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## Adaptation Option Template Future Built Environment Infrastructure DRAFT

### FBEI-1. Integrated Planning for SLR and Associated Coastal Hazards<sup>1</sup>

#### Option Description

Sea level rise and associated hazards such as storm surge, coastal flooding and erosion pose both short term and long term threats. Drawing on the MD CCC science report, we recommend integrated planning at the local, state and Federal level for all bay and coastal communities within the State of Maryland.

This planning must be flexible in that it must account for a diversity of land uses, different levels and probabilities of water inundation and several planning time horizons that exceed what is currently addressed. The key variable to this option is the establishment of a Maryland estimate of the amount of sea level rise and the time frame for future projected rise. This variable is subject to change so this planning element must reflect that certainty. The planning should include policies and appropriate adaptation responses in this defined geographic area.

The overarching mechanism recommended here is that local government plans, as detailed in Article 66B of the Annotated Code of Maryland, include an element that addresses integrated planning for sea level rise, coastal storms and coastal erosion. This recommendation extends to the plans that underpin the comprehensive master planning, including but not limited to water and wastewater plans, marina and boating plans, floodplain management plans, shoreline plans and emergency management plan. This recommendation refers only to comprehensive and strategic plans as described and not operational plans or development regulations and guidelines.

The goal of this policy option is to increase coordination and consistency in planning approaches and to create a framework for the integration of other climate adaptation proposals, such as new building and zoning codes. This option includes 2 major components;

- 1) Local coordination of Comprehensive and other plans to reduce risks from SLR and associated coastal hazards.
- 2) State of Maryland coordination of state plans to reduce risks from SLR and associated coastal hazards.

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<sup>1</sup> This option should integrate RRI-2 Community Realignment Plans, RRI-5 Watershed Planning and Management; RRI-6, And EBEI-7 Adaptation Planning, and HHSW-5

These plans should appropriately apply strategies along the continuum from protection to retreat. At a minimum the plans would address potential threats in affected areas and strategies for a phased implementation response under the following categories:

- Land use, zoning and population density and related incentives/disincentives to reduce property damage and threats to human health; and
- Provision of community infrastructure such as roads, schools; public safety and medical facilities; water and wastewater systems; gas, electrical and communications utilities
- The maintenance of existing and future natural resource lands and wildlife habitat, and working lands (i.e., agricultural and forest lands); and
- Adaptive shoreline erosion control (non-structural and “living shorelines” approaches) and buffer management strategies, including the accommodation of future wetland migration corridors where limited or no development is allowed
- Related public communication and outreach of these efforts.

## Option Design

### **Targets:**

- State, Federal, and local transportation planners will include sea level rise and storm surge vulnerability into short and long range transportation planning to avoid infrastructure expansion into vulnerable areas. Where existing infrastructure is already vulnerable, options should be evaluated to minimize risks, move infrastructure from vulnerable areas, or otherwise reduce vulnerabilities.
- All new development and transportation projects must include advanced “environmental site design” techniques for stormwater such as infiltration, use of natural features, and bioretention over traditional stormwater management techniques. Stormwater management calculations must also take into account anticipated changes in precipitation associated with climate change in the Mid-Atlantic region and seek to accommodate potentially greater volumes of stormwater within the watershed without creating or exacerbating downstream water quality and habitat problems.
- Provide disincentives for development within high vulnerability areas by ensuring that public funds are not spent on infrastructure that supports new development within vulnerable areas.

**Parties Involved:** Maryland Department of Natural Resources, Maryland Department of Planning, Maryland Department of Environment, Maryland State Highway Administration, Maryland Emergency Management Agency, Maryland Department of Health and Mental Hygiene, Local and County Governments Maryland Association of County Organizations, Maryland Municipal League, affected local governments in Maryland’s coastal zone; NOAA, USGS, Corps of Engineers

**Timing:** 2008 prepare proposed administration legislation; 2009 seek passage of legislation; 2010 prepare administrative guidelines, technical assistance materials; 2011 – first year that new local comprehensive plans must incorporate new CHARPE elements.

