

State Strategies to Plan for and Adapt to Climate Change

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Existing Planning Precedents

Climate change is expected to pose a number of risks to communities, such as sea-level rise and an increase in storm surges. States are beginning to develop adaptation plans to reduce climate risks and vulnerabilities within the larger context of economic growth. While the process and structure of the planning efforts vary, the resulting recommendations reveal similarities. The plans include a mix of broad strategies that address the state's objectives and goals and identify supporting policies. To ensure complementary and coordinated responses to climate change, many strategies are cross-sectoral and entail integration and collaboration among multiple government agencies and economic sectors.

Maryland,² Pennsylvania,³ and California⁴ are among the states that have published adaptation plans in recent years at the request of the governor or a state-appointed climate change planning body. In each of these cases, working groups consisting of experts across multiple state agencies developed the plans anticipating an iterative process over the long term. Maryland's plan has been developed in phases. Phase I, published in 2008, focuses on coastal resilience and therefore includes a number of strategies related to sea-level rise and tropical storms. The Maryland working group published Phase II in 2010, offering strategies that promote societal, economic, and ecological resilience of multiple sectors to a larger set of climate impacts, including temperature increases, changes in precipitation, and extreme weather events.⁵ The plan identifies lead agencies, partners, priorities, timeframe, and the potential cost of recommended tactics. California's comprehensive plan, published in 2009, was uniformly developed and engaged multiple agencies to assess the vulnerability of seven sectors and plan for multiple climate impacts. The state provided a one-year progress report to the Governor in 2010, maintaining its commitment to an ongoing planning process. Pennsylvania's adaptation plan, published in 2011, outlines responses to impacts from droughts, floods, and heat waves on infrastructure, public health, natural resources, and tourism.

The principal goal of this document is to provide state adaptation planning bodies with examples of cross-sectoral strategies and policy measures quoted directly from the three plans described above. It presents a sample of general adaptation strategies, as well as those addressing five specific climate impacts.

Defining Strategies and Policies

The strategies defined in the three state plans are broad statements that define objectives and goals that can be integrated into and supported by multiple state agencies. Agencies are then able to develop policies that support the strategies. In general, adaptation strategies and policies fall into four categories: (1) calls for research and education, (2) promotion and facilitation of existing policies or programs that improve resilience, (3) integration of adaptive measures into current policies or planning processes, and (4) development of new policies or practices that reduce vulnerability. The degree of the recommended policy change is naturally influenced by current understanding of climate change impacts, policy needs, and options for adapting to climate change, as well as the practicality of proposed strategies and measures.

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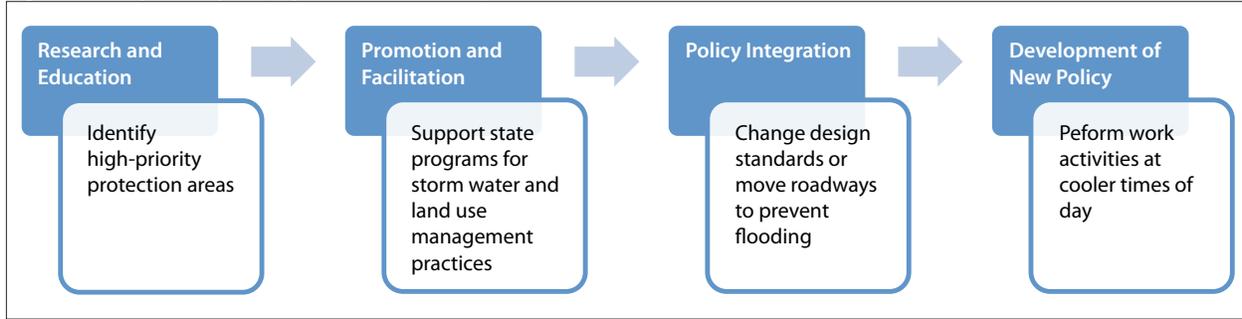
2. <http://www.mdclimatechange.us>.

