Maryland Coastal Adaptation Report Card 2021

Methods Manual

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This report card was funded by The Maryland Coastal Zone Management Program in the Maryland Department of Natural Resources using federal funds under award number NA19NOS4190162 NOAA, U.S. Department of Commerce. Report card development was led by the Integration and Application Network of the University of Maryland Center for Environmental Science. It was developed with support from the Maryland Commission on Climate Change (MCCC) Adaptation and Resiliency Workgroup (ARWG). Stakeholders across Maryland's coastal zone contributed to report card development.

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Introduction

For the last decade, the State of Maryland has invested in and made progress toward adaptation. Through investment in planning, regulation, and restoration, Maryland has become a leader in coastal and climate adaptation. There is, however, a need to clarify adaptation goals to measure progress and hold the state accountable. The Maryland Coastal Adaptation Report Card, a collaboration between the Adaptation and Resiliency Work Group (ARWG) of the Maryland Commission on Climate Change (MCCC) and University of Maryland Center for Environmental Science Integration and Application Network (UMCES-IAN), begins to address this need. The Coastal Adaptation Report Card gives a snapshot of current adaptation status in Maryland's coastal zone, and establishes a framework for measuring future progress.

Report cards are effective in measuring ecosystem condition and adaptation. They help communities, governments, and organizations identify goals for ongoing activities, and measure progress toward those goals. They provide a snapshot of current progress and allow for tracking continued improvement over time. They also identify gaps in data and efforts.

The development of the Coastal Adaptation Report Card followed a well-established, multi-step methodology. Through a series of workshops in the fall and winter of 2020, the research team identified the climate change threats that most concern stakeholders, how these threats are addressed, and what adaptation actions are most critical in measuring progress. The stakeholder process, combined with a literature review to identify viable indicators, resulted in the selection of 15 indicators across four categories: Planning, Flooding, Socioeconomic, and Ecosystem. The current status of each adaptation indicator was assessed by comparing best available data to established goals based on expert knowledge, scientific consensus, and regulatory initiatives.

This methods document details the analysis process for each of the fifteen indicators. Every indicator is described with its background, data source, threshold and scoring process, and current score. Each of the four indicator category scores was attained by averaging scores of indicators in that category. The overall coastal adaptation score is the average of the four category scores. The current indicator category scores, shown below, average to an overall score of 66%.

Category	Score (%)
Ecosystem	87
Flooding	59
Planning	66
Socioeconomic	53

Ecosystem indicators

Wetlands
Dredge
Forest
Shoreline erosion

Each of the four indicators in this category was scored independently as described below. The overall ecosystem score was calculated by averaging together the four indicator scores. The overall ecosystem category score is 87%.

Wetlands

Background:
Wetlands are a habitat that can reduce the magnitude of climate-change effects and are negatively impacted by climate change. Wetlands act as a buffer against floods by holding excess water and reducing the amount that floods into towns and cities. Wetlands are being forced to "migrate," or move landward, as sea level rises. Two important ways of protecting wetlands and maintaining the mitigation effects they provide are 1) ensuring that wetlands have someplace to migrate to, and aren't blocked from inland migration, and 2) rebuilding or restoring wetlands following damage.

Data:
Acreage data for Woody Wetlands and Emergent Wetlands in Maryland's coastal counties were obtained from the NOAA Office for Coastal Management CCAP Database.[1] The most recent available data were from the period of 2011–2016.

Threshold and Scoring
Through the Chesapeake Bay Agreement and the Nontidal Wetlands Act, Maryland has a regulatory goal of "no net loss" of wetland area and function. Therefore, this indicator was scored as pass/fail with a threshold of 0% wetland loss. If no wetland area was lost (or wetland acreage increased) between 2011 and 2016, the resulting score would be 100%. If wetland area decreased between 2011 and 2016, the resulting score would be 0%.

Wetland Area Loss	Score (%)
No loss	100
Any loss	0

Current Score:
Total net change (in square miles) between 2011 and 2016 was positive, with a 0.12% net gain (1.46 mi^2) of wetlands across Maryland's coastal counties. Therefore, the wetlands indicator score is 100%.

