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Adaptation Option Template
Future Built Environment Infrastructure
DRAFT

Common Option (FBEI-1): Integrated Planning for Coastal Erosion, Coastal Storms, and Sea Level Rise

Option Description

Current coastal hazards such as storm surge, coastal flooding and erosion are becoming more severe due to ongoing sea level rise. Drawing on the MD CCC science report, we recommend integrated planning at the Federal, State, and local level for all bay and coastal communities within the State of Maryland. This option focuses on to State and local comprehensive and associated policy plans. It does not address operational plans or building codes.

Key to planning will be the establishment of a statewide standard estimate of expected sea level rise and the time frame for such future projected rise. Projections of the amount and rate of sea level rise will vary due to local conditions and are expected to change with increasing scientific understanding, so planning must reflect that uncertainty. Planning for SLR and associated hazards must be flexible, in that it must account for a diversity of places, time horizons and a variety of hazards. These plans should appropriately apply strategies along the continuum from protection to retreat. They should also address mitigation activities such as avoidance. Plans should include policies and appropriate adaptation responses for the diversity of defined geographic areas.

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, adaptation of infrastructure, and protection of natural resources. Land use related plans need to be integrated with transportation/infrastructure plans, emergency plans and natural resource plans.

This option includes two 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.

There are three continuums that must be addressed in these plans: land use, risk and response. Maryland's coastal lands run the gamut and include Assateague Island beaches, Ocean City

condominiums, Middle River residential neighborhoods and the 350 year old historic downtown of Annapolis. This diversity of land uses represents a tremendous challenge so flexibility will be important in responding to sea level rise related concerns.

Maryland's coastal community coastal floodplains are mapped through FEMA and the NFIP. Additional hazard mapping is being completed by MDE, DNR and Federal partners that show hurricane inundation and potential sea level rise flooding and inundation. These maps, taken together, will show a continuum of risk with some regions exposed to high velocity waves while other areas may have only periodic shallow flooding. Government and private responses to these increased risks include protection in place, mitigation design, avoidance and retreat.

At a minimum, state and local plans would address potential threats in affected areas and strategies for a phased implementation response under the following categories:

- Land use, zoning, and development density regulations to reduce population and investment at risk;
- Public and market-based incentives/disincentives to reduce property damage and threats to human health;
- Anticipation and planning for adverse health consequences of flooding, storms, and storm surges. This planning should consider the physical and mental heath consequences.
- Provision of community infrastructure such as roads, schools; public safety and medical facilities; water and wastewater systems; gas, electrical and communications utilities;
- Maintenance of existing and future natural resource lands and wildlife habitat, and working lands (i.e. agricultural and forest lands);
- 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; and,
- Public communication and outreach.

Greater integration and coordination of plans supporting public and private actions are recommended as these processes provide an overarching mechanism necessary to facilitate more consistent and integrated statewide risk management. Specifically, the Departments of Planning, Natural Resources, and the Environment in consultation with local governments should investigate the appropriate planning mechanisms to implement this policy option. Considerations should include current timing of plan updates, capacity of local governments, and availability of suitable data. The primary mechanism may be local comprehensive plan elements as required in Article 66b of the Annotated Code of Maryland.

This recommendation requires the consideration of plans that underpin the comprehensive plan. The plans informing the comprehensive plan include, but not limited to, appropriate infrastructure and community facilities plans (e.g., water and wastewater plans) land use plans, municipal growth elements, sensitive areas and areas of special concern (e.g., floodplain management, Chesapeake Bay Critical Area, forest preservation), and special plans (e.g., marina and boating plans, Land Preservation Parks and Recreation Plans (LPPRP), shoreline plans and

emergency management plans, all hazard plans). Particular attention should be given to the integration of All Hazards Planning and the Comprehensive Planning processes, as currently there is no such mechanism to coordinate these activities.

In addition, insight from Health Impact Assessments, recommended in policy option HHSW-1, should be incorporated into planning efforts. This recommendation is expected to form the policy basis at the local and State level for the implementation of EBEI-3: *Adaptation of Vulnerable Public and Private Sector Infrastructure*. RRI-1: *New Criteria for Identifying Natural Resource Priority Protection and Restoration Areas* will also be an important cross linked adaptation option.

Option Design

Targets:

- Identify all public and private land at risk from sea level rise and storm surge. Regular, updated floodplain mapping combined with predictive mapping of storm surge associated with specific weather events should be undertaken by MEMA. Local land use regulations should be adapted to better anticipate these risks. Potential health impacts should be assessed in by State and local health departments.
- 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.
- 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 and coastal water quality and habitat problems. 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.
- Infrastructure and development should be adaptable and resilient in areas where development cannot be avoided. 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. Where feasible, the plan should identify where gradual realignment of existing structures, population density, land uses and management approaches will be required to protect the long term health, safety and welfare of Maryland residents.

Parties Involved: Maryland Department of Natural Resources, Maryland Department of Planning, Maryland Department of Environment, Maryland Department of Health and Mental Hygiene, Maryland Department of Transportation, Maryland Emergency Management Agency, Local and County Governments.

Timing: 2008 assess capacity of local governments**;** 2009 select appropriate planning implementation mechanisms at both State and local level; 2009 prepare proposed administration legislation; 2009 seek passage of legislation; 2010 prepare administrative guidelines, technical assistance materials; 2011 – State and local plans begin to incorporate SLR response elements.

Other: Maryland Association of County Organizations, Maryland Municipal League, affected local governments in Maryland's coastal zone; NOAA, USGS, Corps of Engineers

Implementation Mechanisms

Assessment of Local Government Capacity

Current available capacity of local governments to undertake necessary actions to implement these recommended actions is unknown. However, it is expected that the current capacity is insufficient to successfully complete the needed actions in a timely manner. Therefore, the following actions should take place immediately to estimate the capacity. What is recommended is that the DNR, MDE, MDP, MDOT, and MEMA work with MML and MACO to perform and provide:

- 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.

Based on findings of the capacity assessment, State offerings of technical assistance, academic assistance, grants to local governments, and support for local GIS mapping may be appropriate.

Selection of Plan Mechanisms and Development of Guidelines

Planning guidelines would be developed jointly by the Departments of Planning, Natural Resources and the Environment in consultation with local governments 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, and emergency personnel, local, state and federal government agencies, elected officials, the business community and others.

Maryland Planning Article 66B

Implementation of these recommendations could include amendments to §3.06(b) of Article 66B of the Annotated Code of Maryland to expand sensitive areas, and/or add a section on sea level rise under county comprehensive plans and/or local hazard mitigation plans. These efforts should draw on statewide mapping and monitoring efforts. 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.

State Finance & Procurement Article §5-611

The State Finance & Procurement Article, Title 5, Sub-title 6 establishes the authority for the Maryland Department of Planning to define "areas of critical state concern." MDP, DNR, MDE and local governments should work together to define the geographic limits of areas potentially impacted by SLR, coastal erosion and storm inundation. Once defined, MDP and local governments should act to more formally designate these areas as "areas of critical state concern." This will allow the State to apply "federal consistency" which refers to the review process mandated by Section 307 of the Federal Coastal Zone Management Act of 1972, as amended (CZMA), and National Oceanic and Atmospheric Administration (NOAA) regulations (15 CFR part 930). The CZMA requires that federal actions which are reasonably likely to affect any land or water use, or natural resource of a state's coastal zone be conducted in a manner that is consistent with a state's federally approved Coastal Zone Management Program. The CZMA Federal Consistency requirement applies to direct federal activities, including federal development projects, federal licenses or permits, and federal assistance to state and local governments.