3. <http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-10796>.

4. <http://www.climatechange.ca.gov/adaptation>.

5. http://www.dnr.state.md.us/climatechange/climatechange_phase2_adaptation_strategy.pdf.

Figure 1. Adaptation policy spectrum and examples



Cross-Sectoral Strategies

General strategies

States have identified a number of cross-sectoral strategies and policies that improve resilience of systems and reduce the risks of multiple climate hazards. Many of these state recommendations also involve coordination with local government institutions such as county public health departments or city planning departments.

Two of the three plans include strategies to support the adaptation planning process itself. California’s plan explicitly recommends continued comprehensive state agency adaptation planning. It highlights two policies aimed at achieving this: the establishment of an expert climate adaptation advisory panel and the creation of a framework for promoting collaboration among state agencies around implementing climate change strategies. Maryland’s plan includes tracking the state’s success at reducing its vulnerability through a new system of performance metrics.

In addition to creating a strong state-level framework for addressing climate change impacts, state plans also offer strategies to build resilience at the community level. Recommendations commonly call for revisions to current development policies. For example, California’s strategy offers two policies for integrating climate adaptation into land use planning: first, directing lead agencies to evaluate the impacts of locating development in vulnerable areas; and second, focusing on improving the resilience of vulnerable communities through the state’s existing sustainable development planning framework.

Several plans promote information dissemination and public education campaigns. Since publishing its first adaptation strategy in 2009, California’s Natural Resources Agency and Energy Resources Commission have co-developed and released the web-tool Cal-Adapt to help local decision makers assess the impacts of climate change on their communities.⁶

Table 1. Examples of cross-sectoral state strategies and policies to improve resilience and reduce risks of climate change impacts

Strategy	Policy	State
“Give state and local governments the right tools to anticipate and plan for ... climate change.”	“Utilize new and existing educational, outreach, training, and capacity building programs.”	MD
“Commit resources and time to assure progress.”	“Develop and implement a system of performance measures to track Maryland’s success at reducing its vulnerability to climate change.”	MD
“Reduce existing stressors (to ecosystems).”	“Remove barriers to habitat connectivity ... work with citizens and counties to remove barriers to stream connectivity ... particularly for those low-functioning or decommissioned dams or other structures.”	MD
“Promote comprehensive state agency adaptation planning.”	“Establish a framework for promoting collaboration with and among state agencies to implement climate change strategies.”	CA
	“Develop a Climate Adaptation Advisory Panel.”	CA
“Integrate land use planning and climate adaptation planning.”	“Revise state regulations to direct lead agencies to evaluate the impacts of locating development in areas susceptible to hazardous conditions, including those potentially exacerbated by climate change.”	CA
	“Incorporate adaptation considerations into Strategic Growth Council and Sustainable Community Strategy processes to ensure incentives are provided to vulnerable communities preparing for impacts.”	CA

6. <http://cal-adapt.org>.

Heat waves

Pennsylvania’s state-level adaptation recommendations for heat waves and heat stress focus on reducing public health risks and decreasing thermal energy production. In both cases, proposed tactics involve creating new policies like changing work hours or developing renewable energy, or revising and strengthening current policies like improving heat wave response plans or increasing funding for solar projects.

Table 2. Examples of state strategies and policy tactics to improve resilience to heat waves

Strategy	Policy tactic	State
“Reduce impacts of higher temperatures on materials and workers.”	“Perform work activities during cooler portions of the day.”	PA
Reduce heat stress on populations (implied).	“Develop proactive heat wave response plans (including heat wave early warning systems, heat advisories, availability of cooling stations, and other preventative measures).”	PA
“Do not increase thermal stress on sensitive aquatic species and habitats.”	“Develop and use ecological flow thresholds to manage [water] withdrawals.”	PA
“Reduce demand from fossil fuel generators.”	“(Provide) additional funding for solar projects.”	PA

