http://www.mde.state.md.us/air/mccc/

DRAFT

Catalog of State Sectoral Adaptation Actions

A catalog of state-level, vulnerability-reducing adaptation actions and policy options.

Future Built Environment & Infrastructure Adaptation Options Section

Key to Future Rankings of Options in the Tables that Follow:

Potential Risk Reduction (Tentative Title) 1/	Potential Cost or Cost Savings 1/
High (H): Able to reduce significantly climate risks associated with the highest impact magnitudes	**High (H)**: Cost-benefit ratio in excess of 1.5
Medium (M): Able to significantly reduce climate risks associated with the medium impact magnitudes	**Medium (M):** Cost-benefit ratio between 1.0 and 1.5
Low (L): Able to significantly reduce climate risks associated with the lowest impact magnitudes	**Low (L):** Cost-benefit ratio less than 1.0
Uncertain (U): Not able to estimate at this time	**Uncertain (U):** Not able to estimate at this time
1/ Several measures may overlap in terms of vulnerability reduction and/or cost impacts. Estimates assume measures would be implemented independently from other measures.	

Definition of "Priorities for Analysis":

- **High:** High priority options will be analyzed first.
- **Medium:** Medium priority options will be analyzed next, time and resources permitting.
- **Low**: Low priority options will be analyzed last, time and resources permitting.

Notation of Options:

Options marked in bold an asterisk (*) **indicate some of the related state actions that are approved or underway, as described further in the companion options description document. TWG members are encouraged to provide information on other relevant actions.**

Future Built Environment & Infrastructure Adaptation Options

Option No.	Adaptation Policy Option	Flexibility	Capital intensity	Potential Risk Reduction (TENTATIVE)	Adaptive capacity	Level of consensus	Notes
		See working definition on page 9		See working definition above	See working definition on page 9		
1	(Managed) Retreat (understood as taking out what is currently in place)						
1.1	Implement new design standards, building and zoning codes to reflect the need for retreat from areas exposed to sea level rise and associated hazards ~~Site industrial systems away from areas vulnerable to changes in sea level rise and associated hazards~~	H	M	H	M		NOte including setback zones and phased-out or no development in areas; reflects the issues of post disaster rebuilding
1.2	Site industrial systems away from areas vulnerable to changes in sea level rise and associated hazards						
~~1.2~~	~~Develop new building codes, design standards including setback zones and phased-out or no development in areas exposed to sea level rise and associated hazards~~	~~H~~	~~L~~	~~H~~	~~H~~		
1.3	Relocate of threatened structures	M	H	H	M		Possible policy mechanisms: Develop rolling easement program; Develop rolling buffer program; Creating upland buffers
~~1.3~~	~~Relocate of threatened structures~~	~~H~~	~~H~~	~~H~~	~~M~~		~~Possible policy mechanisms: Develop rolling easement program; Develop rolling buffer program; Creating upland buffers~~

Option No.	Adaptation Policy Option	Flexibility	Capital intensity	Potential Risk Reduction (TENTATIVE)	Adaptive capacity	Level of consensus	Notes
~~1.4~~	~~Develop and use insurance policies to drive and support retreat activities~~	~~H~~	~~L~~	~~H~~	~~H~~		
~~1.5~~	~~Guide future development out of areas vulnerable to sea level rise and associated hazards~~	~~H~~	~~L~~	~~H~~	~~H~~		
~~1.6~~	~~End permitting of new homes in areas vulnerable to sea level rise and associated hazards~~	~~H~~	~~L~~	~~M~~	~~L~~		
1.~~4~~7	~~Develop~~ Implement a strategy for managing the retreat of (Small and large) ports and associated infrastructure, such as rail and roads	H	H	M	M		
1.~~5~~8	Modify engineering strategies and standards to manage the retreat of ports and other facilities, such as power plants, that need to be near the water ~~Develop a strategy to assure long-term public access to water~~	~~H~~H	L~~M~~	M~~L~~	M~~L~~		
1.~~6~~9	~~Develop~~Implement strategy to protect unused properties in areas vulnerable to sea level rise and associated hazards, potentially including purchase programs or easements	~~H~~M	H	M	M		
1.~~7~~10	~~Develop~~Implement retreat strategies for the management of existing structures or conditions that may become submerged hazards to navigation or public health (e.g. effluent outfalls, water intakes, septic fields, rockwalls, docks, and piers)	H	~~H~~M	M	M		
1.~~8~~11	~~Develop~~Implement strategies to address situations of changing ingress/egress to structures as support for access roads in areas vulnerable to sea level rise and associated hazards is withdrawn	~~H~~M	H	L	M		
1.~~9~~12	Develop and use insurance policies to drive and support retreat activities~~Modify engineering strategies and standards to manage the retreat of ports and other facilities, such as power plants, that need to be near the water~~	H~~H~~	L-M~~L~~	H~~M~~	H~~M~~		

