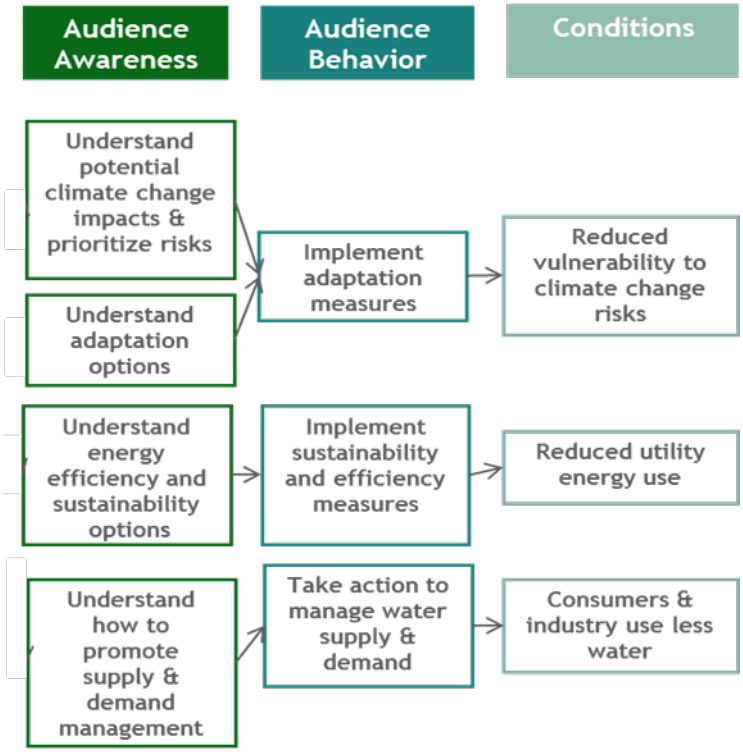
Outputs plus Priority Outcomes-Based Approach

Given the potential limitations of focusing on outputs for measuring progress on adaptive management, the evaluation team recommends developing a measurement approach that encompasses outputs and priority outcomes, and uses the framework of the seven phases of adaptive management to assess progress. The evaluation team finds that the seven phases represent a reasonable approach to assessing adaptation progress on the 2012 Strategy, given the broad and diverse nature of the goals identified therein. The seven phases provide a general framework to summarize progress for each of the five vision areas and for the strategy as a whole. It can be applied across many different types of goals and activities, and at different geographic scales (e.g., states, regions, and nation-wide). This section describes how OW could develop an outputs plus priority outcomes-based approach by applying the seven phases to the goals included in the 2012 Strategy.

Using an outputs plus priority outcomes approach, OW would interpret the seven phases differently than discussed in the previous section on using strategic actions to track progress on adaptive management. In the previous section, we interpreted OW's progress on the seven phases as related to progress on implementing OW's *strategic actions*; here we interpret "implementation" in Phases 4-7 to refer to *on-the-ground activities*, which are typically conducted by OW's partners.

The evaluation team suggests starting with the logic models to define the outcomes that OW is seeking to achieve. The logic models identify changes in condition sought for each of the five vision areas. For example, Area 1: Infrastructure changes in condition sought are reduced vulnerability to climate change risks, reduced utility energy use, and reduced water use by consumers and industry (see Exhibit 5-8). OW could measure progress towards adaptive management on these outcomes. Note that because this measurement approach will likely require an investment of time to gather and assess the needed data, the evaluation team suggests that OW use this measurement approach only for *priority outcomes*.

EXHIBIT 5-8. AREA 1: INFRASTRUCTURE OUTCOMES



Once OW identifies high priority outcomes it seeks to achieve, then it will be necessary to identify criteria that needed to be satisfied to meet each adaptation phase, for each outcome. In Exhibit 5-9, the evaluation team provides examples of such criteria for the outcome of reduced vulnerability of infrastructure to climate change risks, and our assessment of progress toward achieving these outcomes based on the criteria and available data.

- Note that Phases 1 – 3 incorporate OW *outputs*, e.g., conducting a screening assessment to identify the potential implications of climate change for water infrastructure and developing and distributing information and tools to water utilities.
- Phases 4-7 cover *outcomes*, specifically water utility progress on planning for climate change, and undertaking on-the-ground measures where called for by plans.

Phases 4-7 are set up as graduated phases; for example, Phase 4/Initial Implementation can be pegged to 30% of the target audience taking action, while Phase 5 may be pegged to 50% or 70%. Phases 4-7 are shaded in the Exhibit 5-9 to denote that these phases are generally outside of OW's direct sphere of influence, although OW may play a role in Phase 7. It is important to note that these are just examples of criteria; if OW were to take the above approach, it would need to develop clear and appropriate criteria in collaboration with staff responsible for each priority outcome.

After OW has defined appropriate criteria, it will be necessary to collect data on what progress has been achieved toward the outcomes, and then assess progress based on whether there is evidence of meeting the criteria at each stage for each priority outcome. OW could document this information as in Exhibit 5-9 below. OW may want to pilot this approach with just a few priority outcomes. After a pilot

phase, OW would have more information to determine if the approach is workable and could be scaled up to encompass the entire 2012 Strategy.

EXHIBIT 5-9. EXAMPLE CRITERIA AND ASSESSMENT OF PROGRESS ON REDUCING VULNERABILITY OF WATER INFRASTRUCTURE TO CLIMATE CHANGE RISKS

PHASE	CRITERIA FOR ASSESSING PROGRESS FOR AREA 1: REDUCED VULNERABILITY OF INFRASTRUCTURE TO CLIMATE CHANGE RISKS	HAS THE PHASE OF ADAPTIVE MANAGEMENT BEEN MET TO SUPPORT THE GOAL?
1-Initiation	OW conducted a screening assessment to identify the potential implications of climate change for water infrastructure.	**Yes**: OW has conducted a broad review to better understand how climate change affects water infrastructure
2-Assessment	OW has conducted a broad review to better understand how climate change affects water infrastructure, including consulting water utilities.	**Yes**: OW has conducted a broad review to better understand how climate change affects water infrastructure
3-Response Development	In collaboration with partners, OW has developed and distributed information, guides, and tools to assist water utilities in undertaking adaptation, efficiency, and demand/supply management measures.	**Maybe**: OW has developed, refined, and distributed the CREAT tool to partners
4-Initial Implementation	At least 30% of water utilities have conducted initial planning steps and updated planning documents to address climate change risks. ***and*** *A few* water utilities have undertaken substantive, on-the-ground adaptation, efficiency, and demand/supply management measures.	**Not clear/data not available**
5-Robust Implementation	At least 30% of water utilities have undertaken substantive, on-the-ground efficiency, and demand/supply management measures. ***and*** Of water utilities that have identified adaptation measures to be implemented in the short-term, at least 30% have undertaken substantive, on-the-ground adaptation measures.	**Unlikely**
6-Mainstreaming	At least 70% of water utilities have undertaken substantive, on-the-ground efficiency, and demand/supply management measures and have integrated climate change considerations into their normal processes and operations. ***and*** Of water utilities that have identified adaptation measures to be implemented in the short-term, at least 70% have undertaken substantive, on-the-ground adaptation measures.	**Unlikely**
7-Monitoring and Adaptive Management	The water utility sector, independently or in conjunction with OW or other federal agencies, has implemented mechanisms to monitor and evaluate water utility progress, identify lessons learned, incorporate new climate data into planning, and continually improve performance on climate planning and programming.	**Unlikely**

Considerations for Using an Outputs plus Priority Outcomes-Based Approach

The evaluation team suggests that OW consider the following factors specific to implementing an outputs plus priority outcomes-based approach to measuring progress on climate change adaptation.[30]

- **Barriers to collecting data from partners:** To assess progress on outcomes, OW will need to collect data from its partners, as state and local governments and water utilities are the primary implementers of climate change adaptation efforts. For example, using the overarching framework, data collected on OW's activities will generally inform the assessment of progress on Phases 1-3, but in most cases will not address whether criteria have been met for Phases 4-7, because those phases are generally implemented by OW partners. Collecting data from OW partners poses several challenges.
  - Most if not all interviewees for interviewed for the retrospective evaluation emphasized the extreme budget and resource shortages currently faced by the Agency, and indicated that current budgets would not support the comprehensive data collection efforts required to understand outcomes of OW's efforts on climate change adaptation.
  - Many interviewees pointed out that EPA does not have the regulatory authority to compel data collection from partners, and many partners would not respond unless they were mandated to do so. For example, interviewees noted that water utilities are already required to report data to EPA under several different regulatory programs, and are thus unlikely to participate in a voluntary data collection.
  - Finally, for OW to collect data from partners, it would need to go through an ICR request and approval process with OMB. Seeking ICR approval can be a lengthy process; it make take up to nine months for OMB to approval requests, and significant staff and/or contractor time is required prepare analyses and documentation for ICR requests.
  - One potential solution to the above data collection barriers would be to focus on outcomes with an existing mechanism for data collection, such as grant programs, and investigate if IO could include additional data collection for measurement purposes into existing grant reporting processes.
  - OW could also confer with outside organizations noted in Appendix C that have conducted relevant data collections with EPA partners. If an outside organization(s) plans to conduct the data collection in the future, an opportunity may exist for OW to insert questions into the data collection, overcoming the resources and authority barriers. However, these questions must have utility for the outside organization to avoid the ICR barrier. Moreover, OW will be limited in the number and type of questions it can ask of partners using this approach.
- **Attribution issues:** Seeking to assess progress on outcomes raises the question: can progress be attributed to OW efforts? Would the outcome have occurred in absence of OW activities? With topics as complex as climate change adaptation, it is likely that many factors lead to outcomes achieved, including policies and influences exerted by other federal agencies, and by state and local governments. Moreover, as discussed above, limited existing data sources address EPA or OW contribution to outcomes. As such, OW will need to focus on characterizing its *contribution* to outcomes seen by focusing on drawing clear connections between OW program activities and outcomes realized. As part of collecting data from partners, OW will need to inquire not only about

[30] Note that some of the considerations for using an outputs-based approach also apply with an outcomes-based approach, e.g., the need to define key audiences and criteria for assessing progress.

outcomes, but about the role of OW resources in leading to those outcomes. OW may want to retain the services a trained evaluator to design data collections that probe on OW's contribution in a standardized fashion. A trained evaluator will employ question formats yielding data that can be readily aggregated and analyzed.

- **Lack of buy-in from OW staff for outcome-based approach:** Over the course of this evaluation OW staff raised serious concerns about measuring progress on the 2012 Strategic Plan given the severe resource constraints faced by the Agency and the lack of resources dedicated to climate change programming. Interviewees expressed concern that measurement for accountability purposes provides limited value and diverts resources from mainstreaming climate change into programs. Interviewees contacted for the retrospective evaluation raised particular concerns with an outcome-based measurement approach, compared to a measurement approach based on OW's strategic actions, given resource constraints and the above concerns about data collection from partners. OW will need to address this key barrier to successfully implement the 2012 Strategy.

The evaluation team has summarized the advantages and disadvantages of an outputs plus priority outcomes-based approach in Exhibit 5-10 below.

EXHIBIT 5-10. PROS AND CONS OF THE OUTPUTS PLUS PRIORITY OUTCOMES APPROACH

ADVANTAGES	DISADVANTAGES
Approach tracks progress on key goals: goes beyond assessing outputs to assessing the state of climate change adaptation in the field, which is ultimately what matters. Identifying key outcomes (particularly using the logic model framework) would be a helpful step in clarifying OW's priorities on climate change adaptation.	Difficulty of collecting data from external partners. Uncertainty about attributing progress on goals to EPA actions because the approach involves assessment of progress on activities outside of EPA's direct sphere of influence. Lack of buy-in from OW staff for an approach that includes outcomes. Criteria for each vision area would need to be carefully defined by expert program staff, and then pilot tested.

Using Existing Data to Assess Outcomes

The evaluation team considered whether existing data could help assess progress towards OW's goals for climate change adaptation. As presented in Chapter 2 and in Appendix C, the evaluation team reviewed several existing resources and reports that describe progress on climate change adaptation. These resources provide context for OW's efforts to encourage adaptation planning and can help to define the universe associated with OW's work on climate change adaptation. For example, the Georgetown Climate Center tracks state and local climate adaptation plans; it provides a brief description and links to planning documents. The site is sortable and searchable. The National Climate Assessment, which is updated regularly, summarizes climate change adaptation efforts including those specific to coastal areas and wetlands and watersheds.