Dredge

Background:
Dredging is necessary to maintain waterways for transportation, but results in a large amount of dredge material—all of the soil and other matter removed from the water body. A great deal of dredging occurs in Maryland's waters, producing a significant amount of dredge materials. Historically, dredge materials have been considered, and stored as, waste. Alternatively, dredge materials can be used to restore wetlands and to shore up eroded coastline. In order to beneficially use dredge materials in this way, they must be uncontaminated and have the right consistency. Additionally, transportation of dredge materials to restoration sites must be feasible.

Data:
The Chesapeake & Coastal Service of MD DNR provided data on the percent of dredged material that was beneficially used by state-funded projects in 2018–2020. State funding for dredge projects is provided by the MDNR Center for Waterway Improvement & Infrastructure. Although the U.S. Army Corps of Engineers (USACE) conducts much of the dredging and beneficial use of dredge materials in Maryland, data on these efforts were not available for analysis. These data, if accessible, may be used in future report cards.

Threshold and Scoring
Because beneficial use of materials is limited by the type of sediment and location of possible projects, it cannot be expected that an increased amount of material will be put to beneficial use each year.

Through consultation with stakeholders including resource and conservation scientists, the threshold for beneficial use of dredged material was set as the amount used, on average, over previous years. This indicator was scored linearly. The maximum possible score of 100% is achieved if the amount of dredged material beneficially used in a given year exceeds the average amount used in the previous two years. A score of 0% is achieved if no dredged material is beneficially used. Scoring of this indicator can be revised as more data become available, which may enable a threshold time period of >2 years.

Amount of Material Used	Score (%)
≥ average amount used over previous 2 years	100
Any amount between	scaled from 0 to 100
None	0

Current Score:
Because the amount of dredged material used beneficially in 2020 exceeded the average amount used beneficially in 2018 and 2019 by 29%, beneficial use of dredge material scored 100%.

Forest

Background:
In addition to storing carbon, forests offer ecosystem functions that protect against coastal change. Trees buffer against storms, provide natural flood management, and reduce erosion. Tree canopy helps maintain microclimates.

In Maryland, land within 1,000 feet of tidal waters and wetlands is considered Critical Area because it "has direct and immediate effects on the health of the Bay."[2] Special focus is placed on 1) reducing development, 2) protecting and monitoring natural habitats, and 3) preserving forest canopy in the Critical Area. A minimum buffer of 100 feet of naturally vegetated land is protected under the Critical Area Law, as are wetlands and habitats of listed species.

Because the Critical Area is so important in terms of Bay health and forest ecosystem services, the Forest indicator focuses on tree canopy in this area. Green infrastructure areas were considered for inclusion in this indicator, but green infrastructure planning was included in the planning category. In future iterations of this work, as the planning category is modified to assess plan implementation, tree canopy in green infrastructure areas may be considered as a separate indicator.

Data:
Data from the National Land Cover Database and the Chesapeake Conservancy were considered for use. For scoring, Chesapeake Conservancy data were used due to a higher user accuracy than NLCD data. Statistics provided by Maryland Forest Service and the U.S. Forest Service identified general trends from 2012/2013 to 2017/2018, described below. These trends were not used for scoring, but illustrate the nuances of assessing forestry data. A slight decrease (0.07%) in forest canopy was seen across all of Maryland's coastal area over the time period. During the same time period, forest basal area increased 2.1% across Maryland's coastal counties (as reported by U.S. Forest Service), indicating that Maryland's coastal forests are healthy despite observed canopy loss. When using statewide data, changes <2% may be attributed to sampling error and should not be relied upon for scoring.

Maryland Forest Service staff analyzed changes in Critical Area tree canopy across and within each of Maryland's coastal counties between 2012/2013 and 2017/2018.

Threshold and Scoring
Because of the importance of tree canopy cover in the Critical Area, the threshold was set as maintaining tree canopy or increasing tree canopy (for a score of 100%). Coastal counties that maintained or increased tree canopy in the Critical Area received a score of 100%. Those that saw reductions in canopy scored 0%. County scores were averaged together.

Tree Canopy Loss	Score (%)
No loss	100
Any loss	0

Current Score:
This indicator receives a score of 69% in the current report card, indicating that efforts to preserve forest cover in Critical Areas are meeting goals. As noted by a regional forester, "It is important to keep in mind that efforts to mitigate tree canopy loss with new plantings are constant, and…may take at least a decade for new trees to appear [in the data]."