**Other:** This effort will depend on the availability of maps all public and private land at risk from sea level rise and storm surge. This data collection and mapping effort is recommended in option FBEI-6, Integrated geographic information systems, monitoring, and modeling. The effort requires information on Updated floodplain mapping combined with predictive mapping of storm surge associated with specific weather events should be undertaken by DNR.

## Implementation Mechanisms

Implementation of these recommendations could include amendments to Annotated Code of Maryland Planning Article 66B to expand sensitive areas, and/or add a section on sea level rise under county comprehensive plans and/or local hazard mitigation plans. Additional modifications to the Chesapeake Bay Critical Area Act (Natural Resources Article, §8-1807) and implementing Criteria (COMAR, Title 27) to enhance sea level rise adaptation and response might be required.

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Planning guidelines would be developed jointly by the Departments of Planning, Natural Resources and the Environment to ensure consistency and clarity and to facilitate the integration of the new plan element with existing comprehensive planning and zoning requirements. Of particular importance is the need for the SLR element to clearly identify, under various scenarios, how the provision of public infrastructure may change, i.e. whether or not local governments plan to fortify and/or rebuild damaged infrastructure; reduce the footprint of vulnerable or damaged infrastructure; or abandon or relocate critical public infrastructure components. Local governments should also evaluate the estimated costs and benefits of proposed solutions and associated funding mechanisms. These analyses and decisions are of monumental importance to existing and future property owners, insurers, emergency personnel, local, state and federal government agencies, elected officials, the business community and others.

### Capital Planning Component

Capital project planning efforts are to include in the planning process estimations of vulnerability for new or modified infrastructure to sea level rise and storm surge. This process will consider broad floodplain management criteria such that development occurs in areas that best reduce and minimize storm and flood hazards, facilitate natural infiltration, protect/restore riparian buffers, wetlands and forests and allow wetland migration corridors.

### Emergency Management and Mitigation Plans

The adverse health consequences of flooding, storms, and storm surges are complex and far-reaching, and include the physical health effects experienced during the event or clean-up process, or from effects brought about by damage to infrastructure, including population displacement. The physical effects largely manifest themselves within weeks or months following the event, and may be direct (such as injuries) and indirect (such as increased rates of vector-borne and other diseases). Extreme weather events are also associated with mental health effects, such as post-traumatic stress disorder, resulting from the experience of the event or from the recovery process. These psychological effects tend to be much longer lasting and may be worse than the direct physical effects.

To address these risks, in collaboration with appropriate public health agencies and stakeholders, effective approaches will be developed to communicate appropriate responses that protect human health during large-scale floods, storms, and storm surges. Of particular concern are communication systems and plans that address health issues associated with low-income and under-served populations and other vulnerable groups. Plans will be developed for moving critical acute and longer term care facilities if they will need to be closed because sea level rise, storm surges, or flooding will put them at risk. The plans will ensure that climate change concerns are integrated into activities of the Maryland Institute for Emergency Medical Services Systems and other organizations engaged in disaster response. Stakeholders will include managers of hospitals, public buildings, and infrastructure that provide emergency security, communications, and health services, to reduce the vulnerability of critical activities and equipment during an extreme event or other climate-related event.

### Local Government Capacity

- A survey of local governments throughout the state to assess the planning measures already in place for sea level rise, what are some perceived barriers, and how best to share information between state, county and local governments
- A technical review and assessment of planning guidelines used by local communities and municipalities within the coastal zone
- Guidance to assist local governments with identifying specific measures (e.g., local land use regulations and ordinances) to adapt to sea level rise and increasing coastal hazards.

### Local Plans Mandated by Maryland or Federal Government

Comprehensive Master Plan (MD)  
Critical Area Master Plan (MD)  
All Hazard Plan (MD, US)  
Water and Waste Water Plans (MD, US)

### Additional local topical plans to be considered:

Marina, Boating and Water Facility plans  
Emergency Response Plan  
Erosion Control Plans  
Floodplain Management Plans  
Shoreline Master Plans

### State Plans to be considered:

Need State Planning to indicate...