In some cases, existing resources provide a good source of information for understanding progress on adaptive management that has a direct connection to OW activities. For example:

- **CREAT Analytics Data:** CREAT is a software tool designed to assist drinking water and wastewater utility owners and operators in understanding potential climate change impacts and in assessing the related risks at their utilities. Users download and register for the software via the OW website.

Analytic data that tracks the number of downloads could, along with registration data, be used to assess the tool's market penetration in the water utility industry.

- **Climate Ready Estuary Project Information:** The OW's program's webpage contains project summaries and links to Climate Ready Estuary projects in each OW region. Many of the projects pertain to analysing coastal watersheds for climate vulnerability. However, a large portion of the projects are also intended to improve coastal resilience to climate change. In all, the site contains 36 project summaries, and each one links to an external website for the project or the project partners. OW could use the project summaries and linked information to understand progress on adaptive management related to the Climate Ready Estuaries program.

However, in most cases, existing data sources do not present information on adaptive management efforts in a way that connects these efforts to OW activities. Therefore, most of these resources cannot be used independently as a substitute for collecting outcome data on OW efforts. For some outcomes, OW may be able to combine information gleaned from existing resources with internal information on OW policies, technical assistance, training, and other activities that connect OW with the outcomes discussed in existing resources. Another limitation of using existing resources is that many resources identified appear to be one-time reports, as opposed to resources that are continually updated; one-time reports will be of limited utility to OW measurement efforts.

Given all of the limitations of existing resources, if OW seeks to measure progress on outcomes, it will need to develop a strategy for collecting new data for each outcome measure developed, which as noted earlier will involve collecting data from EPA partners.

Using Existing Measures to Track Progress on Climate Change Adaptation

Given that EPA already has a detailed performance management structure, with many performance measures already defined for each program, some reviewers have asked if OW should develop performance measures specifically related to climate change adaptation at all. One alternative would be to train staff to account for the potential impacts of climate change when assessing progress on *existing measures*.

For example, one OW measure in the Drinking Water program tracks the "Percent of community water systems that meet all applicable health-based standards through approaches that include effective treatment and source water protection." Climate change will likely impact the ability of community water systems to meet applicable health-based standards, because higher temperatures and drought may affect water supplies and levels of pathogens in the water. Rather than develop a measure specifically related to efforts to prepare community water systems for the impacts of climate change, the Drinking Water program could simply continue to track progress on its existing measure, understanding that targets will need to be met *in spite of* climate change.

The evaluation team believes this measurement approach merits consideration. However, given the many uncertainties about how climate change will affect progress on existing measures, this approach may not provide sufficient information to program managers about whether they are making appropriate progress in addressing the challenges of climate change. Nevertheless, the evaluators fully support the concept that climate change adaptation should be integrated into existing work (rather than functioning as a separate, add-on set of activities), and over time we encourage OW to consider whether existing measures may be sufficient to capture progress on agency goals in light of climate change.

What specific elements need to be applied to the phased approach to tracking progress outlined in the 2012 strategy, to make it a robust measurement framework?

IO needs to develop objective criteria for each phase of adaptive management to facilitate consistent measurement. Regardless of whether IO selects an outputs based approach or an outputs plus priority outcomes approach, the criteria for meeting each phase of adaptive management should be clear and objective, so that different reviewers assessing the same data would reach the same conclusions about progress made. If IO selects an outputs plus priority outcomes approach, it will be necessary to define criteria for each phase of adaptive management *for each outcome* as discussed above. We suggest that IO set specific, quantitative thresholds for meeting each stage; however, determining appropriate thresholds will require pilot testing.

In addition, we understand that IO may seek to aggregate results across outcomes or strategic actions. We caution that any aggregation should be undertaken with care so that any assumptions are explicit and all weighting is deliberate and transparent. Any effort to "add up" or summarize progress across strategic actions, vision areas, or outcomes implicitly involves weighting, and this should be carefully considered. Note that if results are aggregated without explicit weighting, as OW has done previously, then all results and steps in the adaptive management framework are implicitly given equal weight.

What, if, any, revisions should EPA make to its baseline data collection process to ensure that data collected are meaningful and objective?

The evaluation team reviewed the approach that IO took in measuring progress on the 2012 Strategy to date, as presented in the *2012 Highlights of Progress* report. We documented several data quality and consistency challenges with reported data. Moving forward, we recommend that IO take steps to adhere to key tenets of data quality and consistency described in our recommendations. Core among these, IO will need to develop data reporting templates, clear instructions for reporting, and institute a quality control plan. The evaluation team also noted several issues regarding assumptions, implicit weighting factors, and transparency with IO's previous approach. Thus, we recommend that IO take a different approach to measurement moving forward, as described earlier in this chapter. Additional details on recommendations for data reporting are provided in Chapter 6.

How can lessons learned inform measuring progress in EPA-wide efforts?

One of this project's original evaluation questions asked:

> **How can OW's measurement approach inform measuring progress in the EPA-wide Adaptation Plan, and inform development of the next Agency 4-year Strategic Plan?**

After conducting the evaluation, the evaluation team, in conjunction with EPA, decided to reframe this question to ask:

> **How can lessons learned *from this evaluation of OW's approach* inform measuring progress in the EPA-wide Adaptation Plan, and inform development of the next Agency 4-year Strategic Plan?**

To answer this question we first explore lessons learned from this evaluation project that are relevant to other offices as they develop implementation plans in response to the Agency-wide Climate Change Adaptation plan. Then, we explore lessons learned from this evaluation project that relate to the Agency-level as it contemplates climate change adaptation measures for the next Strategic Plan.

Lessons Learned on Measurment Relevant to the Agency-wide Adaptation Plan

A central goal of EPA's Climate Change Adaptation Plan is to strengthen the capacity of EPA staff and partners across the country to anticipate and respond to the effects of climate change. Strengthening capacity will help EPA staff and partners integrate climate adaptation into everyday work by providing them with needed data, information, and tools. The Adaptation Plan includes a list of ten priority actions that the Agency will take to integrate climate change adaptation into its programs, rules, and operations:

1. Fulfill Strategic Measures in *FY 2011–2015 EPA Strategic Plan*
2. Protect Agency facilities and operations
3. Factor legal considerations into adaptation efforts
4. Strengthen adaptive capacity of EPA staff and partners through training
5. Develop decision-support tools that enable EPA staff and partners to integrate climate adaptation planning into their work
6. Identify cross-EPA science needs related to climate adaptation
7. Partner with tribes to increase adaptive capacity
8. Focus on most vulnerable people and places
9. Measure and evaluate performance
10. Develop Program and Regional Office Implementation Plans (the OW 2012 Strategy serves as the implementation plan for OW)

Following the release of the agency-wide Adaptation Plan, each EPA office and region is required to develop an implementation plan and will need to track progress on it. OW's 2012 Strategy is its implementation plan in response to the agency-wide Adaption plan. Earlier in this chapter we discussed in detail alternative options for OW to track progress on its implementation plan (the 2012 Strategy).

Overall, we recommend that OW strive to measure progress on a few priority outcomes, at least on a pilot basis. Like OW, other EPA offices could go through a similar process of using logic models to select priority outcomes, and developing measures, criteria, and data collection strategies relevant to those priority outcomes. We recommend that programs pilot this approach with mature programs, where outcomes may be apparent and mechanisms for measurement (e.g., grant reporting requirements, or regulations that incorporate reporting mechanisms) may be available.

Alternatively, other EPA offices could to continue to use existing measures, and track progress on them in light of climate change. Using this approach, it would be important to understand the potential for climate change to affect existing measures. It may be necessary to collect contextual information to make it possible to understand the extent to which climate change is making it more difficult to meet targets for existing goals. The evaluation team does not make a recommendation on which of these approaches is preferable; however, we do think that any such approach should be pilot tested on a few outcomes or measures.

Whatever approach other offices choose to take in measuring progress on climate change adaptation, we recommend they keep the following general lessons on measurement in mind:

- **Focus on relatively few priorities.** One of the key lessons learned in developing measurement approaches for the OW 2012 Strategy is that measuring something as multifaceted and complex as adaptation to climate change is very difficult, and even more so when the measures are very specific, detailed, and numerous. At this early stage, and in the current environment of extreme resource constraints, developing just a few higher level measures, or measuring progress on just a few priority goals, is likely the best approach for the other offices to take in developing their implementation plans for the Adaptation Plan. We recommend selecting a small set of outcome measures. We do not recommend using a comprehensive list of strategic actions/outputs as an organizing principle for performance measurement (though it may be helpful for program managers to internally track progress on strategic activities or actions).
- **Weigh the merits of measuring outputs vs. outcomes.** Other EPA offices will need to wrestle with some of the same fundamental decisions that OW is considering: measuring outputs of EPA's work, which are easier to measure and more under EPA's direct control but less related to the desired end results; versus measuring outcomes of EPA's work, which are harder to measure and often depend on partners' efforts. Where possible, the evaluation team recommends focusing measurement efforts on outcomes, even though we recognize that doing so will require an investment of time and resources, and will therefore also require prioritization.
- **Be transparent about assumptions and weighting.** It is difficult to describe progress succinctly on something as complex, with as many diverse aspects, as climate change adaptation. At this point, we urge caution in aggregating performance measure data, and we encourage offices to be clear about any weighting, implicit or explicit, in their scoring or aggregation schemes
- **Ensure data quality.** All EPA offices will need to attend to fundamental principles of measurement discussed in this report as they measure progress on climate change adaptation. These principles include developing clear, consistent criteria for measurement, establishing a comprehensive data collection process for the measures selected, and ensuring data accuracy through a central quality assurance/quality control process.

Lessons Learned on Measurment for the Next Strategic Plan

The FY 2011-2015 EPA Strategic Plan identifies three high-level strategic measures that the Agency will use to evaluate its progress in mainstreaming climate change into operations by 2015:

1. Integrate climate change adaptation into five **rulemaking process**;
2. Integrate considerations of climate change impacts and adaptive measures into five major **grant, loan, contract, or technical assistance programs**; and
3. Integrate climate change trend and scenario information to five major **scientific models or decision support tools** used to implement environmental management programs.

The OW plan reflects these goals in several ways. For example, in support of efforts to develop decision support tools that incorporate climate change information, the NWP is deploying an upgraded version of CREAT, as well as a comprehensive toolbox of water-related climate resources, to better assist water and wastewater utilities in becoming more resilient to climate change. The NWP is also working to incorporate climate change considerations in the development and implementation of a rulemaking by 2015. In addition, the NWP will help NEP grantees consider as a potential priority climate adaptation and resilience in their Comprehensive Conservation and Management Plans s and develop climate adaptation plans and implementation strategies where considered a priority.

The current Strategic Plan's emphasis is to mainstream climate change into operations by 2015; the evaluation team believes the three measures of mainstreaming that the Agency adopted are clear, concise, and measurable. In the next Strategic Plan, once EPA has demonstrated the ability to mainstream climate change into operations, the current three measures will no longer be as relevant.

To develop new measures, we recommend that EPA engage in fundamental strategic planning, and grapple with the particular value that the Agency can add with regard to climate change adaptation. What role can EPA play that no other agency or private market actor can or will play? What role is EPA especially able to play? EPA will need to consistently consider climate change adaptation in all of its existing programs going forward, but the Agency will need to decide where to invest its effort in concentrated new activities related to climate change adaptation. Using a logic model approach with a particular focus on EPA's role and key external influences relative to key audiences and desired outcomes may help the Agency focus in on where investment in climate change adaptation is most warranted.

Given the priority actions identified in the Adaptation Plan, and EPA's key strengths and institutional capabilities, three key areas of EPA expertise may include providing data, decision-support tools, and training to partners related to climate change adaptation. Further work is needed to define a few specific measures that are relevant across the agency, plan for data collection associated with these measures, and determine the degree of EPA's contribution to outcomes achieved. For example, EPA could consider measuring the *percent (or number) of partners that have used EPA information to integrate climate change adaptation into their existing training*. This would require defining who the partners are, and learning from the partners the extent to which they have integrated EPA climate change adaptation partnership into their training. Such information may be relatively easy to collect if EPA is working directly with the partners to develop the training. However, a concerted data collection would be necessary if partners include organizations that EPA is not working with directly, but who benefit from EPA information to inform their training efforts. EPA could also consider measuring the *percent (or number) of partners that incorporate EPA decision support tools into their planning processes.* This measure would involve similar considerations for defining partners and planning for data collection. In some cases, e.g., the CREAT tool, EPA has worked collaboratively with partners to develop climate change adaptation decision support tools and test using them in their planning. In other cases, EPA has developed existing decision support tools that partners may benefit by using; in these cases EPA would need to collect information from partners about how they are using these decision support tools to plan for climate change resilience.