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.

Efforts to link locally developed and adopted comprehensive plans and emergency management plans as well as the planning processes used to develop these plans must be accomplished as described above.

Integration Across State and Local Plans

Planning policy adopted at the state level will be integrated with local efforts at three levels of planning. At the broadest level of planning, state and federal-mandated efforts such as the Comprehensive Master Plan (MD), the Critical Area Master Plan (MD), All Hazard Plan (MD, US), Master Water and Sewerage Plan (MD, US) would guide adoption of broad classifications of impacts and policy response.

Local planning requirements would address in detail the design requirements for public and private development in areas at risk from sea level rise and associated hazards. Examples of these plans include Marina, Boating and Water Facility plans, Emergency Response Plan, Erosion Control Plans, Floodplain Management Plans, and Shoreline Master Plans. Planning for all publicly-funded projects though Capital Plans would require "screening" for possible SLR impacts and establish design standards for mitigating impacts.

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.

Mapping efforts already underway, such as Maryland Shorelines Online and Maryland's iMap, as well as the policy option proposal for Integrated Geographic Information Systems: Mapping

Modeling and Monitoring will provide local and regional governments access to required spatial information for these planning efforts.

The Office of Preparedness and Response (OP&R) at DHMH coordinates with local health departments and MEMA on the health response portion of this option.

Estimation of Adaptation Benefits and Costs

This policy option aims to increase the capacity of Maryland government to respond effectively to threats associated with sea level rise and associated hazards by increasing integration of planning efforts, including state, regional, and local land use planning, hazard management, and health care planning. It emphasizes the need for careful planning before disasters to minimize loss and to guide post disaster response towards greater community resilience. The benefits of the effort come in the multiple contributions to risk reduction. These benefits are difficult to quantify as this effort contributes to effective identification and implementation of risk management strategies.

The improved coordination across planning will increase flexibility in the design and selection of future response options by reducing implementation obstacles, such as response time and inconsistent implementation and increasing the pool of strategies likely to be more effective and timely. Training efforts suggested in this policy option and others will disseminate information on the risks of sea level rise and associated hazards to people most closely in implementation, establishing a broad foundation of knowledgeable parties better able to identify future adaptation options. This policy option addresses an existing need to improve coordination of diverse planning efforts in Maryland and will provide benefits for other planning goals.

This option involves two main sets of costs. Legislative development, research, and training elements require investments of staff time and communications resources. The second set of costs is associated with increasing capacity to conduct planning according to new criteria and implementation of planning processes. These costs are similar to are much more broadly distributed among state, regional, and local planning staff. The training costs will be similar to those associated with other changes to state planning and the implementation costs are most likely to be incremental additions to the cost of ongoing planning processes.

In 2008, staff time will be required to research and prepare proposed administration legislation. Two specific projects have been identified

- 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; and,
- A technical review and assessment of planning guidelines used by local communities and municipalities within the coastal zone.

During 2009, staff will support passage of the legislation. Assuming successful passage, preparation of technical assistance materials identifying specific measures (e.g., local land use regulations and ordinances) will take place in 2010. Beginning in 2011, localities revising their comprehensive plans will be required to incorporate the new integrative elements.

Feasibility Issues

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. . In addition, public awareness of the risks will be important to the successful implementation of strategies to increase resilience. An option addressing approaches to increasing public awareness is included in this report.

Status of Group Approval

TBD

Barriers to Consensus

TBD

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

Option Description

In order to advance action on key recommendations and promote integration of existing programs with recommendations, we propose a two part strategy. Under this option, each agency with a mission affected by sea level rise, associated hazards, and recommended policy options will review the recommendations of the MD CCC and the adaptation policy options developed by the ARWG, report on how these issues and recommendations relate to their missions, and outline an agency action plan for integrating sea level rise and associated hazards into their planning and evaluation procedures. These revised procedures will be the basis for establishing performance measures.

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 to assure that future decisions and actions adequately consider and respond to anticipated impacts due to SLR and increases in storm frequency and intensity. Greater detail on report content is discussed under implementation mechanisms below. 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 Maryland's efforts, capacities, needs, and progress in addressing climate change mitigation and adaptation.

Performance measures will be reported annually. These measures should document process and progress in adaptation to sea level rise and associated hazards. Revised procedures and performance measures would remain in place unless new information on risks or policy changes emerge.

Option Design

Targets: The relevant subset of potential impacts and policy options will vary among agencies; however, they should all evaluate and identify needed changes to their programs, policies, standards, and activities in the areas of:

> Engineering, design, and construction; siting and planning; funding; coastal zone management activities, including permitting of shoreline activities and monitoring; staff training programs; and education/ outreach programs.

These efforts should model best practices, assure funding consistent with the broad goal of reducing exposure to coastal risks; and utilize the most recent scientific information, spatial mapping resources, and monitoring systems on climate change impacts in Maryland.

Timing: Reports and first indicator data will be submitted within a year of publication of CCC Mitigation, Adaptation, and Science Working Group reports. For changes that can be implemented without legislation or adoption of regulation, draft language for necessary changes to rules, forms, evaluation criteria, and policies and procedures should be prepared concurrently

with the report to facilitate implementing the recommended changes to programs, policies, standards and activities. For changes that require legislation or adoption of new regulations, proposals for the recommended changes should be brought forward in the second year. Agencies will be asked to participate in the development of a reporting framework that will accommodate agency-designed measures and assure clarity, consistency, and measurability of indicators among agencies. Performance indicators will be submitted annually.

Parties Involved: The majority of state agencies will be affected by the changing risks and adaptation policy options. These agencies include Maryland Departments of Aging; Budget and Management; Business and Economic Development; Community Initiatives; Education; Emergency Management; Environment; Environmental Services; General Services; Grants Office; Health Care Commission; Health and Mental Hygiene; Higher Education Commission; Homeland Security; Housing & Community Development; Natural Resources; Insurance Administration; Labor, Licensing & Regulation; Institute for Emergency Medical Services Systems; Planning; Public Broadcasting; Public Service; Public Works; Retirement and Pension System; Rural Maryland Council; Secretary of State; Service and Volunteerism; Tourism; Transportation; Treasurer; University System of Maryland; and Volunteer Maryland.

Implementation Mechanisms

Orientation and training for principle agency staff involved in the review process will familiarize them with Maryland specific information on sea level rise, associated hazards, and adaptation policies. The initial agency reports on adaptation should include the following components:

1) Identification of programs affected by SLR, storm frequency and intensity;

2) Evaluation of programmatic and procedural modifications needed to address these issues, including those that may involve legislative or regulatory changes;

3) A timeline for modifications;

a. for changes that can be implemented without legislation or adoption of regulation provide draft language for early implementation and

b. identify changes that require legislation or adoption of regulation for introduction in the following year.

c. identify changes that require additional study/information over a longer period prior to development of necessary changes to programs, policies, standards and activities.

4) Specification of mechanisms to ensure that polices are updated regularly in accordance with science and observed changes; and,

5) Development of a reporting framework that will accommodate measures identified by agencies and assure clarity, consistency, and measurability of indicators among them.