Drought

Recommendations for improving resilience to drought include bolstering current water conservation practices and integrating adaptation planning into existing policy. Planners in California and Pennsylvania have also proposed new policies to supplement existing practices. For example, the California plan recommends that the State Water Resources Control Board and the California Public Utilities Commission impose water conservation measures.⁷ The plan also recommends adoption of new incentive-based water conservation programs for urban and agricultural water users. Recognizing the cross-sectoral implications of drought’s impact on energy production, Pennsylvania’s planners have recommended developing solar and wind energy capacity to reduce water consumption for energy cooling needs.

Table 3. Examples of state strategies and policy tactics to improve resilience to drought

Strategy	Policy	State
“Fully develop the potential of integrated regional water management.”	“By 2011, all Integrated Water Management plans should identify strategies that can improve the coordination of local groundwater storage along with other water supplies including recycled municipal water, surface runoff, flood flows, urban runoff, storm water, imported water, water transfers and desalinated groundwater and seawater.”	CA
“Aggressively increase water use efficiency.”	“The State Water Resources Control Board (SWRCB) and the California Public Utilities Commission may impose water conservation measures in permitting and other proceedings to ensure water conservation efforts. It is recommended that the Legislature authorize and fund new incentive-based programs to promote the mainstream adoption of aggressive water conservation by urban and agricultural water systems and their users.”	CA
“Encourage statewide water conservation and water use efficiency ... at all times.”	“Model incentives similar to EPA’s WaterSense and continue the model of Green Reserve funding administered by PENNVEST.” ^a	PA
“Use renewable energy generation—like solar and wind—during drought or air pollution action days.”	“Develop on-site renewable resources as distributed generation ... and support energy storage options that can work with these renewables.”	PA

a. The Green Reserve was a fund established through the American Recovery and Reinvestment Act of 2009, and administered by the Pennsylvania Infrastructure Investment Authority (PENNVEST). The Green Reserve funds environmentally innovative activities, including green infrastructure and water efficiency projects throughout the state. Program information is available at http://www.portal.state.pa.us/portal/server.pt/community/programs/9322/green_initiatives/541807.

Heavy precipitation and flood events

Flood risks are already addressed in many communities through floodplain development restrictions and storm water infrastructure design practices, among other measures. Although these practices are currently based on historical flooding events, they can also apply to changes in flood risks caused by climate change. Pennsylvania’s statewide strategies call for decreased flood potential through improved storm water management and an increase in permeable surface area. The strategies are supported by specific policies, many of which result in co-benefits, such as improved water quality.

7. A regional example of this type of cross-sectoral adaptive water management is outlined in North Carolina’s Catawba-Wateree Project Comprehensive Relicensing Agreement, which defines procedures for water use reductions during periods of low inflow. The protocol is based on the principal of “shared sacrifice,” where all parties with interest in water quantity, including electric utilities and local water utilities, change practices during droughts. This protocol is accessible at http://sogweb.sog.unc.edu/Water/images/5/51/Duke_Low_Inflow_Protocol-etc..pdf.

Due to the localized nature of major storms and flood events, implementing these state-level policies requires active engagement with local planners and emergency responders.

Table 4. Examples of state strategies and policy tactics to improve resilience to heavy precipitation and flood events

Strategy	Policy	State
Reduce risks to drinking water supply and sanitation services (implied).	"Re-locate high-risk facilities as a long-term solution; ... where possible, in the short term, build protective berms at the facility and as far away as possible from the vulnerable water body to preserve natural function while protecting the facility."	PA
"Decrease flood potential."	"Support state programs for storm water and land use management practices ... with an emphasis on ecosystem based strategies."	PA
	"Change design standards or move roadways to prevent flooding."	PA
"Retain water and reduce imperviousness."	(Ensure) "green infrastructure practices and natural floodplain management ... is incentivized and funded."	PA
"Plan for precipitation-related weather extremes."	"Enhance the preparedness of transportation system and utility providers."	MD
	"Develop operation contingency plans for critical infrastructure."	MD