CHAPTER 6 | CONCLUSIONS AND RECOMMENDATIONS

The 2008 and 2012 OW climate change strategies are important milestones in the continued evolution of the NWP. The evaluators—and many of the people we interviewed as part of this evaluation—anticipate that recognition of the value of these early efforts to understand and address challenges posed by climate change will grow as real impacts to on the ground water resource management become more apparent. The NWP's climate change strategy work is maturing, entering the seventh year since the Climate Change Workgroup was launched in 2007. At the same time, continued resource and staffing pressures and the lack of statutory drivers weaken the ability of climate change considerations to compete for limited NWP time and attention.

In this context, our findings suggest that fresh approaches are needed to ensure robust implementation of the 2012 Strategy. Our findings also suggest substantial limitations to a strategy implementation approach based primarily on extracting annual commitments from programs and requiring output-based reporting. More attention is needed in several critical areas: engaging management in meaningful ways, creating time and space for strategic discussions, incentivizing and recognizing successes, harvesting and analyzing lessons from implementation, forging buy-in to a longer-term measurement approach, increasing the depth of knowledge of climate change implications for OW programs among relevant staff, and relentlessly asking a set of key questions around climate change until they become a core element of the NWP DNA. The shift that needs to be made now in OW can be compared to the shift that OW had to make over the course of the last decade to adopting a watershed approach, although the climate challenge is arguably more complex.

We are confident that OW will continue to make progress on climate change integration regardless of how the 2012 Strategy is implemented. However, we believe that implementation of the 2012 Strategy has potential to inspire, inform, and drive more progress faster if implementation is undertaken carefully and deliberately. Our recommendations below are largely drawn from ideas provided by managers and staff in the National Water Program. While some may seem simplistic, we believe that the combined impact of these recommendations can set 2012 Strategy implementation on a different trajectory with the potential to motivate more progress.

RECOMMENDATIONS

Reinvigorate NWP management and staff commitment to the Climate Change Strategy.

1. **Clarify the purpose of the 2012 Strategy**. Clarifying the purpose of the 2012 Strategy, and communicating that purpose within OW, is critical for informing strategy implementation, identifying reporting and measurement needs, and understanding how measurement data will be used and communicated. The evaluation team heard conflicting rationales for the 2008 and 2012 strategies; some OW staff view the strategies as encompassing only goals and activities that are within EPA's purview, whereas others view the documents as more broadly encompassing goals and activities that involve EPA's partners. Also, it is not clear to OW staff if the strategy is primarily an internal planning document, or primarily a document for communicating OW's vision and goals to external audiences. Notably, during interviews on implementation of the 2008 Strategy, staff

indicated that the previous strategy was more successful as an external communications document than as an internal planning document.

2. **Clarify commitments and roles associated with the 2012 Strategy**. Much of the current language in the 2012 Strategy discussing coordination and collaboration with EPA's partners is vague. It is not clear what EPA's specific roles or investment will be as distinct from partners. IO should clarify EPA roles; this is essential for successful strategy implementation, as well as for measurement. Also, IO needs to harmonize goals and strategic actions at the national and regional levels. While not all national goals and strategic actions will apply to all regions, having two sets of goals and actions is unwieldy and confusing.

3. **Seek buy-in for the 2012 Strategy among OW management and staff.** Lack of buy-in for both the 2008 and 2012 strategies is apparent at both the managerial and staff levels. The evaluation team heard that managers rarely reference the strategy as part of day-to-day business, and that they do not participate in the workgroup designed to coordinate implementation of the strategy. Staff indicated that the strategy is viewed as an IO strategy, that priorities for staff time and funding are not informed by the strategy, and that the strategy lacks a connection to daily work. Notably, some staff interviewed indicated that they were not aware of strategic actions that had been officially assigned to their purview; other staff indicated that they disagreed with the inclusion or wording of certain strategic actions in the 2012 Strategy.

While there is no single magic bullet for attaining buy-in, a few key decisions could go a long way:

- OW should prioritize specific goals. IO should involve program office and regional staff in this prioritization in a meaningful way. Resource decisions should be tied to the priorities.
- Managers should keep climate change as a front and center topic with their staff; they should regularly discuss how the office's daily work relates to and is informed by climate change, and to the climate change priorities selected as part of the strategic planning process. Managers should also re-engage with the workgroup and attend meetings regularly instead of relying on designees
- OW should engage in open discussions with EPA's Office of Policy and Office of Administration and Resources Management to develop a pilot initiative for Senior Executive Service (SES) candidates and managers that encourages and supports the development of climate change "champions." This pilot could provide focused assessment criteria and professional development guidance for advancing climate change as a cross-cutting issue under the "leading change" SES assessment area.

Create management practices that keep climate change integration front and center.

4. **Schedule regular management-level strategic discussions adaptation and Strategy implementation.** OW should create more opportunities for meaningful strategic discussions among management on climate change, its implications for water programs, and efforts to mainstream climate change considerations into voluntary and regulatory programs. While much can be handled at the staff level, there is no substitute for periodic management engagement on strategic topics. It will be important to think carefully about the framing of management level discussions so they are viewed as appropriate and to recognize that some issues may be relevant to some divisions, offices, and programs but not others. An option for creating space is to designate one monthly climate change workgroup meeting every 3 to 6 months for management-level discussions. Another opportunity for strategic discussions is to include time for such discussions on other management meeting agendas. Potential strategic discussions could include:

EXHIBIT 6-1. RECOMMENDATIONS SUMMARY

Reinvigorate NWP management and staff commitment to the Climate Change Strategy.

1. Clarify the purpose of the 2012 Strategy.
2. Clarify commitments and roles associated with the 2012 Strategy.
3. Seek buy-in for the 2012 Strategy among OW management and staff.

Create management practices that keep climate change integration front and center.

4. Schedule regular management-level strategic discussions adaptation and Strategy implementation.
5. Ask key climate change questions relentlessly up and down the management chain.
6. Shift the balance of implementation focus toward "customer service" and learning.
7. Recognize and reward climate change integration progress.

Empower EPA staff and state, tribal, and local partners.

8. Focus education and training support on connecting climate change to practical work.
9. Expand engagement on the strategy with State, Tribal, and local partners.
10. Attract and plan for resources.

Clarify the purpose of measurement and pilot a meaurement approach that includes outcomes.

11. Seek buy-in for measuring progress on Strategy implementation.
12. Consider adopting an outputs plus priority outcomes measurement approach.
13. Ensure data quality and consistency in collecting measurement data.
14. Ensure data quality and consistency in collecting measurement data.

- Given current resource constraints, how can we best incentivize progress on mainstreaming climate change within voluntary and regulatory programs?
- What type of measurement system can best support our efforts over the long-term to respond to climate change? How can we build toward such a system in the near and mid-term?
- What scenarios do we see for how climate change may impact local integrated water resource management and governance? What do these scenarios mean for EPA water programs?
- How might evolving scientific understanding and emerging climate change impacts (e.g., ocean acidification) affect the NWP?
- What strategic priorities or emergent opportunities are important to address?
- What are we learning from climate change integration efforts to date?
- What types of support, information, tools, and resources are needed to drive more rapid progress in responding to climate change?

A suggested support tool for these discussions is a concise (less than 10 pages) adaptation of the 2012 Strategy Executive Summary to serve as a stand-alone resource to guide management discussions. Soliciting input from managers on concise information that could be added to this document will make it more useful to them.

5. **Ask key climate change questions relentlessly up and down the management chain**. One tried and true approach to breathe life into strategy implementation efforts is to ensure that managers at the top consistently ask a set of simple and clear questions. These questions keep the strategy present and send clear signals that the topic is important and must be considered in routine program planning and decisions. Questions could include:

   - Have you considered climate change and its impacts (in your program, plans, analyses, or decision process)?
   - How is climate change likely to affect your program's ability to deliver results and meet goals? How confident are you about this?
   - What work is needed to improve understanding of how climate change will affect your program or to integrate climate change considerations into your program? How can we help support these efforts?
   - What is your current understanding of the outstanding adaptation issues and needs, and the opportunities to address them?
   - Which of those opportunities do you think are the most important to address- do you have resources to do so? How can we support these efforts?

6. **Shift the balance of implementation focus toward "customer service" and learning**. Much of the strategy implementation process is currently viewed as an obligation by divisions, offices, and branches in the NWP. Take steps (including those described in recommendations below) to ask managers and staff in the NWP what they need and how IO can best support mainstreaming of climate change across programs. Foster a culture of learning around the strategy; ask managers and staff what they are learning from efforts underway. Consider periodic deployment of a web-based survey to solicit information from NWP staff to understand the state of climate change awareness, informational needs and questions, and staff-level perceptions of opportunities, accomplishments, and lessons. Compile and communicate input received and consider ways to be responsive to them. Set a clear tone that IO recognizes the challenges of integrating climate change but that the need will only intensify and IO wants to support program offices on this journey.

7. **Recognize and reward climate change integration progress**. Many evaluation participants noted that recognition and modest incentives can go a long way to inspire and encourage managers and staff to take extra steps to advance climate change efforts. IO should build on the "highlights of progress" efforts to showcase accomplishments and lessons, and consider modest opportunities to capture and share successes within and external to EPA in newsletters, intranet postings, staff meetings, and other venues. IO could consider incentives such as "climate champion" badges and other forms of recognition. Although some of these ideas may sound frivolous, their cumulative effect can be powerful and can motivate people to keep the strategy - and the goals and actions that it encompasses - present in the workplace.

Empower EPA staff and state, tribal, and local partners.

8. **Focus education and training support on connecting climate change to practical work**. While general presentations and discussion of climate change and climate impacts can raise awareness, they can also fall flat if they fail to help people answer the question: "What does this mean for me and the work that I do?" More work is needed to help answer this question in divisions, offices, branches and programs across the NWP. All hands meetings and training sessions have their advantages, but they will miss key opportunities if they do not connect broader issues to practical work. One way to explore these connections is to create space during webinars and presentations for direct discussion on this question. Creating space for interaction can also provide insights into managers' and staff members' questions about climate change. A periodic survey could support these efforts. Shifting webinar formats to use real-time polling and facilitated peer exchange can also make education, training, and communication efforts more relevant to participants. EPA's State and Local Climate and Clean Energy Program in the Office of Air is a leader within the Agency in using these approaches. OW should also work closely with the Office of Policy team supporting the Agency-wide Climate Adaptation strategy in exploring innovative ways to conduct education, training, and communications. Interaction may lead to identification of new adaptation opportunities.
9. **Expand engagement on the strategy with State, Tribal, and local partners**. Interest in climate change adaptation and mitigation appears to be growing at the state and local level. Even in jurisdictions where there are political constraints to talking about climate change, local officials are increasingly interested in responses to related issues such as extreme weather, ocean acidification, and integrated water resource management needs. Preliminary evidence suggests that the 2008 and 2012 Strategies have been useful tools for engaging state, tribal, and local partners in discussions and joint planning and projects to respond to climate change. There are significant opportunities to expand these discussions and increase communications between NWP partners about activities, accomplishments, lessons, needs, and challenges. Broader discussions on the response to climate change with external partners can build on existing program and regional office relationships and discussions. OW can encourage coordination with national partners such as the Association of State Drinking Water Agencies and the Association of State Wetland Managers to leverage resources and communication opportunities.
10. **Attract and plan for resources.** IO should explore opportunities to assemble even a modest reserve of resources to support or seed priority climate change related projects. Programs could compete for these resources on a periodic basis and applications could be selected by peers in the NWP. Engage senior managers in discussions to identify creative opportunities to attract limited resources to support high priority activities. IO could explore opportunities to expand the use of pilot projects to test integration approaches with limited funds, and to capture and share lessons from existing pilots and examine resource-efficient ways to expand successful approaches.

Clarify the purpose of measurement and pilot a meaurement approach that includes outcomes.

11. **Seek buy-in for measuring progress on Strategy implementation.** Attaining buy-in for measuring the outcomes of the 2012 Strategy is first predicated on attaining buy-in for the strategy itself, and also on clarifying the purpose of the strategy. However, currently OW staff are skeptical about

measurement, and IO cannot implement a meaningful measurement effort without the support and engagement of staff in the program offices and regions. IO should take several steps specific to measurement to increase program office and regional support. IO should communicate with offices and regions about what it plans to do with measurement data, and how data will be aggregated and communicated. IO should provide assurances that measurement data will not be used as justification for cutting budgets. Finally, if IO pursues an outcome approach, it should pursue measurement primarily for a small set of outcomes, discussed below.