6) Annual reporting of performance indicators.

Related Policies/Programs in Place

All agencies identified have on going review processes and reporting requirements for programs that might be influenced by SLR and associated hazards directly or by proposed policy options. In addition, the BaySTAT program collects indicators some of which may be appropriate to tracking adaptation efforts.

Estimation of Adaptation Benefits and Costs

Mainstreaming consideration of sea level rise and associated impacts into policy and procedures promotes a comprehensive approach to adaptation that reaches across the diverse programs potentially affected by efforts to adapt to SLR and associated hazards. Absent a full review of programs that may be affected, the benefits cannot be quantified but they will include reduction of economic, social, health, and ecological risks to sea level rise and associated hazards. The process of refining policy and procedures will result in increased staff awareness and understanding of the climate change, sea level rise, and associated potential impacts for Maryland. The deeper engagement offers greater capacity for sophisticated, innovative responses to new information.

This policy option has relatively low capital needs as it is designed to mainstream adaptation issues into current programs and review processes. In the first year, it will require each affected agency to conduct an analysis of existing programs and procedures and report on proposed refinements to those processes. This initial effort will require dedicated staff time for coordination and some time from staff in each program area. In addition, agency staff most closely involved with this review and refinement process are likely to require additional training on climate change, sea level rise, and associated impacts to assure that they bring to the process a firm knowledge base, informed by the most recent science conducted for Maryland.

Feasibility Issues

Internal constraints to agencies' abilities to address these changes are likely to be affected by budget limitations and availability of staff time. In some cases, external factors, such as legislative issues and potential agency need for enabling legislation, might limit potential to make some changes. Some agency staff will require additional training on sea level rise and associated hazards in order to conduct thorough evaluations of their programs.

Status of Group Approval

TBD

Barriers to Consensus

TBD

FBEI-5. Climate Change and Insurance Blue Ribbon Advisory Committee

Option Description

Insurance is a central, cross-cutting element to an overall adaptation strategy. The insurance industry faces certain sea level rise, coastal erosion, and increased likelihood of severe storms, including hurricanes. It is clear that climate change is likely to have widespread impacts on insurance industry, and is also likely to have significant impacts on the financial condition of insurers and reinsurers, the ability to pay future claims, and hence on the availability and affordability of insurance to Maryland's citizens and businesses. The structure of insurance will shape social investments and the distribution of risks through society, and the willingness of financial institutions to make capital available for mortgages and other capital investments in at-risk areas. Other policy options recommended here, such as those focusing on building code revisions, integrated planning, and modeling potential impacts, take proactive approach to reducing risk, avoiding future costs, and helping the state to maintain insurability of investments. This option focuses on assessing changing risks and opportunities in the within the insurance arena.

There are a number of approaches being discussed and tested in other states and many changes taking place in the industry, and in some cases the vulnerability of state insurance systems to climate change is becoming clearer. In Florida, for example, where 79% of insured property sits along the coast, homeowner insurance premiums have risen more than in any other state, with the average policy increasing by 88% between 2001 and 2006. Florida has a liability of over $27 billion dollars for a hurricane with an estimated return time of 100 years[1]. Some insurance companies are no longer writing new coverage in the state.[2] In states that are insurers of last resort, the possibility of increasingly expensive or unavailable insurance coverage could pose significant problems for the state's financial and fiscal health as a whole. Where states are not currently the last recourse for insurance, they may be pressured to assume that role if adverse results force insurers are forced to withdraw. Two measures in particular can help Maryland to assess its options for state regulation of insurance in the face of climate change. First, there is a need for information on the risks posed by climate change and how insurers and reinsurers are managing those risks. Second, it is important to have a focused assessment of this issue and a strategy for managing the ramifications of climate change risks and uncertainties.

Blue Ribbon Advisory Committee. We recommend that the Governor establish a blue ribbon advisory committee to study and report 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. Further, we believe that the advisory committee should be independently chaired, and that the Maryland Insurance Commission should take an active role in the advisory committee without chairing it, in order to assure that the breadth of stakeholder concerns is heard. This committee would

[1] Financial Services Commission, Florida Office of Insurance Regulation, "Annual Report of Aggregate Net Probable Maximum Losses, Financing Options, And Potential Assessments." February 2008.

[2] Environmental Defense, "Blown Away: How Global Warming is Eroding the Availability of Insurance Coverage in America's Coastal States," 2007.

consider policy options identified by the National Association of Insurance Commissioners on climate change, incentives (disincentives) in the current insurance market, innovative means for insurers to support best practices in risk reduction, and forms of public-private partnerships to support industry advance in these areas. As part of this effort, the committee should consider whether it is possible to develop a program, similar to the Community Rating System within the National Flood Insurance Program, which would encourage local governments to implement protective or adaptive measures by offering reduced insurance rates for risk-reducing actions.

Enhanced Disclosure of Climate Risks. We also recommend that the Maryland Insurance Commission consider requiring insurers operating in the State of Maryland to disclose to their investors the risks posed by climate change, and what steps the companies are taking to manage those risks. At a minimum, the Commission could consider requiring disclosure of the steps taken to assess the impact of climate change in the state, the results of the assessment over various time periods (short term to long term), and the degree to which climate risks could affect the company's access to reinsurance, solvency, risks in its own investment portfolio, and possible effects on availability and affordability of coverage.

Option Design

There are two actions in this option:

1. Creation of a Blue Ribbon Advisory Committee to advise the State Insurance Commission and the Governor of the risks that climate change poses to the availability and affordability of insurance for Maryland citizens and businesses; and
2. Require that the State Insurance Commission study and report on the costs and benefits of requiring greater disclosure of the risks posed by climate change to investors on the part of all insurance companies operating in the State of Maryland.

Targets: Advisory Committee

Key issues that should be considered by the Blue Ribbon Advisory Committee include the following:

- Assess whether data available to insurers is adequate to assess risks posed by climate change (including sea-level rise) and recommend steps to improve data where it is deficient;
- Assess the degree to which adaptive options (such as zoning that recognizes risks of building in high-risk areas, improved building codes to protect against more severe weather and flooding) may mitigate insured losses due to climate change, and whether insurance rate structures could be constructed that provide incentives for early adaptive actions;
- Assess the accuracy and quality of climate initiatives on the part of insurers; and
- Assess options to promote partnerships with policyholders for loss mitigation.

Timing: The advisory committee should be established and provide an initial report back within one year.

Parties Involved: Maryland Insurance Administration, Department of Natural Resources, Department of Health and Mental Hygiene, Department of Planning, representatives of insurance and reinsurance companies (representing the spectrum of insurance: property and casualty, life and health, directors and officers insurance, etc.), homeowners and property developers, and representatives of public or private institutions providing essential infrastructure services (e.g., electricity, water and sewerage, and telecommunications); and businesses whose access to insurance is essential for continued operation.

Other: There is inevitably tension between the insurance companies and those insured, particularly when disasters occur. In some cases, most recently in Florida, many insurance curtailed their property and casualty businesses along the coastline, in anticipation of more damaging storms, increased incidence of severe weather, and sea-level rise. The loss of insurability, or increasingly expensive coverage, may well be an effective mechanism to discourage further development in areas that are most at risk from the effects of climate change, and may well be something Maryland policymakers should consider. However, changed coverage and loss of affordability can also be extraordinarily damaging to the reputations of insurers, even if the actions they take are in the long-term public interest. It would be useful for the commission to consider not only the needs of Maryland's homeowners and businesses in the work of the commission, but also to take into account the needs of the insurance companies.

