Harvard Dataverse archival submission form

Dataset Information:

Title: NCCOS Assessment: A Community Risk Assessment of Flooding and Heat Hazards in Baltimore, MD, 2023-06-01 to 2025-09-30

Alternative URL:
https://coastalscience.noaa.gov/project/assessing-community-risk-in-relation-to-flood-hazards-in-the-baltimore-maryland-metro-area/

Primary Point of Contact:

- Amy Freitag, amy.freitag@noaa.gov, NOAA; NOS; NCCOS
- NCCOS Data Manager, nccos.data@noaa.gov, NOAA; NOS; NCCOS

Dataset Authors:
Amy Freitag[1], Katherine Auerswald[2], Bria Pope[3], Seann Regan[2], Taryn Sudol[4]

[1] NOAA National Ocean Service, National Centers for Coastal Ocean Science
[2] CSS, Inc. Under contract to NOAA National Ocean Service, National Centers for Coastal Ocean Science
[3]Florida Agricultural and Mechanical University, NOAA Center for Coastal and Marine Ecosystems
[4]Maryland Sea Grant

Description:

Coastal communities are exposed to numerous climate-related hazards, all of which are projected to increase in intensity and frequency in the coming decades. The way these hazards are experienced depends on a variety of factors that make coping with and recovering from natural hazards more difficult for some communities than others. Maryland faces growing pressure from water hazards, including storm surge, sea level rise, and stormwater. With its extensive coastline, the Chesapeake Bay makes managing floodwaters a key priority moving forward. The varied and dense populations on the Western Shore mean that the intersection of multiple vulnerabilities and climate hazards presents a high risk of cascading and compounding hazard events.

This dataset includes census block group level component scores of various indices from the National Centers for Coastal Ocean Science (NCCOS) Community Risk Assessment of Flooding and Heat Hazards in Baltimore, MD. Indices included in this archived dataset include SoVI®, ecosystem services valuation, structural exposure, urban heat hazard, and flood hazard. Each component score is aggregated to the block group level geography provided by the U.S. Census Bureau. Additionally, intermediary raster-based datasets on stormwater flooding hazard are provided, as well as spatial data on wetlands and protected areas.

Methods:

This assessment uses a geospatial, indicator-driven approach to integrate data from a variety of sources related to community risk in Baltimore, MD and the surrounding 5 counties of Baltimore, Harford, Howard, Anne Arundel, and Queen Anne's. SoVI® was derived from Census data and applied to each

block group. Stormwater flooding potential was calculated using an application of the "FIGUSED" methodology based on locally relevant datasets. This methodology incorporates seven indicators frequently used to identify areas of high flooding potential. These indicators are: "F" – flow accumulation, "I"– rainfall intensity, "G" – geology (hydrologic soil groups), "U" –land use, "S" – slope, "E" – elevation, and "D" – distance from the drainage network. For each of these indicators, a value of 1 corresponds to higher flood potential, while values closer to zero (or null) correspond to lower flood potential. The final raster dataset ranges from 0-7, and all data were resampled to a 30 meter resolution grid and also applied to each block group. A structural exposure index was calculated by aggregating each contributing indicator to the block group. An ecosystem service value index was created by averaging a total ecosystem service valuation model across each block group. Sea level rise projections and storm surge estimates from the National Oceanic Atmospheric Administration were calculated at the block group level. An urban heat index was derived using a combination of sensor data from Johns Hopkins University (for Baltimore City) and remotely sensed data, in conjunction with land use/land cover data, for suburban and rural areas. Both raster and block group aggregations are available. Additionally, data on wetland extent and protected areas are included in the archival package.

For full dataset methods please see the NOAA Technical Memorandum NOS NCCOS *report forthcoming*

Keywords:
Sea Areas, Water Bodies, Marine Protected Areas:

- Atlantic Ocean, Chesapeake Bay

NOAA Ships, Other Ships, Platforms:

- n/a

NCCOS Keywords:

- Social Science
- Assessing Vulnerability and Resilience
- Atlantic
- Geospatial
- Maryland
- Baltimore

Related publication: Freitag, A.F., Auerswald, K.A., Pope, B., Regan, S.D., Sudol, T. (2024) NCCOS Assessment: A Community Risk Assessment of Flooding and Heat Hazards in Baltimore, MD, 2023-01-01 to 2025-09-30 NOAA Technical Memorandum NOS *report forthcoming*.