12. **Consider adopting an outputs plus priority outcomes measurement approach.** IO will need to weigh the costs and benefits of potential measurement approaches. Measuring progress on strategic actions is largely an output-based approach, and in and of itself, cannot measure progress on the ultimate goal of fostering climate change adaptation on the ground. As such, the evaluation team recommends pursuing the outputs plus priority outcomes approach. Specifically, we suggest that IO pilot this approach with no more than a few priority outcomes given resource constraints.

    To select outcomes for piloting an outputs plus priority outcomes approach, IO should consider selecting outcomes with an existing mechanism for data collection, such as programs with a grant component. IO may want to focus on more mature efforts, such as CRWU or CRE, where outcomes are more likely be present. IO should develop a data collection and measurement plan in collaboration with partners, such as the State/Tribal Council, and test the plan for a few years. At the conclusion of the pilot, IO and its partners should assess progress, determine lessons learned, and contemplate scaling up the approach to include more outcomes.

    Focusing measurement on a few priority outcomes will serve to investigate proof of concept before scaling up a measurement approach. Trying to implement a comprehensive outcome-based approach from the outset may inadvertently add more confusion than insight; as noted by interviewees, there is a real danger that overinvestment in measurement could result in loss of staff support for tracking progress on climate change adaptation.

13. **Within the measurement approach selected, acknowledge the iterative and evolving nature of this work.** The seven stages of adaptive management make sense conceptually, but as a practical matter, EPA will need to revisit each stage on a regular basis. A more cyclical framework may provide a better model, with the reach of EPA's activities expanding over time to a wider circle of partners.

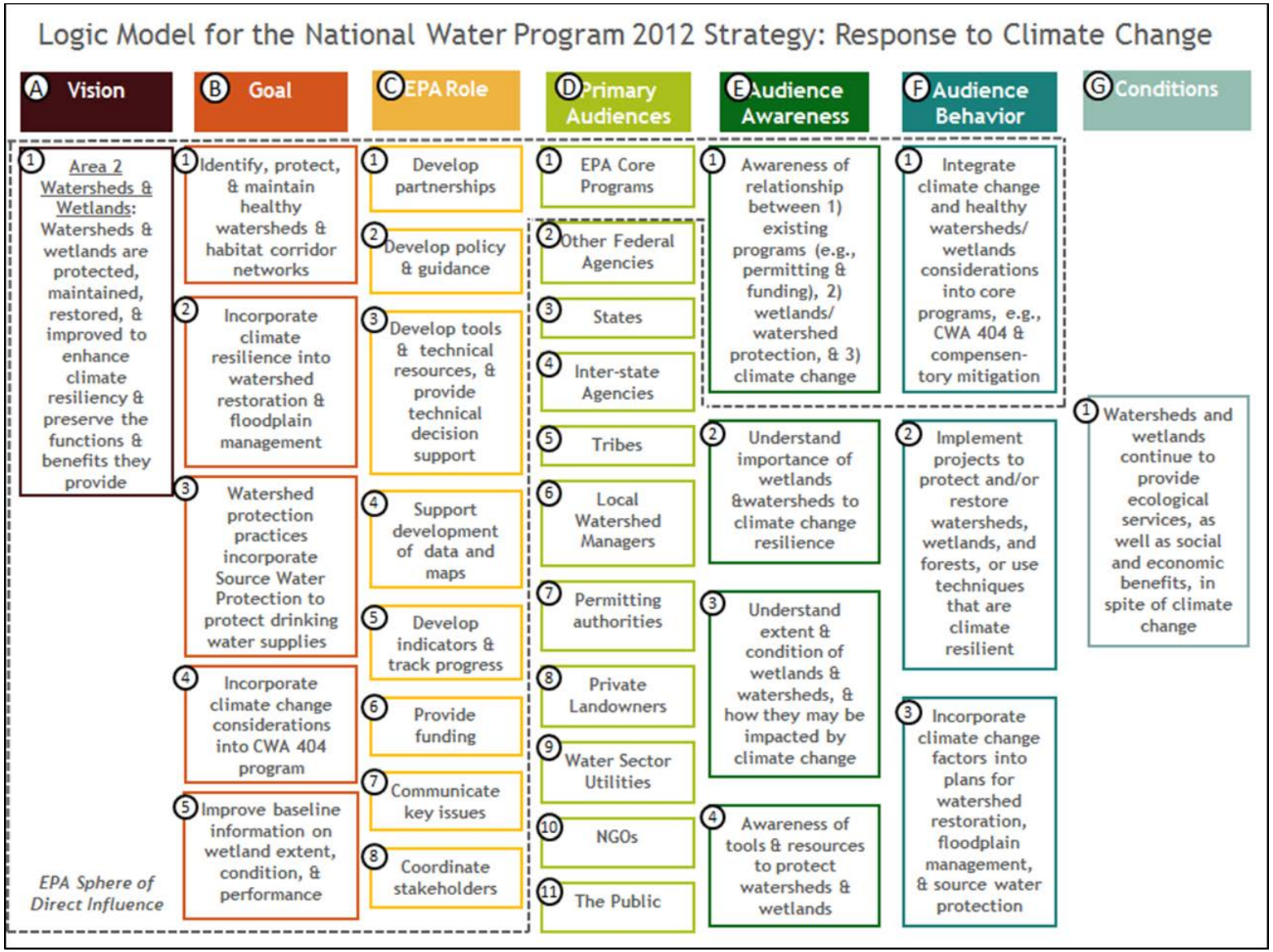
14. **Ensure data quality and consistency in collecting measurement data.** The baseline data OW collected illustrate challenges of data consistency and quality that are important to address in any measurement system. Moving forward, IO needs to develop data collection templates, instructions, and a quality control plan that ensure high quality data. Key steps include:

    - Clearly communicate the data collection plan to all stakeholders involved.
    - Identify specific data to be provided, including units, within data collection templates and instructions. Also indicate the specific data to be provided by specific stakeholders. Do not use open-ended questions to collect measurement data.
    - Require data collection at regular interviews (e.g., annually), and on specific outputs and/or outcomes previously agreed upon. IO should not accept reports of outputs or outcomes that were not included in the measurement plan, at least not as a substitute for previously agreed upon metrics.

- Clarify the time period for activities to be reported on. IO should not accept reports of activities conducted and/or outcomes realized prior to the reporting period. Similarly, IO should not accept descriptions of future activities to satisfy reporting requirements.
- Consider developing an online reporting system to facility easier reporting, review, and storage of measurement data.
- Assign an individual or team within IO to review data submitted; check for completeness, consistency, clarity, and adherence to reporting instructions. Follow up with reporting entities for revisions where necessary.