Implementation Mechanisms

An advisory committee composed of staff from the MD Insurance Administration, MEMA, MDP, homeowners and municipalities vulnerable to damage from sea-level rise, 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. We recommend that the chair of the advisory committee be an independent outside expert.

Related Policies/Programs in Place

The Maryland Insurance Administration has joined the National Association of Insurance Commissioners Climate Change and Global Warming (EX) Task Force.

Estimation of Adaptation Benefits and Costs

This option calls for investigation of insurance issues specific to Maryland and identification of policies and practices that best meet the state's needs. The option does not commit the state to a course of action, but seeks to inform a long term policy process that may establish legal and financial obligations that could be difficult to adjust in the future. By drawing a diverse set of stakeholders into a dialogue on insurance issues, this process will create a knowledge resource specifically attuned to Maryland's concerns. The potential benefits depend on emerging knowledge of vulnerability and risks as well as investment responses to climate change risks, thus they are difficult to fully anticipate. However, the effort will benefit the state through informing decisions about the government liability associated with various insurance strategies, identifying insurance options to meet the residents and businesses in the state, creating a forum

for insurers, government, and consumer to discuss the role of insurance in managing climate risks, and providing access to information on the risks faced by insurance agencies and possible impacts on the accessibility and affordability of coverage.

Option costs are associated with the staffing and convening of an advisory committee and overseeing the disclosure process. These costs include staff time for organizing the committee, research to support committee efforts, staffing reporting, as well as communication and outreach on findings. The committee is expected to meet over the course of 1 year. The disclosure process would pose an incremental cost to the Insurance Administration. The full benefit of this effort will depend on a strong understanding of risks for Maryland. The proposed inventory of public and private investment along the coast, integrated geographic information systems, sea level rise monitoring, and science studies are associated costs.

Feasibility Issues

This effort will a limited amount of funding and committed staff time, but no excxeptional feasibility issues have been identified.

Status of Group Approval

TBD

Barriers to Consensus

TBD

FBEI-6. Integrated Geographic Information Systems: Mapping, Modeling, and Monitoring

Option Description

Maryland's coast is particularly vulnerable to both episodic (i.e., hurricanes and Nor'easters) and chronic hazards associated with shore erosion, coastal flooding, storm surge, and inundation. These hazards are both driven by and exacerbated by climate change and sea level rise, which is occurring in the mid-Atlantic region at a rate nearly double the global average. Sea level rise poses a significant threat to resources and infrastructure in Maryland's coastal zone. As growth and development continues, especially within low-lying Eastern Shore communities, these impacts are likely to escalate.

In recognition of the State's vulnerability to sea level rise and its ensuing coastal hazards, Maryland's State Agencies have been aggressively acquiring and analyzing various data and technological resources (see Related Policies and Programs) to both gain a better understanding of sea level rise vulnerability and to increase the State and local government capacity to adapt and respond. To date, the State of Maryland has amassed a significant amount of data and undertaken state-of-the-art research, making Maryland a national leader in sea level rise modeling, research and response planning. However, more work in the following areas is needed to complete state-wide sea level rise modeling and develop mapping and monitoring products to support both state and local sea level rise adaptation and response planning efforts.

- Complete state-wide sea level rise inundation and storm surge modeling at a scale appropriate for both state and local planning;
- Adopt a production and maintenance schedule for mapping and modeling activities including the data necessary for both activities. This schedule should include: anticipated costs, financing options, data sources, and increasing the accuracy of predicted results;
- Assure easy access to the comprehensive body of information necessary for planning and response activities by state and local governments;
- Review institutional and organizational data management practices and make recommendations to enhance efficiency and cost effectiveness of data gathering, sharing, maintenance and processing efforts and to minimize duplication of effort and data and modeling redundancies;
- Create a digital, spatial inventory of potentially impacted infrastructure from sea level rise, including the identification of public and private systems and facilities and threatened historical structures. This database should be maintained relative to sea level rise projections and scenarios;;
- Utilize GIS systems to model and monitor specific "leading indicators" of climate change impacts. These may include indicators that are representative of specific geographic ranges or behaviors or population characteristics of certain species (e.g., plants, birds, mammals, and insects) that are known to be hypersensitive to sea level rise and other

climatic changes. See Policy Option #EBEI 2, Observation Systems for Changes in Coastal Areas for more information; and,

- Enhance the integration of sea level rise and other climate change related data, research and technology into State and local sea level rise adaptation and response planning efforts.

In addition, participating agencies should coordinate a request from Maryland to federal agencies asking that they provide to provide regular updates of flood risk maps and to account for climate change risk in these mapping efforts

Option Design

Targets: The effort will provide comprehensive coverage for the state and assure regular updates of data, models, and maps. It will also strongly encourage and support requests to federal agencies for the regular updating of flood risk maps and accounting for potential climate change impacts on risk in these 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 MDP, MDNR, MDE, and DHMH to integrate GIS data and improve data quality standards.

Parties Involved: MDNR, MDE, MDOT, MEMA, MDP and DHMH, MD *i*Map, MD State Geographic Information Committee (MSGIC), University System of Maryland.

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

Implementation Mechanisms

This effort will build on ongoing efforts of the MDNR, MDE, MDP, and MEMA, and DHMH to improve the integration and data quality standards of their ongoing data acquisition, mapping and modeling efforts.

Implementation of this policy option should be intrinsically linked with the Maryland Statewide Basemap (Maryland's iMap or MD iMap). MD iMap is an Internet-based interactive map suitable for use by state agencies, local governments and the public. It is to provide access to standardized information (imagery, roads, streams, place names, property information, etc) that will serve as a base that other data can be overlaid, such as the locations of features or resources at risk from SLR or predicted water levels from storm surge modeling. Anticipated deployment of Phase I of *i*Map is Spring 2008. The coordination of maps and model output will be supported by broadly accessible information on the nature of the risks and guidance on appropriate use of the models.

Implementation of this option should also be closely coordinated with the Maryland State Geographic Information Committee (MSGIC). The Maryland State Geographic Information Committee (MSGIC) acts to promote coordinated development and efficient use of resources

amongst all entities involved in the collection and/or use of spatial data and GIS technologies in Maryland.

Related Policies/Programs in Place

Over the past several years, the State of Maryland has directed substantial efforts toward advancing the State's understanding of sea level rise and coastal hazard vulnerability. The foundation of this understanding has been implementation of an aggressive strategy dedicated toward advanced technology, data and research acquisition and support.

Sea Level Rise Vulnerability: Recent data and research efforts of the Department of Natural Resources include: the completion of historic shoreline position maps; the statewide calculation of historic erosion rates; a comprehensive inventory of shoreline features and conditions for Maryland's coast; and a sea level rise economic cost study. Another major achievement for the State is the acquisition of LIDAR (LIght Detection And Ranging) high-resolution topography. Over a five-year time span, DNR worked with State and local partners to acquire high resolution topographic data for the majority of the State's coastal counties including all of the Eastern Shore. This data is now being used to develop sea level rise inundation models that demonstrate both the impact of gradual sea level rise inundation over time, as well as impacts associated with increased storm surge from episodic flood events. Sea level rise modeling has been completed for Worcester County (http://www.dnr.state.md.us/Bay/czm/wcslrreport.html), Dorchester County, and pilot areas within Anne Arundel and St. Mary's Counties. Recently, Sea Level Rise Vulnerability Maps have been created for all coastal counties, depicting lands (i.e., 0-2'; 2 – 5' and 5 – 10') about mean sea level.