Shoreline erosion

Background:
Shoreline erosion was identified by stakeholders as a threat to human safety, property, and natural resources. Erosion is noted as a threat in county-level reports and hazard mitigation plans.[3, 4] It was assessed as a Coastal Hazard in the 2016 Maryland Hazard Mitigation Plan[5] and was the subject of a consequence analysis. A document providing erosion control guidelines for property owners was produced by the Maryland Department of the Environment in 2008.[6]

Practices for shoreline stabilization vary in efficacy and environmental impact. NOAA recommends living shorelines as barriers to erosion in sheltered coastal areas; living shorelines are more resilient and less impacted by coastal change than hardened shorelines.[7]

This indicator was initially meant to quantify shoreline protection against increased erosion from coastal change. The proposed indicator was intended to quantify the percent of Maryland's shoreline (in feet, meters, or miles) that is protected, or classified as "living." Since living shoreline data were unavailable, erosion rates by distance were used as a proxy.

Data:
Data on erosion rates by mile (from 2011) were obtained from The Maryland Department of Natural Resources Living Shorelines Project.[8] These data provide the distance of Maryland's shoreline within 4 erosion rate categories (see table below).

Threshold and Scoring
To score erosion rate, each erosion rate category was assigned a score from 0–100 (table below). The number of miles eroding at each rate was multiplied by the corresponding score, then averaged.

Erosion Rate	Score (%)
None	100
Slight (0 to -2 feet/year)	75
Low (-2 to -4 feet/year)	50
Moderate (-4 to -8 feet/year)	25
High (> -8 feet/year)	0

Current Score:
This indicator receives a score of 79% in the current report card.

Flooding indicators

Critical facilities
Floodplain population
Community rating system
Freeboard height

Each of the four indicators in this category was scored independently as described below. The overall flooding score, calculated by averaging together the four indicator scores, is 59%.

Critical facilities

Background:
Critical facilities, as defined by the Federal Emergency Management Agency (FEMA), are structures and institutions for which "even a slight chance of flooding is too great a threat."[9] The State of Maryland identifies critical facilities as those that "must continue to operate before, during, and after an emergency and/or hazard event and/or are vital to health and safety."[10] Maryland designates fire and police stations, hospitals and medical facilities, emergency operations centers, and schools as critical facilities.[10] Some counties may assign critical facility status to other types of structures.

Areas with especially high risk of flooding are designated by FEMA as Special Flood Hazard Areas (SFHA).[10] In these areas, the purchase of flood insurance is mandatory.[11] There are multiple SFHA designations; these are defined in the table below (from the Maryland Hazard Mitigation Plan).[10]

Special Flood Hazard Area Designations	
Flood Zone	**Definition**
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones.
AE	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
VE	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.

Data:
County-level data on the number of critical facilities in Special Flood Hazard Areas were obtained from the Maryland Hazard Mitigation Plan.[11]

Threshold and Scoring
Because FEMA indicates that "a critical facility should not be located in a floodplain if at all possible," the threshold for a perfect score was set as 0 critical facilities in a SFHA. Each county was scored individually, with a score of 100% being assigned to counties with no critical facilities in a SFHA and a score of 0% assigned to counties with any critical facilities in a SFHA.

County scores were then weighted by the proportion of statewide critical facilities within each county. Weighted scores were summed to an overall score.

# of Critical Facilities in SFHA	Score (%)
0	100
≥1	0

Current Score:
The critical facility indicator score is 10%. Of counties with failing scores, 70% have two or fewer critical facilities in SFHAs. This indicator score can be improved by relocating critical facilities to lower-risk areas.

Future iterations of this work may consider using the current data as a baseline. Additionally, future updates should consider scoring based on the change in the number of critical facilities in the SFHA per county.

Floodplain population

Background:
Floodplain populations face property damage, injury, and loss of life during flooding events. The higher the floodplain population, the more people are at risk. One method of adapting to flood risks, which are exacerbated by climate change, is to reduce the population living in floodplains. This can be achieved in many ways, including voluntary relocation and buyouts. Buyouts are controversial; many communities and individuals resist buyouts, but they are becoming more accepted. Buyouts are also an adaptation privilege. Communities and individuals seeking buyouts may be denied because they do not meet buyout program requirements, while others may feel pressured to accept buyouts for purely financial reasons.[12] Despite the controversy, relocation is an often-discussed strategy in helping communities adapt to climate change and sea level rise-induced flooding.