Option No.	Adaptation Policy Option	Flexibility	Capital intensity	Potential Risk Reduction (TENTATIVE)	Adaptive capacity	Level of consensus	Notes
1.10	Implement a strategy to assure long-term public access to water	H	M	L	L		
2	**Avoid (placing people and property at risk)**						
2.1	Integrate critical area planning and zoning requirements with comprehensive planning laws, including emergency planning and infrastructure planning requirements to avoid SLR and associated coastal hazards	H	L	H	M		
~~2.1~~	~~Minimize of paved surfaces and use of trees to reduce flooding~~	~~H~~	~~L~~	~~L-M~~	~~L~~		
2.2	Require that counties act on comprehensive planning requirements	H	L	M	H		
2.3	Guide future development out of areas vulnerable to sea level rise and associated hazards	H	L	H	H		
2.4	End permitting of new homes in areas vulnerable to sea level rise and associated hazards	H	L	M	L		
2.5~~2.3~~	Minimize of paved surfaces and use of trees to reduce flooding~~Integrate critical area planning requirements with comprehensive planning laws, including emergency planning and infrastructure planning requirements~~	H~~H~~	L~~L~~	L~~H~~	L~~M~~		
2.6~~2.4~~	Strengthen existing critical area planning and implement requirements to address SLR and associated coastal hazards	H	L	H	H		
2.7~~2.5~~	~~Develop~~Implement a strategy to regularly update floodplain maps	H	~~M~~L	H	H		
2.8~~2.6~~	Incorporate findings of the MD Commission on Climate Change into existing government programs~~Evaluate application of hard structural options (such as dikes, levees, floodwalls, and saltwater intrusion barriers) and soft structural options such as dune restoration and creation, wetland restoration, creation, periodic beach nourishment, temporary barriers and other options~~	H~~H~~	M~~M~~	H~~M~~	H~~M~~		

Option No.	Adaptation Policy Option	Flexibility	Capital intensity	Potential Risk Reduction (TENTATIVE)	Adaptive capacity	Level of consensus	Notes
~~2.7~~	~~Incorporate findings of the MD Commission on Climate Change into existing government programs~~	~~H~~	~~M~~	~~M~~	~~H~~		
3	**Accommodate**						Consider resilience and redundancy in policy
3.1	Establish a mechanism to evaluate and recommend new design standards for structures that may be vulnerable to SLR and associated hazards	H	L	H	H		such as the placement of mechanical and electrical equipment
3.2	Design industrial systems to reduce vulnerability to future sea level rise and associated hazards	H	L	H	M		
3.3	Institute new hazard-resistant building codes and design standards to reduce vulnerability of structures to future sea level rise and associated hazards	H	L	H	H		
3.4	Implement standards to assure the survivability of buildings exposed to periodic inundation	H	L	M	M		
3.5~~3.1~~	Storm-surge early warning system and adequate response, evacuation plan	H	M	M	L		
3.6	Raise shoreline structures	M	M	M	L		
3.7	Create standards for floating piers	H	L	L	L		
3.8~~3.2~~	~~Implement a plan to address i~~Create a climate change and insurance commission to evaluate the insurance ramifications of climate change risks	H	L	~~H~~L	H		* Cross cutting issue
3.9~~3.3~~	Develop a statewide insurance pool	H	M-H	M	L		
3.10~~3.4~~	Ban any insurance of “critical risk” areas	H	L	M	L		
3.11~~3.5~~	Raise insurance rates in “vulnerable/at risk” areas	H	L	M	L		
3.12~~3.6~~	Create supplementary requirements to the NFIP Community Rating System	M	L	M	M		
3.13~~3.7~~	Modify of land use, agricultural , and landscape practices including aquaculture, saline-resistant crops, depending on location and purpose	M	L	M	M		

Option No.	Adaptation Policy Option	Flexibility	Capital intensity	Potential Risk Reduction (TENTATIVE)	Adaptive capacity	Level of consensus	Notes
3.143.8	Implement a plan for sharing of sand between communities Raise shoreline structures	HM	LM	MM	LL		
3.153.9	Redefine or create state level definition of coastal barrier system under the Federal CBRS limitsCreate standards for floating piers	MH	LL	ML	ML		
3.10	Establish a mechanism to evaluate and recommend new design standards for structures (and placement of mechanical and electrical equipment) that may be vulnerable to SLR and associated hazards	H	L	L	L		
3.11	Design industrial systems to reduce vulnerability to future sea level rise and associated hazards	H	L	H	M		
3.12	Institute new hazard-resistant building codes and design standards to reduce vulnerability of structures to future sea level rise and associated hazards	H	L	H	H		
3.17	Develop a plan for sharing of sand between communities	H	L	M	L		
3.18	Develop standards to assure the survivability of buildings exposed to periodic inundation	H	L	M	M		
3.19	Redefine or create state level definition of coastal barrier system under the Federal CBRS limits	M	L	M	M		
4	**Research and Data needs**						
4.1	Investigate opportunities and innovations with potential to benefit the economy, public services, and business sectors	H	L	L	H		
4.2	Create inventory of infrastructure vulnerable to future SLR and associated hazards	H	M	LM-H	M		Necessary input to other efforts
4.3	Create on-line mapping capability for multiple audiences, including local governments	H	L	ML	H		Process already well along