Maryland Shorelines Online: To provide ready access to the data and information discussed above, the Maryland Coastal Program, in cooperation with Towson University, developed an Internet portal, titled *Maryland Shorelines Online* (http://shorelines.dnr.state.md.us/). The portal provides information and tools to coastal managers and decision makers, educators, and the public on sea level rise, coastal hazards and shoreline management. This site houses information on Maryland's legal framework, permitting and regulatory guidance, educational materials, assessments, and spatial decision support tools for shore erosion and sea level rise. The tools provided on the website allow for the identification of potential shoreline protection and restoration options throughout the State to mitigate hazards and enhance natural shoreline habitat.

Coastal Bays Hazards Initiative: In February 2004, the Coastal Bays Policy Committee charged the Department of Natural Resources, Coastal Program, with the task of assembling a Work Group to investigate the need and opportunities for better coordination of coastal hazards issues. In particular, recommendations were to be developed on how to promote the use of new tools and developing technologies at the local level to assist in visualizing hazards and local vulnerability.

Recent developments in data gathering, information management, and planning tools have crossed technological thresholds that have greatly enhanced the ability to do desktop planning for hazard response and mitigation. To effectively achieve the efficiencies that the employment of these new technologies and tools offers, a better understanding is needed of local government

technology requirements, mechanisms to increase coordination and leverage available resources. This Final Report identifies some of the hurdles to implementation and lays the groundwork for expanding application of the products and tools statewide. Specific recommendations provided in the report focus on: 1) means for incorporating, developing, processing, and formatting data for decision makers, 2) identifying capacity building opportunities and needs, 3) recognizing responsibilities and coordination, 4) technical support, and 5) financial assistance.

Floodplain Map Modernization: The Maryland Department of the Environment (MDE) Business Plan for Map Modernization (2004-2008) outlines the State's vision for modernization of the State's flood studies and maps. Maryland's vision for floodplain management is closely coupled with its vision for map modernization. MDE seeks to reduce costs associated with traditional detailed studies by developing a new set of "live" studies (digital verses paper product), which can be modified as watershed conditions change. Any proposed changes can be modeled to keep the maps current as permits are issued. LIDAR data is being used to develop the more accurate map products. [NEED TO UPDATE – send to MDE}

Surge Inundation Mapping: LIDAR data has also been used by the U.S. Army Corps of Engineers to develop surge inundation models for Maryland's Eastern Shore Counties. These counties are the lowest areas in the State and some areas are experiencing significant growth pressures. The maps are essential in expanding our knowledge of potential impacts and identifying vulnerable communities and infrastructure. These maps have been provided to local comprehensive planning and emergency management offices. Extension of these mapping efforts into all coastal counties is needed and under consideration.

Local Hazard Mitigation Plans: In November 2004, the Maryland Emergency Management Agency (MEMA) completed the Maryland State Hazard Mitigation Plan (SHMP) and associated mapping pursuant to regulations established by the Disaster Mitigation Act (DMA) of 2000. The goal of the SHMP is to reduce the loss of life and property damage associated with hazard events in Maryland. MEMA complied with this priority as considerable effort has been put forth to map state-owned and critical facilities, as well as the hazard areas for eleven other hazards. The most important aspect of this mapping effort was the identification of facilities, total populations at risk, and vulnerable populations at risk within hazard areas. The data sets and mapping effort will continue to evolve and improve as new data and technologies become available. MEMA considered historic shoreline changes data during the development of the SHMP, which was then used by local governments as the baseline/starting point of information for local hazard mitigation planning activities.

HAZUS-Multi Hazard (MH): HAZUS is a risk assessment software program for analyzing potential losses from floods, hurricane winds and earthquakes. HAZUS-MH estimates damage before, or after, a disaster occurs and takes into account various social and economic impacts of a hazard event. MDE partnered in {insert year} with Salisbury University to complete a statewide analysis of flood vulnerability estimated through the HAZUS-MH flood module. The Level One analysis completed in June 2005, estimates flood damage from a 100-year coastal or riverine flood event to commercial and residential properties. This study takes the next step from identifying flood vulnerability to understanding the risk to the built environment. The final report, "An Assessment of Maryland's Vulnerability to Flood Damage" is now available.

Emergency Management Mapping Application (EMMA): EMMA was developed by Towson University Center for Geographic Information Science (CGIS) in cooperation with Maryland Emergency Management Agency. EMMA is an incident response tool for the emergency management community to display relevant information before, during, and after an incident occurs. As a web-based mapping application, EMMA enables the emergency responders to identify incident locations from the field, generate location-specific reports, visualize incident locations via a map, perform site-specific analysis, and coordinate response efforts. Using a simple Web browser, such as Internet Explorer, EMMA provides basic and advanced tools for map visualization, location analysis, and report generation.

Sea, Lake and Overland Surges from Hurricanes (SLOSH): SLOSH is a computer program available to the emergency management and planning communities. SLOSH is housed and utilized in the State and local emergency operations centers to identify storm surge impacted areas and determine evacuation routes. SLOSH, a computerized model developed by the National Hurricane Center (NHC), assists Maryland's emergency management and response communities in estimating storm surge heights and winds resulting from historical, hypothetical, or predicted hurricanes by taking into account a storm's pressure, size, forward speed, track and wind. During tropical Storm Isabel, communication of the surge predictions from SLOSH for the Chesapeake Bay were not accurately translated and transferred to the public.

Hurricane Evacuation Tool (HURREVAC): HURREVAC is a computer program that is available to the emergency management and planning communities through the National Hurricane Center. HURREVAC automatically tracks hurricane related information and displays the results graphically. The program is utilized in the State's Emergency Operation Center (EOC) housed at MEMA to assist in determination of evacuation options and routes. HURREVAC utilizes current and forecast storm data and displays the track of the storm in various formats. The program derives the potential for storm surge and calculates evacuation times based on storm speed and intensity. It can also be used as a "what-if" tool to help decision makers determine courses of action for different storm characteristics.

Coastal Inundation Prediction System (CIPS): The Chesapeake Bay Inundation Prediction System (CIPS) is being developed by a team of government, academic and industry partners through the Chesapeake Bay Observing System (CBOS) of the Mid-Atlantic Coastal Ocean Observing Regional Association (MACOORA) within the Integrated Ocean Observing System (IOOS). CIPS is being developed to improve the accuracy, reliability, and capability of flooding forecasts for tropical cyclones and non-tropical wind systems such as nor'easters by modeling and visualizing expected on-land storm-surge inundation along the Chesapeake Bay and its tributaries. CIPS will provide an end-to-end prototype inundation forecasting system to facilitate emergency management decision-making in the challenging case of complex, intricate coastlines—semi-enclosed, coastal bays and estuaries. An initial prototype was developed for the tidal Potomac River in the Washington, DC metropolitan area. The Chesapeake Bay component was initiated in October 2007 and is anticipated to be completed in 2010.