Because there are many reasons and avenues for relocation, we track floodplain population change rather than the reason for relocation. Data may reflect relocations due to non-flood-related factors, but movement of people or communities from a floodplain, regardless of the reason, reduces risk.

Data:
For scoring of this indicator, "floodplain" refers to the FEMA floodplain. The most recently available data on the population of Maryland's coastal counties, including the population in the floodplain, were from the 2009–2013 American Community Survey[13] as reported in NOAA's Coastal County Snapshots tool.[14] Data for the percentage of Maryland's coastal county populations in the FEMA floodplain in 2000 were found in Maryland's Coastal Zone Enhancement Plan.[15]

Threshold and Scoring
Population change was scored using a goal of maintaining or reducing the percent of Maryland's coastal county population that lives in the floodplain.

The percentage of Maryland's coastal county population living within the FEMA floodplain was calculated for the most recent years of available data (2009–2013).[14] This percentage was compared to the proportion of coastal county population living in the floodplain in 2004. No change or a decrease in the proportion of population in the floodplain would represent a score of 100%.

Any increase in the proportion of the population living in the floodplain was scored as a 50% or lower on a linear scale, with a 0.00001% increase in floodplain population scoring a 50%, and doubling floodplain population scoring 0%.

Floodplain Population Change	Score (%)
No change/decrease	100
Increase	0

Current Score:
According to the 2009–2013 American Community Survey,[13] the percent of Maryland's coastal county population living in the floodplain is 6.08%, which is less than in 2000, when 6.5% of that population inhabited the floodplain. Therefore, the indicator score is 100%.

Community rating system

Background:
The Community Rating System (CRS) is a voluntary program that rates communities based on the coastal change adaptations they implement. The CRS grants flood insurance discounts to participating communities based on a tiered system that runs from a rate of 1 to 10, with 1 being the highest score. This indicator only considers communities that participate in the CRS and assesses their progress toward adaptation based on their rating.[16] Community ratings are based on adaptation actions. A summary table outlining prerequisites for each level, reproduced from section 211 of the CRS Coordinator's Manual,[17] is below.

Class 1 Prerequisites	To become a Class 1 community, a community must have had a successful Community Assistance Visit conducted by FEMA within the previous 12 months and demonstrate that it has a "no adverse impact" program by receiving a certain number of points for designated activities.
Class 4 Prerequisites	To become a Class 4 or better community, a community must demonstrate that it has programs that minimize flood losses, minimize increases in future flooding, protect natural floodplain functions, and protect people from the dangers of flooding.
Class 6 Prerequisites	To become a Class 6 or better community, a community must have received a classification of 5/5 or better under the Building Code Effectiveness Grading Schedule.
Class 9 Prerequisites	There are six prerequisites to become and stay a Class 9 or better community. They include being in full compliance with the minimum requirements of the National Flood Insurance Program (NFIP), receiving credit for maintaining FEMA Elevation Certificates, and meeting repetitive loss criteria.

Data:
Data on Maryland communities participating in the CRS and their ratings were available from FEMA's October 2020 Community Rating System Eligible Communities list.[17]

Threshold and Scoring
Only communities that participated in the CRS were included in the scoring for this indicator. Because CRS scores are based on a sequence of prerequisites that allow them to increase their rating, communities were scored in bins based on the prerequisites they have achieved. Applying and qualifying to participate in the system receive a score of 50%; scores above this are scaled up to 100%. This is illustrated in the table below.

CRS Class	Prerequisite Level Achieved	Report Card Score (%)
1	1	100
2, 3, 4	4	83
5, 6	6	67
7, 8, 9	9	50
10	10	0

Each participating community was scored. Scores were weighted by the proportion of the total population of participating CRS communities who live within that community. When communities within a county had a different CRS score than their county, communities were assessed individually from the county, and the weighting factor for the county was adjusted accordingly. Community scores, once weighted, were averaged for an overall score.

Current Score:
The current CRS score is 59%. As participating communities achieve required prerequisites, their scores will increase.