Contributors:

- Fredrika Moser and Erin Crowley-Champoux, Maryland Sea Grant (Project Member)
- Sasha Land, Nicole Carlozo, Elliott Campbell, and George Edmonds, Maryland Department of Natural Resources (Project Member)
- Julie Reichert-Nguyen and Jamileh Soueidan, Chesapeake Bay Program Resilience Working Group (Research Group)
- Claire Cambardella, Amanda Rockler, and Nancy Fonti, Baltimore Urban Waters Partnership (Research Group)
- Elizabeth Andrews, William & Mary Law School (Related Person)

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- U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, National Centers for Coastal Ocean Science
    - Identifier: https://ror.org/05ba43f71

Date of Collection:
Start Date: 2023-06-01

End Date: 2025-03-01

Geospatial Metadata
Geographic Coverage: Baltimore, MD
Counties of Baltimore, Harford, Howard, Anne Arundel, and Queen Anne's, MD

Geographic Unit: Census Block Group, 30 x 30 meter raster grid

Geographic Bounding Box:
Northern Boundary: 39.723687
Southern Boundary: 38.706644
Western Boundary: -77.188030
Eastern Boundary: -75.737639

Data Sources:

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File Information

Total File Size: 1.94GB, 311 files, 1 folders; 671MB zipped

Data File Format(s):

- ESRI GRID
- Comma-separated value (.CSV)
- ShapeFile .SHP (and ancillary files .CPG, .DBF, .PRJ, .SBN, .SBX, .SHX)
- Geodatabase .gdb

Data File Compression: winzip
Data File Resolution: Census Block Group level, 30x30m raster grid
GIS Projection: NAD 1983/ NAD 1983 StatePlane Maryland FIPS 1900 (US Feet)

Data Files:

- Archived_Data_Files_RA2_MD.zip

Documentation Files:
- RA2_MD_Data_Dictionary_Archived_Data.csv
- RA2_MD_Data_Dictionary_Archived_Raster_Data.csv
- RA2_MD_Archive_Package_March_2025.pdf

Data Type(s)
- Community Risk

Parameter Description:

Parameters: Community Risk
Property Type: calculated
Units: census block group
Observation Category: modeled data
Sampling Instrument: secondary data analysis
Software name and version: ArcGIS Pro 3.4.0, SPSS
Sampling and Analyzing Method:

This project involved secondary data analysis, for full dataset methods please see the NOAA Technical Memorandum NOS NCCOS *report forthcoming*.

Documentation and Access to Sources:

This data documentation describes data files archived as a NOAA data accession, and is intended to provide dataset-level metadata for the purposes of discovery, use, and understanding. NOAA makes no warranty, expressed or implied, regarding these data, nor does the fact of distribution constitute such a warranty. NOAA cannot assume liability for any damages caused by any errors or omissions in these data. These data were produced by NOAA and are not subject to copyright protection in the United States. NOAA waives any potential copyright and related rights in this data worldwide through the Creative Commons Zero 1.0 Universal Public Domain Dedication (CC0 1.0).

Table 1: RA2_MD_Data_Dictionary_Archived_Data.csv

Column	Variable	Field Name	Definition	Units	Range
1	OBJECTID	OBJECTID	Object ID	n/a	Object ID
2	Shape	Shape	Geometry	n/a	Geometry
3	STATEFP	STATEFP	State	n/a	text
4	GEOID	GEOID	Geographic Identifier (U.S. Census)	n/a	text

5	Ecosystem services aggregated index	Ecosystem_Services_Index	Ecosystem services valuation aggregated index derived from the total ecosystem services valuation layer of the Maryland Department of Natural Resources. These include: a) atmospheric pollution removal, b) carbon sequestration, c) groundwater recharge, d) nitrogen removal, e) flood prevention and stormwater mitigation, f) wildlife habitat and biodiversity, and g) surface water protection. The value is the mean for each block group, in dollars per year.	index score	0-700
6	Ecosystem services normalized index	Ecosystem_Services_Index_MIN_MAX	Ecosystem services valuation normalized index derived from the total ecosystem services valuation layer of the Maryland Department of Natural Resources. These include: a) atmospheric pollution removal, b) carbon sequestration, c) groundwater recharge, d) nitrogen removal, e) flood prevention and stormwater mitigation, f) wildlife habitat and biodiversity, and g) surface water protection. (normalized 0-1)	normalized index score	0-1
7	Structural exposure aggregated index	Structural_Index	Structural exposure aggregated index calculated from Department of Homeland Security's HIFLD, Maryland's iMap	index score	0-22

			geospatial database, and ESRI's business analyst data. The index includes the following: banks, bay access points, colleges, critical roadways, drinking water infrastructure, electricity production, emergency shelters, farms, fire stations, gas stations + electric vehicle charging, government facilities, grocery stores, hardware stores, hazardous waste facilities, hospitals, places of worship, police stations, public transit lines, schools, shoreline protection, stormwater infrastructure, and wastewater infrastructure.		
8	Structural exposure normalized index	Structural_Index_MIN_MAX	Structural exposure aggregated index. The index includes the following: banks, bay access points, colleges, critical roadways, drinking water infrastructure, electricity production, emergency shelters, farms, fire stations, gas stations + electric vehicle charging, government facilities, grocery stores, hardware stores, hazardous waste facilities, hospitals, places of worship, police stations, public transit lines, schools, shoreline protection, stormwater infrastructure, and wastewater	normalized index score	0-1