Maryland State Geographic Information Committee (MSGIC): MSGIC acts to promote coordinated development and efficient use of resources amongst all entities involved in the

collection and/or use of spatial data and GIS technologies in Maryland. The Committee is crucial in promoting coordinated development and efficient use of resources amongst all entities involved in the collection and/or use of spatial data and GIS technologies in Maryland. Most recently MSGIC has focused on interoperable practices and standards, which relate to the "capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units" (MSGIC website). The Maryland Mapping Resource Guide lists projects addressing parcel mapping, tax maps, emergency management support, floodplain mapping, and other projects, including several at the county level.

MD *i*Map: The Maryland Statewide Basemap (Maryland's iMap or MD iMap) is an Internet-based interactive map suitable for use by state agencies, local governments and the public. It will provide access to standardized information (imagery, roads, streams, place names, property information, etc) that will serve as a base that other data can be overlaid, such as the locations of features or resources at risk from SLR or predicted water levels from storm surge modeling. Anticipated deployment of Phase I is Spring 2008.

Estimation of Adaptation Benefits and Costs

This option builds on ongoing efforts to integrate and disseminate GIS information collected by state, regional, and local entities and proposes expansion of the modeling and mapping information available relevant to sea level rise and associated coastal hazards. Integration of the diverse, relevant spatial data, increased monitoring information, refined risk modeling capabilities, and improved accessibility of information is required to assure the full benefits of many adaptation options and other planning goals. Greater accessibility of spatial information combined with regularly updated modeling and risk mapping will facilitate the integration of climate change-related information into existing decision-making and planning processes. These tools offer benefits through informing a wide array planning initiatives for individuals, public, and private entities as well as assessment of risks and policy options. While information is crucial to some analyses and these benefits are likely to be substantial, the benefits of the inputs to a decision are difficult to empirically assess separate from future decisions and uncertainties.

The option requires more detailed assessments in several areas to inform a cost estimate. Research needs include: determination of an appropriate maintenance schedule for updating mapping and modeling, assessment of the status and capabilities of mapping and modeling efforts, review of institutional data management practices to enhance efficiency and coordination, development of pertinent data sets and modeling tools. Development of a financial strategy will depend on findings of these studies and a determination of the adequacy of cyber-infrastructure to assure easy assess to information.

Feasibility Issues

This option involves a capacity assessment of agencies and cyberinfrastructure. Full implementation and benefits will depend on funding to address any needs identified in that assessment. The regular updating of flood hazard maps is needed to assure that planning and regulatory actions using these data sets are based on best available information.

Status of Group Approval

TBD

Barriers to Consensus

TBD

FBEI-8. Green Economic Development Initiative

Option Description

"We must transition from a carbon-based economy to a green, sustainable economy…"

- Governor Martin O'Malley testimony before the U.S. Senate Environment and Public Works Committee in September 2007

A bold, simple vision that unites diverse interests, when supported by a plan, resources, and tangible results, can inspire Marylanders to meet today's and tomorrow's challenges. The observed and projected impacts of climate change provide ample reason for Maryland and the U.S. to shift toward a green, sustainable economy. A green economy will involve both the greenhouse gas mitigation efforts necessary to avoid the increasingly severe impacts associated with greater change and the adaptations required in responding to the current climate change commitment created by past and ongoing emissions.

While some fear climate change as inhibiting economic prosperity and development, increasing numbers of businesses are recognizing that solutions to climate change can actually create significant economic opportunities while solving other societal problems. The IPCC's Fourth Assessment Report states that "Sustainable development can reduce vulnerability to climate change by enhancing adaptive capacity and increasing resilience. At present, however, few plans for promoting sustainability have explicitly included either adapting to climate change impacts, or promoting adaptive capacity." Although green collar jobs in the energy sectors are more widely recognized, adaptation responses to reduce climate change threats and promote sustainability also offer economic development opportunities.

Solutions to climate change can be smart, win-win strategies that address multiple issues for diverse stakeholders simultaneously. There are many adaptation strategies to reduce vulnerability to sea level rise and associated hazards. Carefully crafted, some adaptation opportunities can also contribute to climate change mitigation efforts and broader goals of environmental sustainability. To realize the promise of such strategies, a green economic development plan for Maryland is needed.

Fortunately, the benefits of creating a green, sustainable economy are substantial and widespread. They include a better quality of life, independence from imported fossil energy, thousands of "green collar" jobs, lower operating and maintenance costs for homes and businesses, cleaner and more reliable and resilient power systems, a more dependable and healthy food system, better access and mobility, and significant environmental and health improvements such as cleaner air and water, open space, pedestrian-friendly communities and restored habitats.

The goal of this option is to initiate the development and execution of a green economic development plan. The intent is to catalyze a self-reinforcing green growth cycle across all sectors of Maryland's economy. In such a growth cycle, a growing demand for green products

and services sustains a growing community of green businesses and industries, who in turn create more jobs, healthy communities and a cleaner environment. Central to this growth cycle are natural principles such turning waste into wealth, resource efficiency, optimizing stakeholder value, and life-cycle thinking. Thus, we meet the challenges of climate change while helping Maryland shift toward a greener, leaner, more sustainable economy.

Option Design

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

This option includes both new green businesses as well as the greening of more traditional businesses to improve their economic, social and ecological performance. Currently, there is no standard for defining what constitutes a green business or commonly accepted measures of what it means to be "green." However, the growth potential for a green, sustainable economy is likely quite large given the existing opportunities for reducing resource waste, pollution and ecological impacts. Using State government as a "pump primer" will save taxpayers money by reducing waste while encouraging the growth of green service and product providers. Finally, while the exact percentage of the Maryland's economy that is considered green is difficult to discern, it is generally understood that the green portion of Maryland's economy is relatively small while the demand for green growth is substantial.

There are many barriers to any new technology, of course, and many of those barriers are created by those who profit from the status quo. Using public-sector procurement and publicly-supported resources like academic institutions to help overcome them is a strategy that has been successfully used by governments at every level. The dominance of American microelectronics throughout the latter half of the twentieth century is attributable in some significant measure to early support by the Department of Defense, just as Europe's current dominance in renewable energy technology is attributable to government incentive programs.

Parties Involved:

Climate change response and economic development efforts will influence wide array of people and organizations and relate closely to the broader agenda of sustainability. This partial list of parties identifies agencies, businesses, and environmental organizations associated with climate change responses, coastal areas, and green business initiatives.

Green Business Groups: MD Green Community (such as Green Drinks, Green Building Institute, Chesapeake Alliance for Sustainable Business, Maryland League of Conservation Voters and Businesses for the Bay); MD Green Building Council (standing commission created by legislature); Clean Energy Partnership – MD-based non-profit that organizes businesses in support of practical solutions to global warming

Business and Labor Organizations: Local Chambers of Commerce; MD Chapter of National Federation of Independent Business (NFIB) – small business advocacy organization; Labor Unions; Organizations; Financial Community – banks, investment firms, pension funds

State Agencies and Offices: MD Department of Business and Economic Development; MD Economic Development Corporation; MD Department of Environment; MD Coastal Program (a networked program administered at DNR that includes state, federal and local partners); MD Department of Transportation; MD Department of Agriculture; MD Department of Housing and Community Development; MD Office for a Sustainable Future (within Department of Natural Resources); MD Sustainability Sub-Cabinet; and, MD University System.