Freeboard height

Background:
Freeboard is the construction or raising of a structure above Base Flood Elevation (BFE). According to FEMA, freeboard "tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions".[18] The National Flood Insurance Program does not require freeboard, but does recommend a one-foot freeboard above BFE.[19] The Maryland Climate Action Plan recommends a minimum freeboard height of two feet above the 100-year BFE for all structures within tidal floodplains.[20] Specific minimum freeboard heights are recommended by the state government, with guidelines or policies implemented at the local level. Local jurisdictions may recommend or require freeboard at or above this level.

Data:
Freeboard recommendations and requirements for each county were found in County Hazard Mitigation Plans. In Maryland, freeboard ranges from zero to three feet. Additional data on freeboard recommendations or requirements were provided by The Maryland Department of the Environment Water and Science Program. Population data by municipality in 2010 were available from the U.S. Census Bureau.

Threshold and Scoring
Hazard mitigation officers and other stakeholders determined that a score of 100% should be assigned to communities that implement a stricter freeboard policy than the state recommendation of two feet. Counties with a freeboard meeting the state recommendation of two feet were scored as 75%, and those not meeting the state recommendation (with a freeboard height below two feet) scored 0%.

Each community for which freeboard was reported was scored. Scores were weighted by the proportion of coastal Maryland's total population living within that community. When communities within a county had a different freeboard score than their county, communities were assessed individually from the county, and the weighting factor for the county was reduced accordingly. Community scores, once weighted, were summed for an overall score.

Freeboard Height	Score (%)
> 2 feet	100
2 feet	75
< 2 feet	0

Current Score:
The current freeboard score is 65%. Reflected in this score is the fact that some communities have freeboard requirements below the state recommendation.

Planning indicators

Flood mapping
Green infrastructure plan
Nuisance flood plan

Each of the four indicators in this category was scored independently as described below. The overall ecosystem score was attained by averaging together the four indicator scores. The overall planning score is 66%.

Flood mapping

Background:
Climate change is contributing to an increase in flooding impacts in coastal counties, and these are expected to worsen in the future. Comprehensive, downscalable, publicly available, and easy-to-use data, maps, and visualizations for all types of flooding are essential to effectively plan for and adapt to flooding events now and into the future. There are mapping products available in Maryland, including but not limited to both regulatory and non-regulatory: FEMA flood maps, the Coast Smart Climate Ready Action Boundary, the Maryland State Highway Administration Climate Change Vulnerability Viewer, and local maps developed to visualize flood risk. These map products provide Maryland with a greater understanding of where flooding may occur; however, there is a need to continue to expand and enhance flood risk visualizations that prepare coastal communities for current and future impacts. As these visualizations are developed, technical assistance on how to apply, utilize, and interpret them at both a state and local level will be needed.

Current and future flood maps are an important part of the state's climate adaptation portfolio. Legislation passed in 2015 requires science-based sea level rise projections that include maps indicating the areas of the state that may be most affected by storm surges, flooding, and extreme weather events. It is also required that these projections shall be made publicly available online. Progress has been made towards these mandated requirements; however, more work is needed.

As identified in the 2015 legislation, the University of Maryland Center for Environmental Science (UMCES) in collaboration with the Scientific Technical Workgroup and Adaptation and Resiliency Workgroup of the Maryland Commission on Climate Change will map flooding risk in Maryland and make all results and products publicly available and accessible. This should be done in conjunction with the next sea level rise projection update, which will be completed in 2023.

Data:
A committee of flood experts and stakeholders, including members of the Maryland Department of Planning, Chesapeake and Coastal Services, and the Maryland Department of the Environment, used their knowledge of planning progress to assess this indicator.

Threshold and Scoring
Thresholds for score ranges, shown in the table below, were determined by the stakeholder committee previously described.

Score Range (%)	Threshold Requirements
80–100	1) Mapping products that show sea level rise, storm surge, nuisance flooding, and other flood risks through an integrated platform 2) Comprehensive technical assistance must be offered to all jurisdictions to support interpretation of these products
60–80	1) Mapping products that show stormwater overflow risk 2) Revised relative sea level rise projections
40–60	1) FEMA floodplain (100-year and 500-year) 2) Flood risk conveyed beyond the floodplain 3) SLR projections through 2150 4) Current and projected tidal nuisance flooding 5) Storm surge maps

Current Score:
The score is 55%. Justification for this score indicating how each required milestone for the 40–60% score range has been met is shown in the table below.