## **Related Policies/Programs in Place**

Recommend strengthening of enforcement of the Federal Consistency Review in the coastal management program.

The Maryland Coastal Program Coastal Communities Initiative provides technical and financial assistance to local governments to promote the incorporation of natural resource and/or coastal management (e.g., coastal hazards, public access, water-use activities) issues into local planning and permitting activities. Additionally, a number of state sponsored activities are currently underway that relate to this option including hazard mitigation planning; incentives and technical assistance for soft shoreline erosion control; sea level rise and storm surge mapping; green and blue infrastructure assessments; and an evaluation of growth management tools in coastal areas. These activities and technical resources will be valuable assets to local governments as they develop their CHARPEs.

### Estimation of Adaptation Benefits and Costs

Provide a bulleted summary regarding the overall benefits and costs expected to result from the implementation of the option, as per the categories listed below.

**Capital intensity:** Characterize the option relative to the expected costs associated with implementation up to the previously indicated target level. This estimate can be provided either quantitatively or qualitatively depending on data availability.

**Flexibility:** Characterize the option relative to its flexibility regarding future corrective action given reduction in uncertainty levels regarding future impacts. This estimate can be provided qualitatively as per the outcome of TWG discussions.

**Adaptive capacity:** Characterize the option relative to the degree to which it builds adaptive management capacity among state institutions and among private entities. This estimate can be provided qualitatively as per the outcome of TWG discussions.

**Other:** Identify and characterize as appropriate other adaptation benefits and costs that would need to be addressed to better understand the implications for the implementation of the option in the state.

### Documentation of Adaptation Benefits and Costs

Provide a bulleted summary regarding the documentation for the estimated benefits and costs of the option, as per the categories listed below.

**Data Sources:** Indicate as specifically as possible the sources that were used to characterize the option relative to its costs and benefits.

**Quantification Methods:** Indicate as specifically as possible the methodology that was used to quantify the capital intensity of the option, as appropriate.

**Key Assumptions:** Indicate as specifically as possible the key assumptions on which the characterization of the option's costs and benefits is based.

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### **Additional Benefits and Costs**

Provide up to one paragraph describing additional benefits and costs, if any, that have not been captured in the estimate of costs and benefits described earlier.

### **Feasibility Issues**

Provide up to one paragraph describing state-specific issues related to implementation feasibility.

Full benefit of this effort will depend on access to local information on SLR and associated hazards for planning purposes. A policy option designed to address monitoring, data management and quality, geographic information systems, and integration of required modeling efforts is recommended elsewhere in this report.

### **Status of Group Approval**

At the conclusion of the process, provide an indication of the status of TWG approval. Three categories are possible, namely full TWG consensus, super-majority, or majority consensus based on a number of objection(s).

### **Barriers to Consensus**

At the conclusion of the process, provide a brief and specific description of any objections to the option.

## FBEI-2. State Agency Reporting on Response to CCC Findings

Formerly titled “Mandate Integration of MD CCC Findings and Recommendations Into All Appropriate State and Local Programs”

### Option Description

The Executive Order establishing the MD CCC recommended that state agencies incorporate and accommodate CCC findings where applicable. In order to advance action on key recommendations and promote integration of existing programs with recommendations, we recommend that each state agency be asked to report on their review the recommendations of the MD CCC and associated action plan. The report should address opportunities for integration with existing programs, actions initiated, new programmatic efforts, and barriers to response. Particular attention should be given to State and Local program implementation. These reports are to be submitted to the Governor, the Executive Committee, Cabinet members, and Committee Chairs with copies to the Commission on Climate Change. Information from these reports would support ongoing evaluation of MD’s efforts, capacities, and needs in addressing climate change mitigation and adaptation.