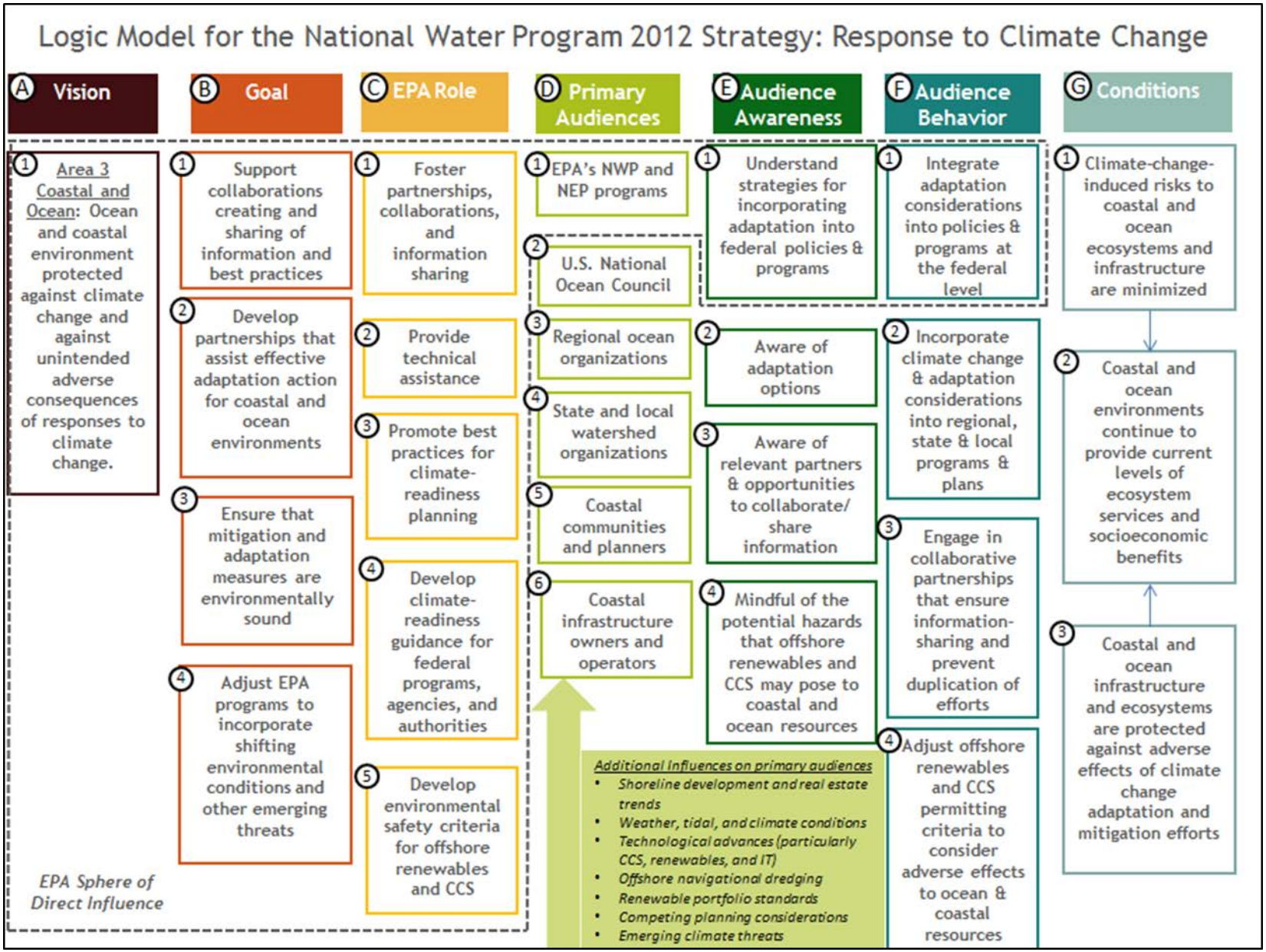
APPENDIX A | CONNECTIONS IN THE LOGIC MODELS

EXHIBIT A-1. LOGIC MODEL CONNECTIONS MATRIX: WETLANDS AND WATERSHEDS



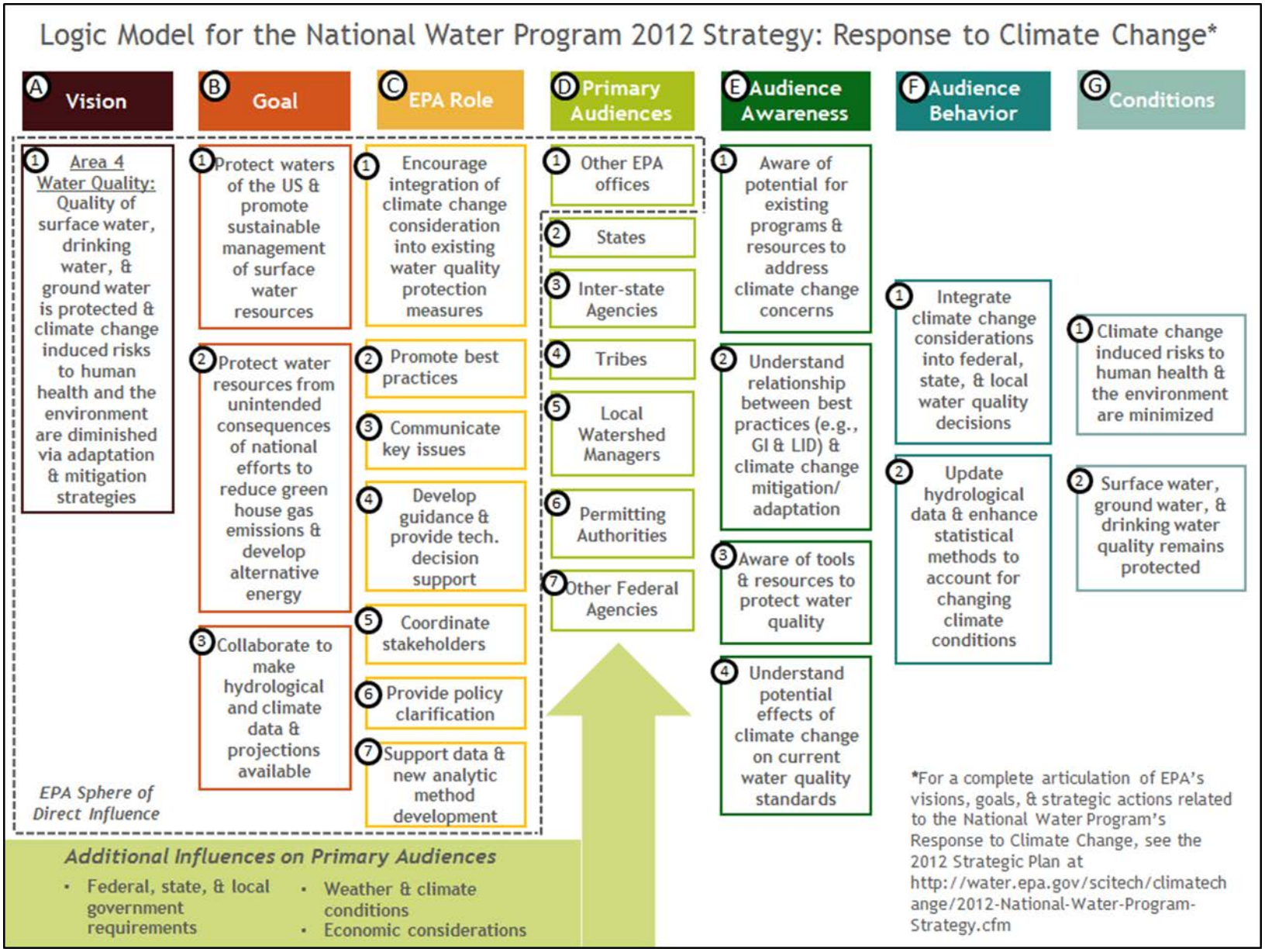
A: Vision	B: Goal	C: EPA Role	D: Primary Audiences	E: Audience Awareness	F: Audience Behavior	G: Conditions
All	**B1:** A1	**C1:** B1, B2, B3, B4	**D1:** C1, C2, C3, C4, C5	**E1:** D1, D2, D3, D4, D5, D6, D7	**F1:** D1, D2 E1	**G1:** F2
	B2: A1	**C2:** B1, B4	**D2:** C1, C2, C3, C4, C7, C8	**E2:** D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11	**F2:**D3, D5, D6, D7, D8, D9, E1, E2, E3, E4, F1, F3	
	B3: A1	**C3:** B1, B2, B3, B4, B5	**D3:** C1, C2, C3, C4, C5, C6, C7, C8	**E3:** D1, D2, D3, D4, D5, D6, D7, D8, D9, D10	**F3:** D3, D6, D6, E1, E2, E3, E4	
	B4: A1	**C4:** B5	**D4:** C6, C8	**E4:** D1, D2, D3, D4, D5, D6, D7, D8, D9, D10		
	B5: A1	**C5:** B1, B5	**D5:** C1, C2, C3, C6, C7, C8			
		C6: B1, B2	**D6:** C3, C7			
		C7: B1	**D7:** C3, C7, C8			
		C8: B2, B3, B5	**D8:** C3, C7			
			D9: C3, C7, C8			
			D10: C3, C7, C8			
			D11: C7			

EXHIBIT A-2. LOGIC MODEL CONNECTIONS MATRIX: COASTAL AND OCEAN WATERS



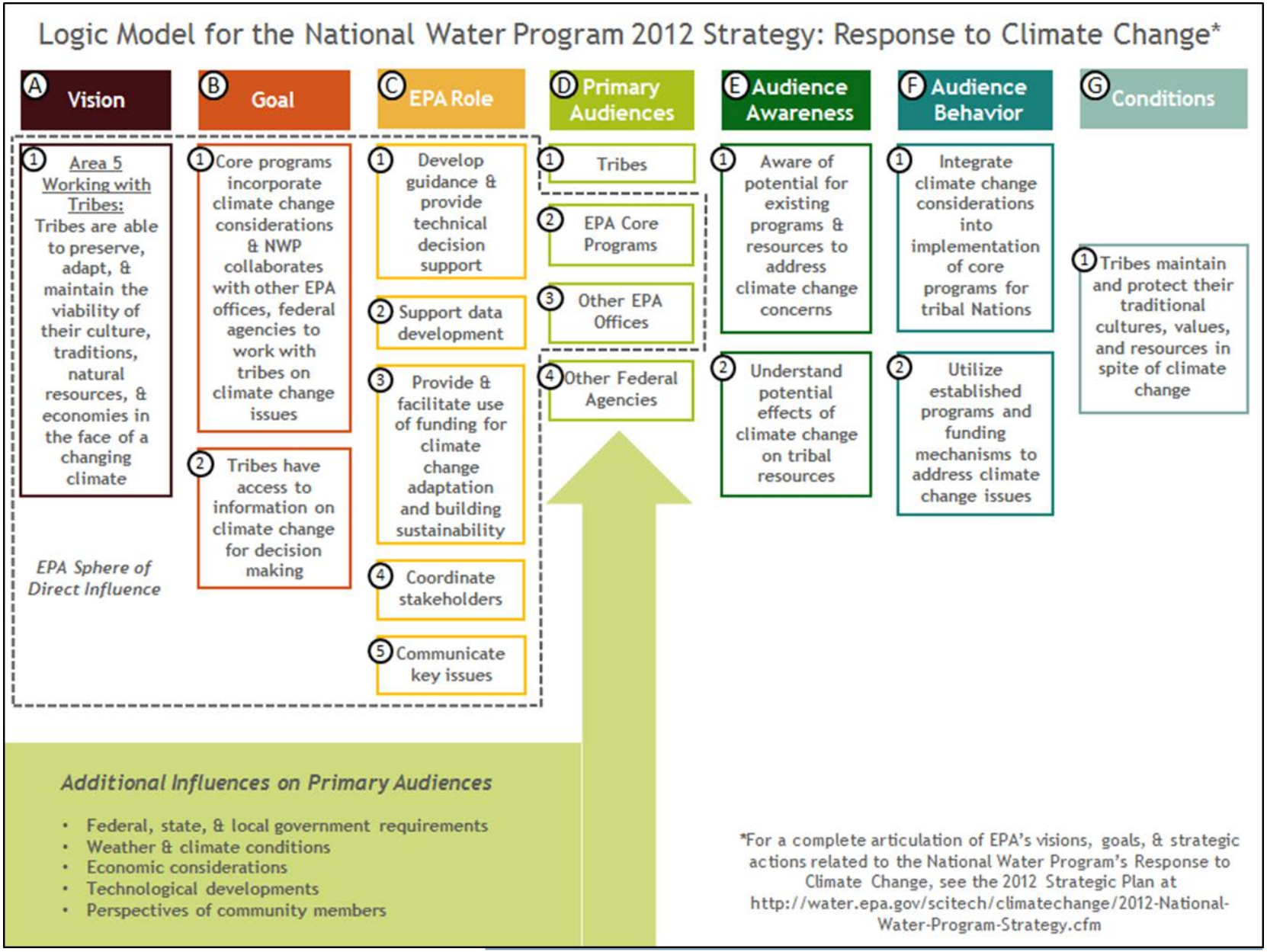
A: Vision	B: Goal	C: EPA Role	D: Primary Audiences	E: Audience Awareness	F: Audience Behavior	G: Conditions
All	**B1:** A1	**C1:** B1, B2, B4	**D1:** C1, C2, C3, C4, C5	**E1:** D1, D2	**F1:** E1, E2	**G1:** F1, F2, F3
	B2: A1	**C2:** B1, B2, B3	**D2:** C1, C4, C5	**E2:** D1, D2, D3, D4, D5, D6	**F2:** E1, E2, E3	**G2:** F1, F2, F3, F4
	B3: A1	**C3:** B1, B3	**D3:** C1, C2, C5	**E3:** D1, D2, D3, D4, D5	**F3:** E3	**G3:** F4
	B4: A1	**C4:** B4	**D4:** C1, C2, C3	**E4:** D1, D3, D4, D5	**F4:** E4	
		C5: B3	**D5:** C1, C2, C3			
			D6: C2, C3			

EXHIBIT A-3. LOGIC MODEL CONNECTIONS MATRIX: WATER QUALITY



A: Vision	B: Goal	C: EPA Role	D: Primary Audiences	E: Audience Awareness	F: Audience Behavior	G: Conditions
All	**B1:** A1	**C1:** B1, B3	**D1:** C2, C4, C6, C7	**E1:** D1, D2, D3, D4, D5, D6	**F1:** E1, E2, E3, E4	**G1:** F1, F2
	B2: A1	**C2:** B1, B2	**D2:** C1, C2, C3, C4, C6, C7	**E2:** D2, D4, D5, D6, D7	**F2:** E2, E3, E4	**G2:** F1, F2
	B3: A1	**C3:** B1, B2	**D3:** C1	**E3:** D2, D4, D5, D6		
		C4: B1, B2	**D4:** C1, C2, C3, C4, C6, C7	**E4:** D1, D2, D3, D4, D5, D6, D7		
		C5: B1, B3	**D5:** C1, C2, C4, C7			
		C6: B1, B2	**D6:** C1, C2, C4, C7			
		C7: B1, B2, B3	**D7:** C1, C2, C4, C7			

EXHIBIT A-4. LOGIC MODEL CONNECTIONS MATRIX: WORKING WITH TRIBES



A: Vision	B: Goal	C: EPA Role	D: Primary Audiences	E: Audience Awareness	F: Audience Behavior	G: Conditions
All	**B1:** A1	**C1:** B1, B2	**D1:** C1, C2, C3, C4, C5	**E1:** D1, D3, D4	**F1:** E1, E2	**G1:** F1, F2
	B2: A1	**C2:** B1, B2	**D2:** C2	**E2:** D1, D2, D3, D4	**F2:** E1	
		C3: B1, B2	**D3:** C1, C3			
		C4: B1	**D4:** C3, C5			
		C5: B1, B2				

APPENDIX B: SUMMARY OF STRATEGIC ACTION BASELINE DATA

STRATEGIC ACTION	COUNT OF ACTIVITIES	REGION/OFFICE
SA 1: Improve access to vetted climate and hydrological science, modeling, and assessment tools through the Climate Ready Water Utilities program.	3	Region 3, Region 6, OGWDW
SA 2: Assist wastewater and water utilities to reduce greenhouse gas emissions and increase long-term sustainability with a combination of energy efficiency, co-generation, and increased use of renewable energy resources.	8	Region 1, Region 4, Region 5, Region 6, Region 7, Region 8, Region 9, OWM
SA 3: Work with the states and public water systems, particularly small water systems, to identify and plan for climate change challenges to drinking water safety and to assist in meeting health based drinking water standards.	4	Region 1, Region 3, Region 7, OGWDW
SA 4: Promote sustainable design approaches to provide for the long-term sustainability of infrastructure and operations.	4	Region 4, Region 6, Region 7, OWM
SA 5: Understand and promote through technical assistance the use of water supply management strategies.	4	Region 3, Region 5, Region 6, OWM
SA 6: Evaluate and provide technical assistance on the use of water demand management strategies.	5	Region 5, Region 6, Region 8, OWM
SA 7: Increase cross-sector knowledge of water supply climate challenges and develop watershed specific information to inform decision making.	3	Region 3, Region 6, Region 8,
SA 8: Develop a national framework and support efforts to protect remaining healthy watersheds and aquatic ecosystems.	1	OWOW/AWPD
SA 9: Collaborate with partners on terrestrial ecosystems and hydrology so that effects on water quality and aquatic ecosystems are considered.	2	Region 4, OWOW/AWPD
SA 10: Integrate protection of healthy watersheds throughout the NWP core programs.	1	OWOW/AWPD
SA 11: Increase public awareness of the role and importance of healthy watersheds in reducing the impacts of climate change.	2	Region 4, OWOW/AWPD
SA 12: Consider a means of accounting for climate change in EPA funded and other watershed restoration projects.	3	Region 5, Region 7, OWOW/AWPD
SA 13: Work with federal, state, interstate, tribal, and local partners to protect and restore the natural resources and functions of riverine and coastal floodplains as a means of building resiliency and protecting water quality.	1	OWOW/AWPD
SA 14: Encourage states to update their source water delineations, assessments or protection plans to address anticipated climate change impacts.	2	Region 7, OGWDW
SA 15: Continue to support collaborative efforts to increase state and local awareness of source water protection needs and opportunities, and encourage inclusion of source water protection areas in local climate change adaptation initiatives.	2	Region 1, OGWDW
SA 16: Consider the effects of climate change, as appropriate, when making significant degradation determinations in the CWA Section 404 wetlands permitting and enforcement program.	1	OWOW
SA 17: Evaluate, in conjunction with the U.S. Army Corps of Engineers, how wetland and stream compensation projects could be selected, designed, and sited to aid in reducing the effects of climate change.	2	Region 7, OWOW
SA 18: Expand wetland mapping by supporting wetland.	1	OWOW
SA 19: Produce a statistically valid, ecological condition assessment of the nation's wetlands.	1	OWOW
SA 20: Work with partners and stakeholders to develop information and tools to support long term planning and priority setting for wetland restoration projects.	3	Region 1, Region 4, OWOW