Threshold Requirements (40–60% score)	Product or product date
1) FEMA floodplain (100-year and 500-year)	100-year and some 500-year maps are available
2) Flood risk conveyed beyond the floodplain	CS-CRAB (Coast Smart Climate Ready Action Boundary)
3) SLR projections through 2150	Completed in 2018
4) Current and projected tidal nuisance flooding	Climate Change Vulnerability Viewer
5) Storm surge maps	MD Coastal Atlas

Green infrastructure plan

Background:
Green infrastructure plans, developed at the local level, help municipalities identify and plan implementation of adaptation actions to reduce climate change effects such as flooding, erosion, and urban heat.[21] Adaptations may include installing rain gardens and green roofs, increasing green space, and installing pervious concrete to allow absorption of excess stormwater. This indicator is scored based on the availability of green infrastructure plans in Maryland's coastal counties.

Data:
Data on whether coastal counties in Maryland have green infrastructure plans were collected by searching county websites and interviewing county planners and hazard mitigation officers.

Threshold and Scoring
The goal or threshold for this indicator is that all counties have a green infrastructure plan or include green infrastructure in other county plans such as hazard mitigation plans.

Each coastal county that has a green infrastructure plan was assigned a score of 100%, and each county that did not have one scored a 0%. Scores were then averaged for an overall score.

Green Infrastructure Plan Status	Score (%)
Available	100
Unavailable	0

Current Score:
The current green infrastructure score is 71%. In the future, this indicator may be replaced with one that assesses whether actions identified in green infrastructure plans are being implemented, or one based on progress toward meeting goals identified in these plans.

Nuisance flood plan

Background:
Nuisance flood plans are required for Maryland jurisdictions that experience high-tide flooding, sea level rise inundation, and coastal flooding. These plans are developed at the local level in accordance with state-level legislation (House Bill 1427).[22] This indicator is scored based on how many communities that are required to complete a nuisance flood plan have done so.

Data:
The Chesapeake & Coastal Service of the Maryland Department of Natural Resources provided data on what counties and municipalities 1) experience tidal flooding, 2) are required to submit a nuisance flood plan, 3) and have completed and submitted these plans.

Threshold and Scoring
The goal or threshold for this indicator is that all counties that experience tidal flooding and that are required to develop a nuisance flood plan do so.

The initial June 19, 2020 deadline for submission of a nuisance flood plan was extended (due to COVID) beyond the time of report card development.[23] However, the purpose of this report card is to assess how close the state is to achieving adaptation goals. Therefore, scoring was based on whether each county required to submit a nuisance flood plan had done so at the time of report card development in 2020.

Each county that submitted a nuisance flood plan when required to do so was assigned a score of 100%, counties that reported being in the process of submitting a plan scored 50%, and each county that had not yet submitted a plan (but was required to) was assigned a score of 0. County scores were then averaged for an overall score.

Nuisance flood plan status	Score (%)
Submitted	100
In process	50
Not submitted or in process	0

Current Score:
The current score is 71%. This score will improve as counties in the process of developing plans complete them.

Socioeconomic indicators

Business disruption
Preserved farmland
Loss coverage
Repetitive loss properties

Each of the four indicators in this category was scored independently as described below. The overall socioeconomic score was attained by averaging together the four indicator scores. The socioeconomic score is 53%.

Business disruption

Background:
Business disruption is a financially expensive result of coastal change events. Storms and floods, increasing with climate change, threaten short- and long-term business closures that may impact whole economies. The Congressional Budget Office calls a loss of 5% of annual income "substantial."[24] This indicator considers whether the expected business disruption cost from a climate change event exceeds 5%.

Data:
Data on estimated loss due to business disruption in case of a 100-year flood were available in FEMA Flood Risk Reports for each county. Data on total county income were available from county-level Demographic and Socio-Economic Outlook Documents provided by the Maryland State Data Center.