### Option Design

**Targets:** State agencies will each review CCC findings and recommendations and report to the Governor on their efforts to incorporate and accommodate findings.

**Timing:** Reports will be submitted within a year of publication of CCC Mitigation, Adaptation, and Science Working Group reports.

**Parties Involved:** All State agencies are expected to report and coordinate with local and regional partners as appropriate.

**Other:**

### Implementation Mechanisms

Provide up to 1 paragraph describing how the option would be implemented. Specify whether implementation would be based on changes to existing rules/regulations, new legislation, provision of incentives, or other mechanisms.

### Related Policies/Programs in Place

Provide up to 1 paragraph describing any existing or planned programs or policies that are complementary or reinforcing.

### Estimation of Adaptation Benefits and Costs

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### **Feasibility Issues**

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### **Status of Group Approval**

### **Barriers to Consensus**

At the conclusion of the process, provide a brief and specific description of any objections to the option.

**FBEI-3. New Design Standards and Codes to Facilitate Retreat,  
Avoid Sea Level Rise, and Increase Resilience**

Existing Built Environment is now leading the common option that includes these issues.

## FBEI-4. Preserve Undeveloped, Vulnerable Lands

### Option Description

Preserving undeveloped, vulnerable lands offers a significant opportunity to avoid placing people and property at risk to sea level rise and associated hazards including storm surge, coastal flooding, and erosion. Many of these lands may also support natural resource conservation goals, such as wetlands migration. Expanding the priorities for existing land acquisition plans offers an opportunity to promote risk reduction and other land use goals. In addition, existing land acquisition programs have established priority setting strategies that address other important preservation goals and can be augmented to impacts of sea level rise.

### Option Design

**Targets:**

**Timing:**

**Parties Involved: MDNR, MDP**

**Other:**

### Implementation Mechanisms

Options for the implementation of this effort include building on several existing programs. These include amendments to Annotated Code of Maryland Planning Article 66B to expand sensitive areas, and/or add a section on sea level rise under county comprehensive plans and/or local hazard mitigation plans. Additional modifications to the Chesapeake Bay Critical Area Act (Natural Resources Article, §8-1807) and implementing Criteria (COMAR, Title 27) may be required to enhance sea level rise adaptation and response.

### Related Policies/Programs in Place

Provide up to 1 paragraph describing any existing or planned programs or policies that are complementary or reinforcing.

### Estimation of Adaptation Benefits and Costs

Provide a bulleted summary regarding the overall benefits and costs expected to result from the implementation of the option, as per the categories listed below.

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### **Status of Group Approval**

### **Barriers to Consensus**

At the conclusion of the process, provide a brief and specific description of any objections to the option.

## FBEI-5. Create a Climate Change and Insurance Advisory Committee

### Option Description

Insurance is a central, cross-cutting element to an overall adaptation strategy. The structure of insurance will shape social investments and the distribution of risks through society. Because there are a number of approaches being discussed and tested in other states and many changes taking place in the industry, it is important to have a focused assessment of this issue and a strategy for managing the ramification of climate change risks and uncertainties. We recommend that the Maryland Insurance Administration establish an advisory committee to study and report to the Governor on potential impacts of climate change on insurance in the state, the potential role for insurance in promoting environmental management goals, and address the relationship between changing building and design standards and insurance.

The TWG/Julie Gorte is making contact with representatives of Swiss Re, Munich Re, CERES, and others to consult with them on the key issues that they see as most important to responding to these challenges. Based on those conversations, we will be developing a set of major topics that this advisory committee should address.

### Option Design

Define specific objectives and/or structure to be recommended, and provide a bulleted summary regarding the overall option design modalities, as per the categories listed below.

**Targets:** TWG has begun conversations with insurance specialists in order to identify key issues that should be considered by such as commission.

**Timing:** The advisory committee should be established and provide an initial report back within a year. MORE HERE

**Parties Involved:** Maryland Insurance Administration, Fireman's Fund, and professionals from associated industries

**Other:** As needed, identify other factors/parties that would need to be engaged for successful implementation of the option in the state.