STRATEGIC ACTION	COUNT OF ACTIVITIES	REGION/OFFICE
SA 21: Collaborate to ensure that synergy occurs, lessons learned are transferred, federal efforts effectively help local communities, and efforts are not duplicative or at cross-purposes.	1	OWOW
SA 22: Work within EPA and with the U.S. Global Change Research Program and other federal, tribal, and state agencies to collect, produce, analyze, and format knowledge and information needed to protect ocean and coastal areas and make it easily available.	2	Region 1, OWOW
SA 23: Work with the NWP's larger geographic programs to incorporate climate change considerations, focusing on both the natural and built environments.	3	Region 1, Region 10, OWOW
SA 24: Address climate change adaptation and build stakeholder capacity when implementing NEP Comprehensive Conservation and Management Plans and through the Climate Ready Estuaries Program.	3	Region 1, Region 4, OWOW
SA 25: Conduct outreach and education, and provide technical assistance to state and local watershed organizations and communities to build adaptive capacity in coastal areas outside the NEP and Large Aquatic Ecosystem programs.	3	Region 4, OWOW, GLNPO
SA 26: Support coastal wastewater, stormwater, and drinking water infrastructure owners and operators in reducing climate risks and encourage adaptation in coastal areas.	2	Region 10, OWOW
SA 27: Support climate readiness of coastal communities, including hazard mitigation, pre-disaster planning, preparedness, and recovery efforts.	3	Region 1, Region 10, OWOW
SA 28: Support preparation and response planning for diverse impacts to coastal aquatic environments.	1	OWOW
SA 29: Consider climate change impacts on marine water quality in NWP ocean management authorities, policies, and programs.	1	OWOW
SA 30: Use available authorities and work with the Regional Ocean Organizations and other federal and state agencies through regional ocean groups and other networks so that offshore renewable energy production does not adversely affect the marine environment.	1	OWOW
SA 31: Support the evaluation of sub-seabed sequestration of CO2 and any proposals for ocean fertilization.	1	OWOW
SA 32: Participate in interagency development and implementation of federal strategies through the NOC and the NOC Strategic Action Plans.	1	OWOW
SA 33: Encourage states and communities to incorporate climate change considerations into their water quality planning.	2	Region 5, OWOW/AWPD
SA 34: Encourage green infrastructure and low-impact development to protect water quality and make watersheds more resilient.	3	Region 1, Region 8, OWM
SA 35: Promote consideration of climate change impacts by National Pollutant Discharge Elimination System permitting authorities.	2	Region 5, OWM
SA 36: Encourage water quality authorities to consider climate change impacts when developing wasteload and load allocations in TMDLs where appropriate.	2	Region 10, OWOW/AWPD
SA 37: Identify and protect designated uses that are at risk from climate change impacts.	2	OW/OST
SA 38: Clarify how to re-evaluate aquatic life water quality criteria on more regular intervals; and develop information to assist states and tribes who are developing criteria that incorporate climate change considerations for hydrologic condition.	1	OW/OST
SA 39: Continue to provide perspective on the water resource implications of new energy technologies.	1	Baseline data submitted but reporting office not identified
SA 40: Provide assistance to states and permittees to assure that geologic sequestration of CO2 is responsibly managed.	3	Region 4, OGWDW

STRATEGIC ACTION	COUNT OF ACTIVITIES	REGION/OFFICE
SA 41: Continue to work with States to help them identify polluted waters, including those affected by biofuels production, and help them develop and implement Total Maximum Daily Loads (TMDLs) for those waters.	0	No baseline data submitted
SA 42: Provide informational materials for stakeholders to encourage the consideration of alternative sources of energy and fuels that are water efficient and maintain water quality.	2	Region 6, OWM
SA 43: As climate change affects the operation or placement of reservoirs, EPA will work with other federal agencies and EPA programs to understand the combined effects of climate change and hydropower on flows, water temperature, and water quality.	1	OWM
SA 44: Monitor climate change impacts to surface waters and ground water.	0	No baseline data submitted
SA 45: Collaborate with other federal agencies to develop new methods for use of updated precipitation, storm frequency, and observational streamflow data, as well as methods for evaluating projected changes in low flow conditions.	0	No baseline data submitted
SA 46: Enhance flow estimation using National Hydrography Dataset Plus (NHDPlus).	1	OWOW/AWPD
SA 47: Through formal consultation and other mechanisms, incorporate climate change as a key consideration in the revised NWP Tribal strategy and subsequent implementation of CWA, SDWA, and other core programs.	1	Region 1
SA 48: Incorporate adaptation into tribal funding mechanisms, and collaborate with other EPA and federal funding programs to support sustainability and adaptation in tribal communities.	1	Region 5
SA 49: Collaborate to explore and develop climate change science, information, and tools for tribes, and incorporate local knowledge.	1	Region 10
SA 50: Collaborate to develop communication materials relevant for tribal uses and tribal audiences.	0	No baseline data submitted
SA 51: Continue building the communication, collaboration, and training mechanisms needed to effectively increase adaptive capacity at the federal, tribal, state, and local levels.	0	No baseline data submitted
SA 52: Adopt a phased approach to track programmatic progress towards strategic actions; achieve commitments reflected in the Agency's Strategic Plan; work with the EPA workgroup to develop outcome measures.	0	No baseline data submitted
SA 53: Work with EPA's Office of Research and Development, other water science agencies, and the water research community to further define needs and develop research opportunities to deliver the information needed to support implementation of this 2012 Strategy, including providing the decision support tools needed by water resource managers.	1	IO/OST

APPENDIX C: SUMMARY OF REPORTS AND ONLINE RESOURCES THAT DESCRIBE PROGRESS ON CLIMATE CHANGE ADAPTATION

EPA Resources

- **Resource/Report title:** Climate Ready Estuary Projects—Where you live—2008 - 2012
  - **Author:** EPA
  - **Link:** http://water.epa.gov/type/oceb/cre/live.cfm
    http://water.epa.gov/type/oceb/cre/upload/CRE_2011Report_RiskManagementPullout_508.pdf
  - **Partners included:** EPA Climate Ready Estuaries program, various states and communities
  - **Description:** This webpage summarizes and links to Climate Ready Estuary projects in each EPA region. Many of the projects pertain to analysing coastal watersheds for climate vulnerability. However, a large portion of the projects are also intended to improve coastal resilience to climate change. For example, a study by the New York and New Jersey Harbor Estuary Program is examining adaptation options for the sewage authority. Likewise, the Lower Columbia River Estuary Partnership is working to incorporate climate considerations into the estuary program's Comprehensive Conservation and Management Plan to guide adaptation efforts. In all, the site contains 36 project summaries, and each one links to an external website for the project or the project partners. A separate PDF report (see second link above) categorizes these projects according to the ISO 31000 Risk Management Framework.
  - **Updates:** Frequency of updates depends on the particular project
  - **Applicable areas:** Infrastructure, Wetlands and Watersheds

- **Resource/Report title:** CREAT analytics data
  - **Author:** EPA
  - **Link:** http://water.epa.gov/infrastructure/watersecurity/climate/creat.cfm
  - **Partners included:** Water and wastewater utilities
  - **Description:** CREAT stands for Climate Resilience Evaluation and Awareness Tool. It is a software tool designed to assist drinking water and wastewater utility owners and operators in understanding potential climate change impacts and in assessing the related risks at their utilities. Users download and register for the software via the EPA website. Analytic data that tracks the number of downloads could, along with registration data, be used to assess the tool's market penetration in the water utility industry.
  - **Updates:** It is unclear how often EPA updates the CREAT software or the analytics programs that track downloads of CREAT
  - **Applicable areas:** Infrastructure, Water Quality

- **Resource/Report title:** EPA Coastal Area Impacts and Adaptation
  - **Author:** EPA
  - **Link:** http://www.epa.gov/climatechange/impacts-adaptation/coasts.html#adapt
  - **Partners included:** Links to other federal agencies

- **Description:** This EPA website is a clearinghouse for information on coastal climate impacts and the adaptation approaches being taken by in states and communities around the country. In addition to discussions of how climate change will affect coastal communities and ecosystems, this website contains examples of EPA, interagency, and state adaptation efforts. Examples include state and federal efforts to map sea level rise, state regulations that require construction contractors to consider climate effects, and an online forum for communities to share information about adaptation. The site includes subpages that report on region-specific problems and adaptation efforts. For example, the *Northwest Impacts and Adaptation* subpage features the summary *Olympia, Washington, Plans for Sea Level Rise.*
- **Updates:** Website last updated June 14, 2012; it is not clear whether the website is regularly updated
- **Applicable areas:** Infrastructure, Wetlands and Watersheds.

- **Resource/Report title:** EPA's Water Infrastructure Website
  - **Author:** EPA
  - **Link:** http://water.epa.gov/infrastructure/
  - **Partners included:** States, municipalities, water utilities
  - **Description:** EPA's water infrastructure website is a clearinghouse of resources on climate adaptation in the water supply and wastewater management sector. It contains links to surveys and case studies about what specific utilities and other infrastructure systems are doing to adapt to climate change, as well as more generic tools and resources designed to provide technical assistance to infrastructure stakeholders.
  - **Updates:** Website was last updated December 5, 2012; it is not clear whether the website is regularly updated
  - **Applicable areas:** Wetlands and watersheds

- **Resource/Report title:** Workshop Proceedings on Water Infrastructure Sustainability and Adaptation to Climate Change
  - **Author:** EPA
  - **Link:** http://www.epa.gov/nrmrl/wswrd/wq/wrap/workshop.html
  - **Partners included:** Various states, cities, and infrastructure owners and operators
  - **Description:** These proceedings include links to workshop materials created by and/or for water infrastructure owners and operators. Many of the materials contain case studies on successful capital investments for adapting water utilities to climate change. Examples include presentations about water supply adaptation efforts in Boston, water availability forecasting in South Florida, and preparations for climate change among water utility operators in East Bay, California. More general materials include abstract tips and strategies for adapting municipal water systems to climate change.
  - **Updates:** It is unlikely that the proceedings would be updated
  - **Applicable areas:** Wetlands and Watersheds

Other Federal Government Resources

Report title: Addressing Climate Change in Long-Term Water Resources Planning and Management

- **Report author:** Department of the Interior (Bureau of Reclamation) and U.S. Army Corps of Engineers

- **Report link:** http://www.usbr.gov/climate/userneeds/
- **Partners included:** Many (Fed., State, Local gov't agencies, private industries, and non-profits)
- **Description:** The report describes the need for information and tools to support long-term climate change planning efforts by various water management agencies (Fed., State, and Local level). The findings are intended to identify tool and information gaps and in turn, focus future research efforts. The gaps are categorized into eight technical steps by which findings are summarized. The eight steps are as follows:
  - Summarize relevant literature
  - Obtain climate change information
  - Make decisions about how to use climate change information
  - Assess natural systems response
  - Assess socioeconomic and institutional response
  - Assess system risks and evaluate alternatives
  - Assess and characterize uncertainties
  - Communicating results and uncertainties to decision makers
- **Updates:** Report was last updated on 4/24/2011; it is unclear if a future update is planned.
- **Applicable areas:** Infrastructure

- **Report title:** National Climate Assessment, Adaptation Section (draft 2013)
  - **Report author:** National Climate Assessment and Development Advisory Committee
  - **Report Link:** http://ncadac.globalchange.gov/download/NCAJan11-2013-publicreviewdraft-chap28-adaptation.pdf
  - **Partners included:** Many (Fed., State, Local gov't agencies, private industries, and non-profits)
  - **Description:** Report summarizes the latest information on climate change adaptation efforts across the US. The report concludes that "Substantial adaptation planning is occurring in the public and private sectors and at 20 all levels of government, however, few measures have been implemented and those 21 that have appear to be incremental changes." The report finds that, "Most adaptation efforts to date have occurred at local and regional levels." A few of the examples of climate change adaptation provided relate to wetlands and watersheds. For example, the report states that the city of Groton, Connecticut, "Partnered with federal, state, regional, local, non-governmental, and academic partners through the EPA's Climate Ready Estuaries program to assess vulnerability to and devise solutions for sea level rise." The report finds that the general stages in the adaptation process include 1) understanding risks and vulnerabilities, 2) planning, assessing, and selecting options, 3) implementation, 4) monitoring and evaluation, and 5) revising strategy and research and sharing lessons learned. These steps can occur simultaneously, in a different order, or may be omitted completely. Evaluation and monitoring efforts to date and focused on process-based rather than outcome indicators, however efforts are underway to develop outcome-based indicators (including efforts at EPA).
  - **Updates:** Every four years
  - **Applicable areas:** All areas

- **Resource/Report title:** NOAA Coastal Climate Adaptation and Action Plans
  - **Author:** NOAA
  - **Link:** http://collaborate.csc.noaa.gov/climateadaptation/Lists/Resources/AdaptationAction%20Plans.aspx
  - **Partners included:** States and municipalities
  - **Description:** This clearinghouse of adaptation plans contains reports and action plans created by states and cities to plan and document their adaptation efforts. The website characterizes each plan according to the sectors and impacts discussed. Several dozen documents are characterized and linked to. An example is the San Diego Bay Sea Level Rise Adaptation strategy, which lays out a comprehensive vulnerability assessment and a series of broad recommendations for building the resilience of community assets.
  - **Updates:** Latest plan added on March 27, 2013; new plans are added regularly
  - **Applicable areas:** Infrastructure, Wetlands and Watersheds, Water Quality, Tribes.