Option No.	Adaptation Policy Option	Flexibility	Capital intensity	Potential Risk Reduction (TENTATIVE)	Adaptive capacity	Level of consensus	Notes
4.4	Create visualization tool for SLR and associated hazards	H	L	~~L~~L	M		Google Earth?
4.5	Assure adequate surveillance and monitoring of sea-level rise	H	M	~~L~~M	M		
4.6	Investigate potential and limitations of eminent domain, vesting, grandfathering, and amortizing strategies to support retreat activities	H	L	L	M		
4.7	Assess financial impact of property value changes	H	L	L-M	M		
4.8	~~Develop~~Conduct a detailed analysis and inventories of the pros and cons of application of hard structural options (such as dikes, levees, floodwalls, and saltwater intrusion barriers) and soft structural options such as dune restoration and creation Wetland restoration, creation, periodic beach nourishment, temporary barriers and other options	H	L	L	M		
4.9	Evaluate the potential risks and opportunities to a ferry system (incl. public transportation and emergency planning)	H	L	L	L		
4.10	Research to update guidance on landscaping, including a climate zone map	H	L	~~M~~L	M		
4.11	Investigate the availability and distribution of sand resources for beach renourishment	H	M	~~L~~M	M		
4.12	Investigate the potential need for replacing/backfilling resources lost due to SLR (e.g., wells lost to ground water intrusion)	H	L	L	M		
5 Capacity Building and Training Coordination							
5.1	Establish a coordinating mechanism to assure that local governments act in concert with the state to reduce future impacts from SLR and associated	H	L	M	H		

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	hazards						
5.2	Synchronize future design with emergency planning infrastructure requirements	H	L	M	M		
5.3	Increase coordination among existing planning and development entities	H	L	M	H		
5.4	Identify existing state and local programs that could be modified and /or strengthened to accommodate for climate change, SLR, and the MCCC recommendations and requirements.	H	~~M~~L	H	H		
5.5	Increase consistency in definition of what is considered a "critical" area to include all areas and resources threatened by SLR and associated coastal hazards	H	L	H	H		
Education							
5.6	Establish structured capacity building and training for key adaptation sectors including building trades, infrastructure, finance and insurance, landscapers and others	H	L	~~L~~M	~~H~~H		
5.7	Establish structured training and vocational support for trades and others involved in implementation of new design standards	H	L	~~L~~M	~~H~~H		
5.8	Establish structured capacity building and training for public servants	H	L	~~L~~M	H		
5.9	Integrate climate change and adaptation issues into advanced training in university, community college, and technical training programs	H	L	~~L~~M	M		
5.10	Provide training for permit and planning agencies staff to address SLR and associated coastal hazards	H	L	M	H		Note: Existing coastal training program
5.11	Provide outreach and education to the broader population	H	L	~~L~~M	M		
Mapping of potential impacts and vulnerability							
5.12	Identify and map highly vulnerable and valuable areas	H	~~M~~L	M	H		

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5.13	Map the vulnerable surface and ground water resources	H	~~M~~L	M	M		
5.14	Identify and modify state programs relying on shoreline or vulnerable area mapping to assure that they have plans to regularly update maps	H	~~M~~L	L	H		
Economic							
5.15	~~Develop~~Implement a state Revolving Loan Plan to finance state and local investments in CC adaptation and mitigation actions	M	M	L	M		
5.16	Create an economic development plan centered on climate change response and adaptation opportunities	M	M	L	M		
5.17	Create incentives for the private sector to invest in innovative approaches to adaptation	M	M	L	M		e.g. revolving funds
5.18	Create a culture of certainty on the economic opportunities in greening	H	L	L	L		
5.19	Allow state pension plans to invest and fund climate change-friendly, local investments	M	L	L	M		
5.20	Encourage private 401Ks to foster socially responsible investment (SRI) options for their members	H	L	L	M		
5.21	~~Develop~~Implement strategies to encourage and incentivize banks to invest in Maryland CC mitigation- related companies	M	L	L	M		i.e., tax breaks, expedited depreciation, and capital gains tax breaks
Insurance							
5.22	Implement a plan to address the insurance ramifications of climate change risk	M	L	H	H		Cross cutting repeated from section 3

Working Definitions

- **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.