County and Local Government Agencies: Baltimore Development Corporation; MD Association of Counties

Implementation Mechanisms

Building on Governor O'Malley's vision and the momentum of initiatives already in place, the State of Maryland should take immediate steps to capitalize on green economic development potential. We suggest that Governor establish a Task Force or other appropriate group capable of acting quickly to refine implementation and initiate strategies that will give Maryland strong capacity to recognize and promote market opportunities arising from climate change adaptation and mitigation requirements. Department of Business and Economic Development and other agencies with programs in business development and trade promotion should play a major role in this effort. The first effort of the group will be to determine the capacity of existing efforts to identify emerging opportunities in the area of climate change adaptation and mitigation, support the development of products and ideas, and promote these businesses nationally and internationally. The appropriate group should include among its recommendations strategies to augment and/or enhance statewide capabilities to the level necessary to act on this groups recommendations. Steps for a task force or other appropriate body include advancing strategies to:

1. **Build public and business awareness of why a green, sustainable economy is good for Maryland**. This step will stimulate demand for green products and services and the "greening" of businesses across sectors. Use benefits listed under Option Description to track and communicate progress. While developing a green sustainable economy is critical to mitigating the impacts of climate change, the challenges created by sea level rise, increases in storm frequency and intensity of storms, and the many other impacts of climate change will create needs for innovative processes and the development of new goods and services, as well as open competitive market opportunities.

2. **Promote the "greening" of existing Maryland businesses**. Society is being forced to adapt to the impacts of changing climate while minimizing longer term threats through mitigation efforts. For businesses, adaptation means improving risk management and innovating for new opportunities. This includes demonstrating and supporting practices and solutions that integrate economic, social and environmental performance. For instance, a company can reduce its risks, build market share and profits and cut costs

through better environmental management (by reducing waste, pollution and ecological impact) and the introduction of green products and services. Key actions include recognizing leadership in green business practices, providing education, networking and outreach, and supporting technology and standards development.

3. **Use Maryland government as a "pump primer" for stimulating the growth of a sustainable, green economy.** This includes greening State procurement and work policies to save money, improve worker productivity and morale, reduce waste, improve resource efficiency and lower or eliminate pollution. Develop a scorecard that measures progress along these and other goal areas.

4. **Develop adaptation decision support services and tools for business.** Develop applications and training programs that help businesses identify the climate change issues most relevant to them and the adaptation options available. Climate change will affect business insurance and financing, product and service development, distribution networks, supply chains, relationships with regulators and local communities, your competitors, and customers and markets. Each of these areas are opportunities for some to adapt to reduce impacts and for others to expand into a new important sector.

5. **Market Maryland as a leader in the green revolution.** Undertake communications campaign to market Maryland as a "green collar state" receptive to new green businesses. Take inventory of green initiatives and green enterprises already started within the State. Help these entities collaborate, succeed and market themselves more effectively. Build on the innovations of other states and governments and promote eco-innovation within the State.

6. **Build a green-collar, entrepreneurial workforce through education, training and outreach.**

    a. Education from grade school to university/community college can help our society transition to a greener, more sustainable future. People become more aware of problems and opportunities.
    b. For some economic sectors, job retraining will be an important element in helping people adjust to changes in the necessary skill sets
    c. Professional and trade personnel across diverse industries need to be trained on installation and maintenance of technologies and the opportunities and risks associated with climate change.
    d. Networking and public outreach will help foster collaboration and help build public support.

7. **Consider allocating portions of public pension funds within the state to green or clean tech strategies, within the state's definition of fiduciary duty**. Like public procurement, State and local government pension funds can help to foster the development of clean technologies and enterprises. Several state pension funds have made allocations of small portions of overall assets to publicly traded or private equity green technology portfolios. The size of the allocation must be consistent with the public, private and non-profit funding sources can play a pivotal role. This includes, for

instance, retirement funds and mortgages. Consider targeting state pension plans to in-state investments. There is a need to coordinate the two sides of the insurance--risk management and the investment portfolio. State retirement funds should offer opportunities to invest in green industries, technologies and companies.

8. **Create an environment to foster green business and markets**.

Possible examples include:

a. Develop new sustainability curricula and R&D (research and development) programs within the State University System.

b. Create a business incubator within the State University System to provide technological and business services support and outreach to green businesses.

c. Provide tax credits or other tax incentives for green consumers, businesses and technologies.

d. Foster businesses pursuing innovations for more resilient coastal area development from planning to new technology and design.

e. Promote a sustainable trade program, including capacity for marketing, outreach development, website design and management, arranging sustainable trade delegations itineraries, and sponsoring conventions.

f. Promote and invest in water quality and water conservation technologies that will be adaptive to the stresses of saltwater intrusion, drought, and potential for increased number and intensity of severe storms.

g. Promote and invest in distributed power systems such as combined heat and power, microturbines, wind and solar power.

h. Subsidize the production of cellulosic biomass in the agricultural and forestry industries. Partner with Pennsylvania and other States promoting this development path.

i. Increase Renewal Portfolio Standard (RPS) requirements for utilities; broaden requirement to include energy efficiency along with renewable energy.

j. Foster businesses specializing in 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.

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

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

m. Foster green, eco-industrial parks where collocated businesses benefit from sharing and exchanging resources and byproducts. http://en.wikipedia.org/wiki/Industrial_ecology

9. **Create sustainable resource-based industries.**
Resource-based industries such as forestry, agriculture, commercial and recreational fishing, and sportsmen's activities represent the economic backbone of rural Maryland. These industries are heavily dependent on the health and vitality of the Chesapeake Bay and its tributary ecosystems, which is threatened by SLR and associated hazards such as storm surge, coastal flooding and erosion. Research should to be conducted within each respective field to identify potential ecological and subsequent economic impacts. The end result should lead to formulating and implementing appropriate adaptation strategies to buffer such effects, as well as identifying potential opportunities for expansion and development within respective fields.

Related Policies/Programs in Place

There is a wide variety of efforts aimed at promoting environmental and business interests. In addition to the Federal, state, and local programs mentioned below, further programs are likely to be identified if action is taken on policy option FBEI-2, "*State Agency Reporting on Response to CCC Findings.*" This policy option complements the greenhouse gas mitigation policy option developed by the Maryland Commission on Climate Change's Mitigation Working Group titled "*Promote Economic Development Opportunities Associated with Reducing GHG Emissions in MD***"** and RRI policy option **"***Resource-Based Industries – Economic Initiative***."**

The federal government is currently supporting an array of green business and green collar job programs. The majority of these are focused on renewable energy and the broader agenda of sustainability, but they indicate federal support for an environmental business and jobs. As the adaptation agenda gains greater traction, it is likely to emerge as a new dimension to these efforts, particularly where adaptation and mitigation efforts can be integrated as in living shorelines management strategies or green buildings. The Federal agenda is distributed across several agencies, including the Department of Commerce, International Trade Administration, Environmental Protection Agency, Department of Energy, and the Department of Agriculture (http://www.ita.doc.gov/competitiveness/sustainablemanufacturing/USG_PRS_Sustainable_Business.asp). The Energy Independence and Security Act of 2007 included a provision for Department of Labor to establish an energy efficiency and renewable energy worker training program that includes grants to states and support national research to develop labor market data and to track workforce trends for energy-related initiatives.