### Implementation Mechanisms

An advisory committee composed of staff from the MD Insurance Administration, MEMA, MDP and representatives from associated industries, such as insurance and reinsurance companies would meet to consider major issues. They would be expected bring in additional outside experts to inform their discussions on topics.

### Related Policies/Programs in Place

Provide up to 1 paragraph describing any existing or planned programs or policies that are complementary or reinforcing.

### Estimation of Adaptation Benefits and Costs

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### **Barriers to Consensus**

At the conclusion of the process, provide a brief and specific description of any objections to the option.

## FBEI-6. Integrated geographic information systems, monitoring, and modeling <sup>2</sup>

### Option Description

Strategies for minimizing current and future risks will depend on an understanding of the extent of risks and vulnerabilities. This option is designed to assure collection and easy access to the comprehensive body of information necessary for planning and response activities through monitoring, modeling, and inventory efforts and integration of existing geospatial data.

Additional data collection efforts needed to augment the ongoing efforts of state agencies include:

- Enhanced monitoring will track the local rate of sea level rise, recognizing the potential for significant differences in rates between areas in relatively close proximity, as well as shoreline changes.
- An inventory of potentially impacted infrastructure, including the identification of public and private systems and facilities at serious risk from sea level rise, the evaluation of the presence and significance of threatened historical structures. This database should be maintained relative to emerging projected sea level rise findings.
- Modeling and geospatial coverages of model output to reflect changing risks of SLR and associated coastal hazards.
- Enhancement of statewide monitoring programs to detect biological, physical and chemical responses to direct and indirect effects of climate change. An expert panel to guide the development of this monitoring strategy is recommended.

**NOTE- TWG will investigate relationship of this effort to state IMAP project**

### Option Design

Define specific objectives and/or structure to be recommended, and provide a bulleted summary regarding the overall option design modalities, as per the categories listed below.

**Targets:** The effort will provide comprehensive coverage for the state and assure regular updates of data, models, and maps. These maps will be made broadly accessible to professionals and public to support adaptation planning and understanding of risks and processes of change.

**Timing:** This effort will support the ongoing efforts of DNR, MDE, and MD health to integrate GIS data and improve data quality standards

**Parties Involved:** MDNR, MDE, MEMA, MD Dept. of Planning and MHMH, Maryland IMAP effort

**Other:** As needed, identify other factors/parties that would need to be engaged for successful implementation of the option in the state.

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<sup>2</sup> Now a common option that should integrate RRI-3 Monitoring Programs, EBEI-5 Inventory of Vulnerability of Coastal Infrastructure

## Implementation Mechanisms

This effort will build on ongoing efforts of the MDNR, MDE, and MDH to improve the integration and data quality standards of their ongoing monitoring efforts.

We will investigate relation to the MD IMAP program with Kenny Miller, DNR.

## Related Policies/Programs in Place

MDNR – MANTA-MD Biological Stream Survey, MDNR Shorelines Online

Since 1994, Maryland Department of Natural Resources, Monitoring and Non-Tidal Assessment Division (MANTA) has sampled and assessed more than 2,000 freshwater, wadeable streams for biological, habitat, and chemical quality through the Maryland Biological Stream Survey (MBSS). Stream quality indicators have been developed for fish, benthic macroinvertebrates, salamanders, and physical habitat. MBSS results have been used in a variety of ways, including 1) watershed characterizations (i.e., targeting areas in need of both restoration and protection) via the Clean Water Action Plan and the resultant Watershed Restoration Action Strategies, 2) listing impaired streams for MDE's 303d list, 3) evaluation of stressors to aquatic fauna, and 4) determining geographic ranges of rare, threatened, or endangered aquatic species.