State and Local Resources

Report title: Climate Change Adaptation for Maryland Water Utilities

- **Report author:** Maryland Depart of Environment's Water Supply Program
- **Report link:** http://www.mde.state.md.us/programs/Water/Water_Supply/Documents/120516_CCbrochure_Web.pdf
- **Partners included: NA**
- **Description:** This report is intended to help local water utilities in Maryland plan and prepare for the impacts of climate change. The report lays out potential impacts to drinking water along with guidelines to choosing appropriate adaptation measures. Recommended adaptation measures to address changes to water quality are as follows:
  - Acquire and manage forested/vegetated lands
  - Improve monitoring
  - Increase treatment capability
  - Green infrastructure
- **Updates:** Updated on 9/21/2012, it is not clear whether the report is regularly updated.
- **Applicable areas**: infrastructure

- **Report title:** Climate Change Handbook for Regional Water Planning
  - **Report author:** California DWR, US Army Corps of Engineers, and US EPA Region 9
  - **Report link:** http://www.water.ca.gov/climatechange/docs/Climate_Change_Handbook_Regional_Water_Planning.pdf
  - **Partners included:** Many (Fed., State, Local gov't agencies, private industries, and non-profits)
  - **Description:** This report is a handbook that lays out an analytical framework for incorporating climate change impacts into regional and watershed level planning processes. The handbook focuses on the California Integrated Regional Water Management Planning but is intended to inform any water planning process. The handbook addresses adaptation and mitigation techniques and describes various decision support tools and techniques that water planning agencies can use. The use of

these tools and techniques are illustrated through case studies. Additionally, Section 6 of the handbook discusses evaluation of climate change adaptation and mitigation programs. It stresses the need for having quantifiable metrics in order to measure performance.

- **Updates:** Prepared in Nov. of 2011 it does not appear the report is regularly updated.
- **Applicable areas:** Infrastructure, Coastal and Ocean Waters, Wetlands and Watersheds

Report title: Managing an Uncertain Future – Climate Change Adaptation Strategies for California's Water

- **Report author:** California DWR
- **Report link:** http://www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf
- **Partners included:** NA
- **Description:** The report recommends ten capacity building climate change adaptation strategies for state and local water managers. The recommended strategies are very specific, laying out precise actions that the State of California should take. Some of the strategies involve immediate actions and others require further planning and consultation.
- **Updates:** Prepared in 2008, it does not appear to be regularly updated
- **Applicable areas:** Infrastructure, Wetlands and Watersheds, Coastal and Ocean Waters

Report title: Adapting to Climate Change in Minnesota: Preliminary Report of the Interagency Climate Adaptation Team

- **Report author:** Minnesota Pollution Control Agency
- **Report link:** http://www.pca.state.mn.us/index.php/view-document.html?gid=15414
- **Partners included:** MN DOA, DOC, DOH, DNR, Public Safety and Transportation
- **Description:** This report outlines anticipated climate change effects on the State of Minnesota. It also describes various state agencies' current climate change adaptation efforts. With regard to water quality, the Minnesota Pollution Control Agency (MPCA) has conducted the following activities:
  - Initiated a watershed-focused monitoring design to help provide better spatial resolution of stressors.
  - Initiated a statewide random monitoring program to develop long-term trends on a large scale.
  - Integrate biological, physical and chemical monitoring to develop relationships between environmental factors (including climate) and aquatic life.
  - Developed biological indices for fish and invertebrates to measure response.
  - Developed approaches to reduce storm-water runoff through low impact development.
- **Updates:** Prepared in August of 2010, it does not appear to be regularly updated.
- **Applicable areas:** Infrastructure

Report title: The Oregon Climate Change Adaptation Framework

- **Report author:** Oregon DOE
- **Report link:** http://www.oregon.gov/ENERGY/GBLWRM/docs/Framework_Final_DLCD.pdf
- **Partners included:** Numerous state agencies including: Oregon DOA, DOE, DEQ, DFW, and many others…
- **Description:** The report describes a framework for the development of strategies and plans to address climate change impacts in the State of Oregon. The framework discusses Oregon's climate change risks, adaptive capacity, and short priority actions and a long term process to build Oregon's adaptive capacity. The report does not focus specifically on water quality but it is addressed in various portions of the report.
- **Updates:** Prepared in December of 2010, it does not appear to be regularly updated.
- **Applicable areas:** Infrastructure, Wetlands and Watersheds, Coastal and Ocean Waters

- **Website title:** State and Local Adaptation Plans
  - **Website author:** Georgetown Climate Center
  - **Website link:** http://www.georgetownclimate.org/adaptation/state-and-local-plans
  - **Partners included:** State and local governments
  - **Description:** This website provides links to state and local adaptation plans.
  - **Updates:** Website appears to be continually updated; recent plans from December 2012 are included.
  - **Applicable areas:** All areas

Other Resources

- **Report title:** Adaptation Planning – What U.S. States and Localities are Doing (2009)
  - **Report author:** Pew Center for Global Climate Change/Center for Climate and Energy Solutions
  - **Report link:** http://www.c2es.org/publications/state-local-adaptation-planning
  - **Partners included:** States and localities
  - **Description:** This report describes state and local climate change adaptation planning efforts, with links to more information.
  - **Updates:** Prepared in 2009, it does not appear that the report is regularly updated
  - **Applicable areas:** All areas

- **Report title:** Climate Change Adaptation Plan for Coastal and Inland Wetlands in the State of Michigan (2012) (*Included as an example of a state adaptation plan specific to wetlands*)
  - **Report author:** The Association of State Wetland Managers, Inc.
  - **Report link:** http://aswm.org/wetland-science/climate-change/climate-change-adaptation/3214-climate-change-adaptation-plan-for-coastal-a-inland-wetlands-in-the-state-of-michigan
  - **Partners included:** Michigan Department of Environmental Quality Wetlands Program and Coastal Management Program
  - **Description:** The report describes how wetlands are a tool to help adapt to climate change, identifies wetland adaptation planning in other states, and provides recommended actions for Michigan related to wetlands adaptation.

- **Updates:** The report was prepared in September 2012 in draft format; a partnership of state, local, and regional agencies and groups will need to review the recommendations reach agreement on specific actions that can be taken to ensure that wetland resources are included in broader strategies to address and adapt to climate change. It does not appear there are currently plans to update the report.
- **Applicable areas:** Wetlands and Watersheds, Coastal and Ocean Waters

- **Report title:** Climate Change Adaptation: What Federal Agencies Are Doing (2012)
  - **Report author:** Center for Climate and Energy Solutions
  - **Report link:** http://www.c2es.org/publications/climate-change-adaptation-what-federal-agencies-are-doing
  - **Partners included:** US Federal Agencies
  - **Description:** For each Department, the report highlights specific adaptation initiatives (such as a program office or strategic plan) that are in place at the Department level. These are followed by an overview of each agency or bureau within that Department and relevant adaptation activities, which are typically divided into: (1) initiatives and strategies, (2) programs and institutional mechanisms, and (3) tools and resources. This January 2012 update also includes several examples of federal projects that incorporate the impacts of climate change and adaptive actions into the planning, design, and implementation process. These projects further highlight the leadership role federal departments and agencies are taking to promote a more climate resilient economy, society, and environment.
  - **Updates:** the report was originally developed in 2010, and updated in 2012.
  - **Applicable areas:** All areas

- **Report title**: State Wetland Climate Change Adaptation Summaries (2010)
  - **Report author**: Association of State Wetland Managers
  - **Report link**: http://aswm.org/wetland-science/climate-change/climate-change-adaptation/1200-climate-change-adaptation-summaries
  - **Partners included**: States
  - **Description:** This web-based report describes states that have respond to climate change through adaptation planning, studies, and monitoring. The report describes the status of the activity (e.g., in progress or completed) and whether adaptation planning includes wetlands. Each example includes a brief description and links to websites and/or contacts for more information.
  - **Updates:** Prepared in 2010, it does not appear that the report is regularly updated.
  - **Applicable areas:** All areas

- **Website title:** StormSmart Coasts
  - **Author:** StormSmart Coasts Network
  - **Link:** http://stormsmartcoasts.org/
  - **Partners included:** EPA, NOAA, Gulf of Mexico Alliance, Northeast Regional Ocean Council
  - **Description:** StormSmart Coasts is "a resource for coastal decision makers looking for the latest and best information on how to protect their communities from weather and climate hazards." While the website contains some information that may not be strictly considered *adaptation* (e.g., best practices for assessing storm damage), the majority of

the site is dedicated to sharing information on activities more traditionally considered under the banner of adaptation, including analysing sea level, flood, and storm vulnerability; creating community, hazard, and adaptation plans; and drafting new building and siting codes that account for climate change. StormSmart has individual websites for the following states: Alabama, Connecticut, Delaware, Florida, Louisiana, Maine, Massachusetts, Mississippi, New Hampshire, Rhode Island, and Texas. Some of the site's offerings differ among states. For example, the Texas site includes a "tools" section, which links to tools such as a vulnerability atlas of the Texas coast, while the Florida site does not. This tool and others could provide some data on adaptation efforts.
    - **Updates:** The website is updated as new states join the network and add adaptation information, but a regular update schedule is unavailable
    - **Applicable areas:** Infrastructure

- **Report title:** Swinomish Climate Change initiative – Climate Adaptation Action Plan
    - **Report author:** Swinomish Indian Tribal Community: Office of Planning and Community Development
    - **Report link:** http://www.swinomish-nsn.gov/climate_change/Docs/SITC_CC_AdaptationActionPlan_complete.pdf
    - **Partners included:** University of Washington, Center for Science in the Earth System, Climate Impacts Group
    - **Description:** This report provides a comprehensive picture of the threats that climate change poses to the Swinomish Tribe, identifies specific adaptation/mitigation actions that the Tribe can take, and assesses their ability to fulfil these actions in a specified time frame. Additionally, the report uses parameters to prioritize each of the recommended actions. The report was written in 2010 and is part of the Swinomish Tribe's on-going climate change adaptation effort.
    - **Updates:** Prepared in October of 2010, it does not appear to be regularly updated.
    - **Applicable areas:** Working with Tribes

- **Resource/Report title:** The Role of Coastal Zone Management Programs in Adaptation to Climate Change
    - **Author:** Coastal States Organization
    - **Link:** http://www.coastalstates.org/wp-content/uploads/2010/07/CSO-2008-Climate-Change-Report2.pdf
    - **Partners included:** Coastal states
    - **Description:** This report explores state coastal program's climate change initiatives, as well as states' assessments about national policy needs. It is the end result of a survey of 30 U.S. coastal states and territories about climate change adaptation efforts and needs. The data in the report constitute an attempt to rank coastal climate change issues, assess work done to date, and estimate a cost associated with state adaptation activities. A results section toward the end of the report documents about a dozen adaptation strategies and actions being undertaken in coastal states around the nation.
    - **Updates:** While this report will not be updated, additional reports will likely be released in the future
    - **Applicable areas:** Infrastructure, Wetlands and Watersheds, Water Quality