Tropical storms

As with managing flood risks, adaptation planners can draw on current risk management practices to develop strategies for more intense and frequent tropical storms. For instance, Maryland state planners have recommended strengthening existing building codes and construction techniques, which is already a common response in areas that experience major storms. Maryland's recommended strategy of retaining and expanding natural habitats in order to protect against coastal flooding is an example of a "win-win" strategy, as it improves coastal ecosystem resilience to storm surges, which will also be beneficial under future climate regimes where tropical storms may become more frequent and potent. The strategy involves two major steps: identification of high-priority areas followed by protection and restoration efforts. These responsibilities will largely fall on the Department of Natural Resources, but coordination with state and local agencies that generate long-term development plans will be critical to their success.

Table 5. Examples of state strategies and policy tactics to improve resilience to tropical storms

Strategy	Policy	State
"Protect human habitat and infrastructure from future risks."	"Strengthen building codes and construction techniques for new infrastructure and buildings in vulnerable coastal areas."	MD
"Retain and expand forests, wetlands, and beaches to protect from coastal flooding."	"Identify high priority protection areas and strategically and cost-effectively direct protection and restoration actions."	MD

Sea-level rise and inundation

State attempts to reduce the risks from sea-level rise reflect the tension between sustaining important local economic and natural coastal resources and minimizing their acute vulnerability to climate change. Sea-level rise presents planners with an unprecedented problem, which in extreme cases leads to politically unpopular discussions of abandonment. Many of the proposed strategies and policies found in Maryland's plan may help to set the stage for more substantial policy changes in the future, and are focused on gathering more information and coordinated planning between state and local agencies.

Table 6. Examples of state strategies and policy tactics to improve resilience of coastal communities, industries, and infrastructure to sea level-rise and inundation

Strategy	Policy	State
"Give state and local governments the right tools to anticipate and plan for sea-level rise."	"Strengthen federal, state, local, and regional observation systems to improve the detection of biological, physical, and chemical responses to climate change and sea level rise."	MD
"Require the integration of coastal erosion, coastal storm, and sea level rise adaptation and response planning strategies into existing state and local policies and programs."	"State and local governments should define the geographic limits of areas potentially impacted by sea level rise, coastal erosion, and storm surge. Once defined, these areas should be formally designated as areas of critical state concern."	MD
"Minimize risks and shift to sustainable economies and investments."	"Develop and implement long-range plans to minimize the impacts of sea level rise to natural resource-based industries."	MD

Conclusion

Although state-level adaptation planning is just emerging around the country, the initial plans developed by Maryland, California, and Pennsylvania reflect a significant effort to understand and respond to the impacts of climate change at the state and local level. Adaptation planners in these states have been tasked with laying the groundwork for recurring planning processes. This task is complicated by the lack of robust, localized climate information that reveals the changing hazards to historically low-risk development and natural resources as well as by limited information about the potential costs of adaptation policies. Given these gaps in knowledge, it is not surprising that some recommendations are underdeveloped. Planners deal with such uncertainty by recommending “win-win” strategies and policies that have both current benefits and improve long-term resilience. Even at this early stage, the actionability of some recommendations could be improved. For example, identifying lead and partner agencies that are responsible for developing and implementing recommendations instills a degree of accountability that will promote action.

Nevertheless, the importance of defining initial strategies and policies should not be undervalued. These plans provide state agencies with a flexible roadmap of adaptation options and represent a major first step in approaching a long-term, dynamic policy challenge. Perhaps one of the most important results of such planning processes will be the adjustment of state investments that anticipate and therefore avoid or reduce negative impacts due to climate change. With that in mind, the examples provided here offer those responsible for planning for a more climate-resilient future a foundation for addressing their own unique climate risks.



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