MANTA's Sentinel Site Network: To track natural variability in stream chemical, physical, and biological conditions, the Maryland Biological Stream Survey (MBSS) established a long-term monitoring component, the Sentinel Site Network, in 2000. The Network consisted of 26 of the highest quality, minimally disturbed streams in Maryland based on physical, chemical, and biological data collected by the MBSS from 1995-1997. In addition, MANTA has developed a Proposed Monitoring Program for Tidal Freshwater Ecosystems

## Estimation of Adaptation Benefits and Costs

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## Additional Benefits and Costs

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## Feasibility Issues

Provide up to one paragraph describing state-specific issues related to implementation feasibility.

## Status of Group Approval

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## Barriers to Consensus

At the conclusion of the process, provide a brief and specific description of any objections to the option.

## **FBEI-7. Evaluate Shoreline Protection Structures**

This option is incorporated into a common option lead by the EBEI TWG.

## FBEI-8. Economic Development Initiative

### Option Description

As Governor O'Malley stated in testimony before the U.S. Senate Environment and Public Works Committee in September 2007... "We must transition from a carbon-based economy to a green, sustainable economy." As we face the inevitable impacts of climate change in the coming years, adapting to sea level rise and associated coastal hazards with entail considerable costs to our residents and our economy. However, the flip side of these challenges will be the economic opportunities provided by the creation of "green collar" jobs within the new "green" economy. The State of Maryland must take the initiative and adopt a leadership role by facilitating development of both the workforce knowledge, skills and expertise and the business (commercial, industrial, financial) platform that will be necessary to take advantage of these new opportunities.

### Option Design

**Targets:** Establish MD as a leader in the new "green" economy by increasing by 20% by 2015 both: 1) the number of businesses within the State that provide products or services related to sustainability; and 2) the amount of investment within the State in products and services related to sustainability.

**Timing:** 20% increase by 2015; 50% increase by 2030

### Parties Involved:

MD Department of Business and Economic Development  
MD Economic Development Corporation  
MD Department of Environment  
MD Office for a Sustainable Future (within Department of Natural Resources)  
MD Green Building Council (standing commission created by legislature)  
MD Sustainability Sub-Cabinet  
MD University System  
Baltimore Development Corporation  
MD Association of Counties  
MD Chapter of National Federation of Independent Business (NFIB) – small business advocacy organization  
Financial Community – banks, investment firms, pension funds  
Clean Energy Partnership – MD-based non-profit that organizes businesses in support of practical solutions to global warming

### Other:

## Implementation Mechanisms

Development of new sustainability curricula and R&D (research and development) programs within the State University System

Increased Renewal Portfolio Standard (RPS) requirements for utilities; broadening requirement to include energy efficiency along with renewables

Emissions brokering, offset credits/allowances, and other economic opportunities generated by MD participation in Regional Greenhouse Gas Initiative (RGGI) cap-and-trade system; provide tradeable credits for green buildings, agricultural sequestration and other GGH mitigation mechanisms under cap-and-trade system

Incorporate monitoring and improvement of sustainability performance metrics for state agencies under new Department of Information Technology (see Governor's 2008 Legislative Agenda)

Create sustainability "revitalization and incentive zones" similar to, or incorporated within, new BRAC R&I Zones (see Governor's 2008 Legislative Agenda)

## Related Policies/Programs in Place

Provide up to 1 paragraph describing any existing or planned programs or policies that are complementary or reinforcing.

## Estimation of Adaptation Benefits and Costs

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## FBEI-9. Training and Capacity Building

### Option Description

Implementation of new policies and strategies to address the changing risks of sea level rise and coastal hazards will depend on a wide variety of professions. For instance, new building codes will require electricians, plumbers, carpenters, and inspectors to be aware of the changes designed to protect against the potential for greater storm surges and greater or more frequent flooding. Possible impacts on shorelines will affect developers, landscapers, people involved in shoreline protection, as well as insurance agents and mortgage brokers. All of these groups communicate with property owners and support effective implementation of new approaches. Training and capacity to address these issues will increase Maryland's capacity to respond effectively as new information becomes available. Incorporation of climate change and sea level rise risks into formal training programs for people entering these businesses would assure a strong capacity to address these issues in the future. The effort will include those in building trades and local officials and staff who are responsible for writing bids, purchasing, data management, and insurance coverage. The policy would focus on integration of information on sea level rise and associated risks and risk management strategies into existing, ongoing training programs and support the creation of those programs where they do not currently exist.