- **Website title:** Tribal Climate Change Project
  - **Website author:** University of Oregon and the USDA Forest Service Pacific Northwest Research Station
  - **Website link:** http://tribalclimate.uoregon.edu/
  - **Partners included: U**niversity of Oregon, Environmental Studies Program and the USDA Forest Service Pacific Northwest Research Station
  - **Description:** This website provides information on the Tribal Climate Change Project, part of the USDA Forest Service's 2010 Coordinated Approach to Tribal Climate Change Research. The project addresses the following key research areas:
    - Tribal adaptation and mitigation planning
    - Management of off-reservation resources
    - Tribal consultation in the context of climate change
  - **Updates:** Website appears to be continually updated as projects are developed
  - **Applicable areas:** Working with Tribes

- **Website title:** Tribes & Climate Change
  - **Website author:** Institute for Tribal Environmental Professionals
  - **Website link:** http://www4.nau.edu/tribalclimatechange/tribes/index.asp
  - **Partners included:** Northern Arizona University
  - **Description:** This website contains profiles of various Tribes and describes the potential impacts climate change may have on them. Additionally, the site provides links to numerous resources about climate change that Tribes can use to help with adaptation and mitigation efforts. The resources include tools, reports, funding opportunities, and information about traditional tribal knowledge related to climate change.
  - **Updates:** Site was last updated 8/27/2012, there does not appear to be a set schedule for updates.
  - **Applicable areas:** Working with Tribes

- **Report title:** Yurok Tribe and Climate Change: An Initial Prioritization Plan
  - **Report author:** Kathleen Sloan and Joe Hostler – Yurok Tribe Environmental Program
  - **Report link:** http://www.yuroktribe.org/departments/ytep/documents/YurokTribeandClimateChangePrioritizationPlan.pdf
  - **Partners included:** US EPA Environmental Justice Small Grants Program
  - **Description:** The report provides a preliminary assessment of available climate change information and the potential impacts to the "Yurok People, Resources, and Lifeways." The report is intended to provide information to tribal decision-makers and help guide climate change research and planning efforts. The report focuses on the first two steps of a more robust plan:
    - Communicate and consult
    - Monitor and review
  - **Updates:** Prepared in September of 2011, it does not appear to be regularly updated.
  - **Applicable areas:** Working with Tribes

APPENDIX D: CATEGORIES OF STRATEGIC ACTIONS

STRATEGIC ACTION	POLICY AND/OR GUIDANCE CHANGE	FINANCIAL INCENTIVE	TECHNICAL RESOURCES / DATA DEVELOPMENT	TECHNICAL ASSISTANCE / TRAINING	FOSTERING PARTNERSHIPS / COLLABORATION
Infrastructure					
1: Improve access to vetted climate and hydrological science, modeling, and assessment tools through the Climate Ready Water Utilities program.			X		
2: Assist wastewater and water utilities to reduce greenhouse gas emissions and increase long-term sustainability with a combination of energy efficiency, co-generation, and increased use of renewable energy resources.				X	
3: Work with the states and public water systems, particularly small water systems, to identify and plan for climate change challenges to drinking water safety and to assist in meeting health based drinking water standards.				X	
4: Promote sustainable design approaches to provide for the long-term sustainability of infrastructure and operations.				X	
5: Understand and promote through technical assistance the use of water supply management strategies.				X	
6: Evaluate and provide technical assistance on the use of water demand management strategies.				X	
7: Increase cross-sector knowledge of water supply climate challenges and develop watershed specific information to inform decision making.			X		
Watersheds and Wetlands					
8: Develop a national framework and support efforts to protect remaining healthy watersheds and aquatic ecosystems.					X
9: Collaborate with partners on terrestrial ecosystems and hydrology so that effects on water quality and aquatic ecosystems are considered.					X

STRATEGIC ACTION	POLICY AND/OR GUIDANCE CHANGE	FINANCIAL INCENTIVE	TECHNICAL RESOURCES / DATA DEVELOPMENT	TECHNICAL ASSISTANCE / TRAINING	FOSTERING PARTNERSHIPS / COLLABORATION
10: Integrate protection of healthy watersheds throughout the NWP core programs.	X				
11: Increase public awareness of the role and importance of healthy watersheds in reducing the impacts of climate change.				X	
12: Consider a means of accounting for climate change in EPA funded and other watershed restoration projects.	X				
13: Work with federal, state, interstate, tribal, and local partners to protect and restore the natural resources and functions of riverine and coastal floodplains as a means of building resiliency and protecting water quality.					X
14: Encourage states to update their source water delineations, assessments or protection plans to address anticipated climate change impacts.			X		
15: Continue to support collaborative efforts to increase state and local awareness of source water protection needs and opportunities, and encourage inclusion of source water protection areas in local climate change adaptation initiatives.				X	
16: Consider the effects of climate change, as appropriate, when making significant degradation determinations in the CWA Section 404 wetlands permitting and enforcement program.	X				
17: Evaluate, in conjunction with the U.S. Army Corps of Engineers, how wetland and stream compensation projects could be selected, designed, and sited to aid in reducing the effects of climate change.	X				
18: Expand wetland mapping by supporting wetland.			X		
19: Produce a statistically valid, ecological condition assessment of the nation's wetlands.			X		
20: Work with partners and stakeholders to develop information and tools to support long term planning and priority setting for wetland restoration projects.			X		

STRATEGIC ACTION	POLICY AND/OR GUIDANCE CHANGE	FINANCIAL INCENTIVE	TECHNICAL RESOURCES / DATA DEVELOPMENT	TECHNICAL ASSISTANCE / TRAINING	FOSTERING PARTNERSHIPS / COLLABORATION
Coastal and Ocean Waters					
21: Collaborate to ensure that synergy occurs, lessons learned are transferred, federal efforts effectively help local communities, and efforts are not duplicative or at cross-purposes.					X
22: Work within EPA and with the U.S. Global Change Research Program and other federal, tribal, and state agencies to collect, produce, analyze, and format knowledge and information needed to protect ocean and coastal areas and make it easily available.			X		
23: Work with the NWP's larger geographic programs to incorporate climate change considerations, focusing on both the natural and built environments.				X	
24: Address climate change adaptation and build stakeholder capacity when implementing NEP Comprehensive Conservation and Management Plans and through the Climate Ready Estuaries Program.				X	
25: Conduct outreach and education, and provide technical assistance to state and local watershed organizations and communities to build adaptive capacity in coastal areas outside the NEP and Large Aquatic Ecosystem programs.				X	
26: Support coastal wastewater, stormwater, and drinking water infrastructure owners and operators in reducing climate risks and encourage adaptation in coastal areas.				X	
27: Support climate readiness of coastal communities, including hazard mitigation, pre-disaster planning, preparedness, and recovery efforts.				X	
28: Support preparation and response planning for diverse impacts to coastal aquatic environments.				X	
29: Consider climate change impacts on marine water quality in NWP ocean management authorities, policies, and programs.	X				

STRATEGIC ACTION	POLICY AND/OR GUIDANCE CHANGE	FINANCIAL INCENTIVE	TECHNICAL RESOURCES / DATA DEVELOPMENT	TECHNICAL ASSISTANCE / TRAINING	FOSTERING PARTNERSHIPS / COLLABORATION
30: Use available authorities and work with the Regional Ocean Organizations and other federal and state agencies through regional ocean groups and other networks so that offshore renewable energy production does not adversely affect the marine environment.				X	
31: Support the evaluation of sub-seabed sequestration of CO2 and any proposals for ocean fertilization.				X	
32: Participate in interagency development and implementation of federal strategies through the NOC and the NOC Strategic Action Plans.					X
Water Quality					
33: Encourage states and communities to incorporate climate change considerations into their water quality planning.	X				
34: Encourage green infrastructure and low-impact development to protect water quality and make watersheds more resilient.		X			
35: Promote consideration of climate change impacts by National Pollutant Discharge Elimination System permitting authorities.			X		
36: Encourage water quality authorities to consider climate change impacts when developing wasteload and load allocations in TMDLs where appropriate.			X		
37: Identify and protect designated uses that are at risk from climate change impacts.				X	
38: Clarify how to re-evaluate aquatic life water quality criteria on more regular intervals; and develop information to assist states and tribes who are developing criteria that incorporate climate change considerations for hydrologic condition.				X	
39: Continue to provide perspective on the water resource implications of new energy technologies.				X	

STRATEGIC ACTION	POLICY AND/OR GUIDANCE CHANGE	FINANCIAL INCENTIVE	TECHNICAL RESOURCES / DATA DEVELOPMENT	TECHNICAL ASSISTANCE / TRAINING	FOSTERING PARTNERSHIPS / COLLABORATION
40: Provide assistance to states and permittees to assure that geologic sequestration of CO2 is responsibly managed.				X	
41: Continue to work with States to help them identify polluted waters, including those affected by biofuels production, and help them develop and implement Total Maximum Daily Loads (TMDLs) for those waters.			X		
42: Provide informational materials for stakeholders to encourage the consideration of alternative sources of energy and fuels that are water efficient and maintain water quality. 43: As climate change affects the operation or placement of reservoirs, EPA will work with other federal agencies and EPA programs to understand the combined effects of climate change and hydropower on flows, water temperature, and water quality.			X X		
44: Monitor climate change impacts to surface waters and ground water.			X		
45: Collaborate with other federal agencies to develop new methods for use of updated precipitation, storm frequency, and observational streamflow data, as well as methods for evaluating projected changes in low flow conditions.			X		
46: Enhance flow estimation using National Hydrography Dataset Plus (NHDPlus).			X		
Working with Tribes					
47: Through formal consultation and other mechanisms, incorporate climate change as a key consideration in the revised NWP Tribal strategy and subsequent implementation of CWA, SDWA, and other core programs.	X				
48: Incorporate adaptation into tribal funding mechanisms, and collaborate with other EPA and federal funding programs to support sustainability and adaptation in tribal communities.		X			

STRATEGIC ACTION	POLICY AND/OR GUIDANCE CHANGE	FINANCIAL INCENTIVE	TECHNICAL RESOURCES / DATA DEVELOPMENT	TECHNICAL ASSISTANCE / TRAINING	FOSTERING PARTNERSHIPS / COLLABORATION
49: Collaborate to explore and develop climate change science, information, and tools for tribes, and incorporate local knowledge.			X		
50: Collaborate to develop communication materials relevant for tribal uses and tribal audiences.			X		
Totals	7	2	17	19	5

APPENDIX E: DATA CONSISTENCY AND QUALITY

The evaluation team's assessment of strategic actions according to the seven phases of adaptive management was based in part on baseline data collected for strategic actions by OW in December. These data illustrated challenges of data consistency and quality that are important to address for any measurement system. Some of these challenges derive from the problems discussed in the report (see the section entitled, "Considerations for Mapping Strategic Actions to the Phases of Adaptive Management"). For example, broadly written strategic actions may lead to radically different interpretations among partners and ultimately to significant variations in the amount and type of data reported. Other issues with the data consistency and quality cannot be directly attributed to the way EPA has written its strategic actions. The evaluation team noted the following issues with baseline data:

- Reporters often discussed future plans instead of current progress.
- Reporters cited activities that occurred many years ago as evidence of progress.
- When providing examples of progress, reporters cited activities that were only vaguely related to each strategic action.
- The baseline data survey itself needs more specificity.

Data consistency and quality were adversely affected when reporters cited future plans or activities from the distant past as current progress on strategic objectives. Data become incomparable when each reporter makes their own assumptions about relevant timeframes. For example, if one region discusses activities going back three years and another going back five years, it is difficult or impossible to determine which region has made more progress. EPA should specify an appropriate timeframe, within which reporters can cite relevant past and future activities as examples of progress.

Data consistency and quality also faltered because the activities cited as examples of progress had varying degrees of relevance to the strategic actions. It becomes difficult to compare various datasets when one reporter takes a conservative view and provides a few activities that definitively relate to a specific strategic action, while another provides a multitude of examples that are only vaguely relevant. To prevent this problem, EPA should consider drafting strategic actions that are more narrowly worded and providing examples of activities that are and are not appropriate citations of progress.

Finally, the template EPA used to collect baseline data does not promote consistency. Most significantly, the template asks open ended questions that lend themselves to a high degree of inconsistency. Likewise, it permits reporters to describe—or not describe—progress on any strategic action they choose, rather than requiring them to cite progress or lack of progress on all strategic actions in their purview. The outcome is a patchwork of results from HQ offices and regions. Additionally, by asking about future plans and challenges, the template distracts from its intended purpose: to gauge progress on strategic actions. EPA could improve the template by utilizing check boxes or pick lists instead of open ended questions, requiring progress reports for all strategic actions, focusing questions on progress instead of challenges and future plans, and asking for progress reports in terms of strategic action stages rather than adaptive management phases.