Threshold and Scoring
Because the Congressional Budget Office calls a loss of 5% of annual income "substantial," a 5% loss was set as a failing or 0% score for this indicator. Because stakeholders indicated that any loss caused by business disruption could be extremely damaging, a score of 50% was assigned to counties with loss estimates of 0.01% or higher. Loss estimates between 0.01% and 5% were scaled for scores of 50% and 0% respectively. Counties with loss estimates less than 0.01% scored 100%. Each county was scored, and county scores were weighted by proportion of Maryland's coastal population, then summed for an overall score.

Loss estimate	Score (%)
<0.01%	100
0.01%	50
0.01–5%	scaled from 50 to 0
≥5%	0

Current Score:
The current score is 44%.

Preserved farmland

Background:
Preserved farmland evaluates the amount of farmland that has been protected through conservation easements or other avenues. Such protection can reduce climate threats and safeguard farmland against development, bolstering the future of farming. Maryland has an official goal of preserving 1,030,000 acres by 2022. Programs working toward this goal include The Maryland Agricultural Land Preservation Foundation (MALPF), the Rural Legacy Program, and local programs. This indicator score is based on what percent of the goal has already been met through these programs.

Data:
Data were obtained from the Maryland Protected Lands Dashboard.

Threshold and Scoring
Maryland's official goal of preserving 1,030,000 acres of farmland was set as the threshold for this indicator. The amount of farmland preserved by local programs, MALPF, and the Rural Legacy Program were summed. This value was used to calculate progress (as percentage of the way) toward the threshold goal of 1,030,000 acres.

Acres Preserved	Score (%)
1,030,000	100
0–1,030,000	Scaled from 0–100
0	0

Current Score:
The current score is 78%.

Loss coverage

Background:
Loss coverage evaluates how much of estimated future flood damage would be covered by current insurance policies. Flood insurance is only required in FEMA-identified flood risk areas, but floods in the near future are predicted to impact properties beyond these areas.

Flood insurance is available for properties not in the FEMA floodplain, but because it is not required, these areas may be un- or under-insured. This indicator considers how much of the property that is expected to be impacted in a 100-year flood is covered by existing flood insurance policies.

Data:
Data were collected from two sources. The estimated value of properties that would experience insurable damage in a 100-year flood was found in FEMA Flood Risk Reports for each county. The Maryland Department of Emergency Management provided county-level information on flood insurance coverage.

Threshold and Scoring
Many insurance policies, including flood insurance policies, have an 80% rule. This requires property owners to purchase insurance coverage equivalent to 80% of the home's value in order to have the full amount of damage covered in case of an insurance claim. Therefore, the threshold for this indicator was set at 80%. Because data on individual policies are not publicly available, scoring was applied at the county level. If 80% or more of the estimated property value in a county was covered by reported insurance policies, that county scored 100%. Counties that did not meet this threshold scored 0%. Scores were weighted by county population as reported in FEMA Flood Risk Reports, and summed for an overall score.

% of Property Value Insured	Score (%)
≥80	100
<80	0

Current Score:
The current score is 78%. Some counties or communities may be under-insured.

Repetitive loss properties

Background:
Repetitive loss properties are properties that have had two or more National Flood Insurance Program claims over $1,000 within 10 years. These properties may be adapted to better withstand threats of climate change by, for example, elevating them. This indicator assesses the proportion of repetitive loss properties with such adaptations implemented.

Data:
Data detailing the repetitive loss properties and their status (whether mitigated or not) were provided by the Maryland Department of Emergency Management.

Threshold and Scoring
Because repetitive loss properties are likely to continue experiencing repeated flood damage as coastal change leads to increasing frequent and severe flooding, the threshold for this indicator is that all repetitive loss properties should be mitigated in some way.

Each repetitive loss property was scored, with mitigated properties receiving a score of 100% and unmitigated properties receiving a score of 0%. County scores were calculated by averaging the overall property scores within each county. County scores were weighted by proportion of the coastal county population in each county, then summed for an overall score.

Repetitive Loss Property Status	Score (%)
Mitigated	100
Unmitigated	0

Current Score:
The overall score is 11%. Most repetitive loss properties remain unmitigated. Although programs exist to help property owners mitigate their properties, funding is not necessarily readily accessible to all property owners. The fact that county scores range from 0 to 41% indicates that this or some other factor strongly influences the ability of residents in different counties to mitigate their properties.

References

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