The potential synergies between the economic development policies, such as the policy option proposed, and this option will be an important draw to bring in some groups while other existing groups will be reached through continuing education options.

### Option Design

Define specific objectives and/or structure to be recommended, and provide a bulleted summary regarding the overall option design modalities, as per the categories listed below.

**Targets:** Indicate as specifically as possible the target for the option. Targets may be defined in physical terms (e.g., install a tree planting program along 100% of all vulnerable undeveloped coastal areas as a flooding control strategy), economic terms (e.g., increase incentives by 25% for purchase of industrial flood hazard insurance), or other terms (e.g., identify all public and private systems/facilities at serious risk from sea level rise)

**Timing:** Identify the year in which the option would be implemented in the state, including any details regarding ramp-up to meet the targets above (e.g., install a tree planting program starting in 2010 and reach the specified target after a 5-year period).

**Parties Involved:** Professional associations of the building and construction trades, landscapers, local officials, local engineers, building inspectors, emergency management officials, local planning agency staff, finance and insurance agents, faculty and administration of university, community college, and technical training programs

**Other:** As needed, identify other factors/parties that would need to be engaged for successful implementation of the option in the state.

### Implementation Mechanisms

Provide up to one paragraph describing how the option would be implemented. Specify whether implementation would be based on changes to existing rules/regulations, new legislation, provision of incentives, or other mechanisms.

### Related Policies/Programs in Place

Provide up to 1 paragraph describing any existing or planned programs or policies that are complementary or reinforcing.

### Estimation of Adaptation Benefits and Costs

Provide a bulleted summary regarding the overall benefits and costs expected to result from the implementation of the option, as per the categories listed below.

**Capital intensity:** Characterize the option relative to the expected costs associated with implementation up to the previously indicated target level. This estimate can be provided either quantitatively or qualitatively depending on data availability.

**Flexibility:** Characterize the option relative to its flexibility regarding future corrective action given reduction in uncertainty levels regarding future impacts. This estimate can be provided qualitatively as per the outcome of TWG discussions.

**Adaptive capacity:** Characterize the option relative to the degree to which it builds adaptive management capacity among state institutions and among private entities. This estimate can be provided qualitatively as per the outcome of TWG discussions.

**Other:** Identify and characterize as appropriate other adaptation benefits and costs that would need to be addressed to better understand the implications for the implementation of the option in the state.

### Documentation of Adaptation Benefits and Costs

Provide a bulleted summary regarding the documentation for the estimated benefits and costs of the option, as per the categories listed below.

**Data Sources:** Indicate as specifically as possible the sources that were used to characterize the option relative to its costs and benefits.

**Quantification Methods:** Indicate as specifically as possible the methodology that was used to quantify the capital intensity of the option, as appropriate.

**Key Assumptions:** Indicate as specifically as possible the key assumptions on which the characterization of the option's costs and benefits is based

**Key Uncertainties:** Indicate as specifically as possible the key uncertainties embedded into the characterization of the option's costs and benefits.

### **Additional Benefits and Costs**

Provide up to 1 paragraph describing additional benefits and costs, if any, that have not been captured in the estimate of costs and benefits described earlier.

### **Feasibility Issues**

Provide up to one paragraph describing state-specific issues related to implementation feasibility.

### **Status of Group Approval**

At the conclusion of the process, provide an indication of the status of TWG approval. Three categories are possible, namely full TWG consensus, super-majority, or majority consensus based on a number of objection(s).

### **Barriers to Consensus**

At the conclusion of the process, provide a brief and specific description of any objections to the option.