State wide efforts related to this option fall into four main categories – sustainable energy policy, sustainable coastal management, and economic development which are supported by university educational initiatives. Efforts to increase government efficiency provide further support for implementation.

SUSTAINABLE ENERGY POLICY

New initiatives focused on sustainable energy policy are establishing programs that offer economic development opportunities. The Maryland Energy Administration (MEA) created the Maryland Strategic Electricity Plan to assist the Governor and General Assembly in crafting a sustainable energy policy for Maryland's future. The 2008 legislative session passed several pieces of enabling legislation that will have a significant impact on energy-related opportunities.

EmPOWER Maryland

EmPOWER Maryland, originally established by the Governor, has now been codified strengthening the commitment to the goal of reducing the State's electricity consumption 15% by 2015. Utilities will rely heavily on increasing implementation of existing technologies to meet this goal.

Maryland Strategic Energy Investment Fund

The Maryland Strategic Energy Investment Fund will make approximately $40 million a year available to support clean energy programs. It is will create economic opportunities by supporting investment in energy efficiency technology, stimulating Maryland's emerging clean energy industry, promoting programs to reduce electricity consumption by low and moderate income customers, and sponsoring research on technologies to reduce Maryland's vulnerability to climate change. The fund allows MEA to support traditionally underserved markets, such as providing below-market financing to encourage energy efficiency investments by homeowners and small businesses. The fund will be financed through the upcoming sale of carbon allowances to power plants as part of the Regional Greenhouse Gas Initiative (RGGI).

Green Building Standards for Building Financed with State Funds

The General Assembly passed legislation promoting green building technologies in new construction receiving state funding. Maryland will lead by example by requiring that all new schools and significantly renovated State buildings over 7,500 square feet meet the LEED Silver green building standard.

Renewable Portfolio Standard (RPS)

To meet growing electricity needs, new legislation has committed Maryland to investing in new forms of electricity generation by raising the renewable portfolio standard from 9.5% to 20%. This requirement will create opportunities increase renewable and clean energy generation.

Solar and Geothermal Tax and Grant Incentive

New tax relief and grant opportunities for both solar and geothermal systems are designed to stimulate investment in clean energy and increase supply. These incentives create new economic and employment opportunities by encouraging more investors and households to enter clean energy sectors.

SUSTAINABLE ENVIRONMENTAL POLICY

The Chesapeake Bay is Maryland's most precious natural resource. Approximately $381 million of the FY 2009 is designated to provide programs that are directly related to the restoration of the Bay and its tributaries. Maryland has supported developing expertise in agricultural management programs, which protect the Bay while supporting sustainable agriculture practices and preserving open space. State legislation also supports improved stormwater management and oyster restoration. Sea level rise and associated threats of climate change will exacerbate the threats to the Bay. In this situation, skills, knowledge, and technologies developed for environmental management will become increasingly valuable elements of adaptation. Additional state programs that may support more effective environmental management include:

Chesapeake Bay 2010 Trust Fund

The Chesapeake Bay 2010 Trust Fund will ultimately make $50 million dollars available for innovative pollution reduction and clean-up strategies to improve the health of the Bay.

Revisions to the Critical Area Act

Revisions to the Critical Area Act improve administration and enforcement capabilities to protect critical buffers around the Bay.

Transit Oriented Development

Transit-oriented development (TOD) legislation provides another tool to support smart growth, revitalize communities, and curb sprawl while offerings opportunities to reduce transportation contributions to greenhouse gas emissions. International, national, and state trends in efforts to reduce greenhouse gas emissions suggest that knowledge and experience in this sector will be increasingly sought after.

PROMOTING JOBS AND ECONOMIC GROWTH

Several new efforts to support education, workforce development, economic and community growth offer opportunities to promote environmentally friendly technologies and practices. In addition to the programs and policies listed above, there are other initiatives related to renewable energy development (especially ethanol and biodiesel) and business incubators that could support green economic development.

BRAC Community Enhancement Act and BRAC Revitalization and Incentive Zones

Base Realignment and Closure (BRAC) Subcabinet, which coordinates the planning and financial resources of State government to support the missions of military installations expanding under BRAC, anticipates that as many as 60,000 new jobs and 28,000 new households will come to Maryland by 2011. The *BRAC Community Enhancement Act* includes initiatives to leverage state and private sector investments critical to support the community and transportation infrastructure necessary to accommodate BRAC-related growth. *BRAC Revitalization and Incentive Zones* will provide local jurisdictions with incentives to enhance public infrastructure such as streets, utilities and recreation venues in designated revitalization and redevelopment areas in keeping with Smart Growth principles. BRAC Zones will offer incentives to draw businesses into targeted areas of the State that are in need of revitalization and redevelopment. These incentives may also provide an opportunity to encourage high quality green businesses to locate in the state. In addition to the *BRAC Community Enhancement Act*, the Administration will propose to expand the uses of the new Higher Education Investment Fund to allow for BRAC-related higher education initiatives administered by the Maryland Higher Education Commission. Governor O'Malley has included $3 million in the Fiscal Year 2009 budget for workforce training initiatives related to BRAC.

EDUCATION

The University System of Maryland has established an Environmental Sustainability and Climate Change Initiative aimed at improving environmental management practices on campuses, supporting state efforts, and providing training in environmental programs. While education programs currently listed are not focused on climate change, they do include relevant efforts such as the University of Maryland Center for Environmental Science and the multicampus Graduate Program in Marine-Estuarine-Environmental Science.

MAKING GOVERNMENT WORK

The state government can lead by example as well as foster innovative climate change responses. Programs established to increase government efficiency can be used to track these efforts. StateSTAT, a performance-measurement and management tool, collects data on important state initiatives to increase accountability and efficiency.

Many policy options proposed here rely on coordination across agencies. The newly created Department of Information Technology will have policy responsibility for information technology matters enabling agency, community, and public access to vast amounts of data and useful information. The new Department of Information Technology will also assume the responsibility for coordinating, purchasing and managing all telecommunications devices and systems utilized by State agencies. The Secretary of Information Technology will lead chief information officers of all agencies to streamline business processes across State government, achieve cost-savings through economies of scale, and coordinate initiatives related to security, disaster recovery and continuity of operations.

Estimation of Adaptation Benefits and Costs

This policy option focuses on taking advantage of new market opportunities arising from climate adaptation and mitigation needs. The level of benefits will depend on the implementation strategies pursued and their success in the broader competitive market. At a minimum, this option encourages private sector involvement in innovation and development of green economic sectors and jobs. It also broadens the range of entities involved in collecting, evaluating, and responding to climate change and increases the potential for innovation and better adaptation solutions. The mix of these programs can be adjusted relatively quickly and easily to accommodate new information and opportunities, particularly if there is a diverse set of sectors and strategies in the portfolio. Costs associated with this policy option will vary based on the portfolio of strategies pursued.

Feasibility Issues

This option builds on Maryland's strong base of leadership and expertise in environmental management. There are ideas and technologies ready for further development or adoption as well as a growing market. Success of this effort depends on funding availability, public and organizational acceptance and support for climate change adaptation and mitigation.

Status of Group Approval

TBD

Barriers to Consensus

TBD