			infrastructure. (normalized 0-1)		
9	SoVI aggregated index	SoVI_Index	SoVI® aggregated index, generated by principal components analysis of 29 demographic variables per 2019 methodology: https://sc.edu/study/colleges_schools/artsandsciences/centers_and_institutes/hvri/data_and_resources/sovi/index.php.	index score	0-9.06
10	SoVI aggregated index, normalized	Social_Vulnerability_Index_MIN_MAX	SoVI® aggregated index, generated by principal components analysis of 29 demographic variables per 2019 methodology: https://sc.edu/study/colleges_schools/artsandsciences/centers_and_institutes/hvri/data_and_resources/sovi/index.php. (normalized 0-1)	normalized index score	0-1
11	Stormwater flooding aggregated index	Stormwater_Index	Mean value of stormwater flood potential raster based on the FIGUSED index that incorporates flow accumulation, precipitation, hydrologic soil groups, land use-landcover, slope, elevation, and drainage density). Index was aggregated to census geographies.	index score	0-7
12	Stormwater flooding aggregated index, normalized	Stormwater_Index_MIN_MAX	Mean value of stormwater flood potential raster based on the FIGUSED index that incorporates flow	normalized index score	0-1

			accumulation, precipitation, hydrologic soil groups, land use-landcover, slope, elevation, and drainage density). Index was aggregated to census geographies. (normalized 0-1)		
13	Sea level rise of 2ft aggregated index	SLR_2ft_Index	Total area covered (in square meters) in a 2ft of sea level rise scenario calculated from NOAA Office for Coastal Management data, 2024.	index score	0-14263554
14	Sea level rise of 2ft aggregated index, normalized	SLR_2ft_Index_MIN_MAX	Total area covered in a 2ft of SLR scenario calculated from NOAA Office for Coastal Management data, 2024. (normalized 0-1)	normalized index score	0-1
15	Sea level rise of 5ft aggregated index	SLR_5ft_Index	Total area covered (in square meters) in a 5ft of SLR scenario calculated from NOAA Office for Coastal Management data, 2024.	index score	0-15780485
16	Sea level rise of 5ft aggregated index, normalized	SLR_5ft_MIN_MAX	Total area covered in a 5ft of SLR scenario calculated from NOAA Office for Coastal Management data, 2024. (normalized 0-1)	normalized index score	0-1
17	Category 4 storm surge aggregated index	Cat4_Storm_Surge	Mean value of area covered in a Sea, Lake, and Overland Surge from Hurricanes (SLOSH) Model, Category 4.	index score	0-14

18	Category 4 storm surge aggregated index, normalized	Cat4_Storm_Surge_MIN_MAX	Mean value of area covered in a Sea, Lake, and Overland Surge from Hurricanes (SLOSH) Model, Category 4. (normalized 0-1)	normalized index score	0-1
19	Urban heat aggregated index	UHI	Mean value of predicted urban heat severity index for census block groups, indicating severity of heat on a scale of 1-5.	index score	1-5
20	Urban heat aggregated index, normalized	UHI_MIN_MAX	Mean value of predicted urban heat severity index for census block groups, indicating severity of heat on a scale of 1-5. (normalized 0-1)	normalized index score	0-1
21	Urban heat p.m. temperature including 90 degree threshold	UHI_Mean_PM_Temp	Average urban heat p.m. temperatures aggregated to census block groups.	score	82-93
22	Wetland Areas	Wetland_Percent_Covered	Percent of census block groups covered by wetland areas, including riverine, tidal, and terrine wetland extent.	index score	0-100
23	Protected Areas	Protected_Areas_Percent_Covered	Percent of census block groups covered by protected areas, defined as public land and voluntarily provided private protected areas from the Protected Areas Database of the United States.	index score	0-100
24	Shape length	Shape_Length	Shape length	meters	Geometry
25	Shape area	Shape_Area	Shape area	meters squared	Geometry

Table 2: RA2_MD_Data_Dictionary_Archived_Raster_Data.csv

Variable	Filename	Definition	Units	Range	Resolution
Stormwater flooding potential index raster	SW_index	Stormwater potential flooding index based on the FIGUSED methodology that incorporates flow accumulation, precipitation, hydrologic soil groups, land use-landcover, slope, elevation, and drainage density. Higher values indicate higher stormwater potential flooding.	Continuous raster	0-7	30m
Flow accumulation	FLOW_FIGUSED	Flow accumulation data derived from digital elevation model (DEM) used in calculation of overall stormwater flooding potential index. (normalized 0-1)	Continuous raster	0-1	30m
Precipitation	PRISM_FIGUSED	Global Gridded Standardized Precipitation Index (SPI) from PRISM climate group, annual precipitation 30 year normals used in calculation of stormwater flooding potential index. (normalized 0-1)	Continuous raster	0-1	30m

Geology (hydrologic soil groups))	GEO_FIGUSED	Hydrologic soil group raster, using soil data from the USDA National Resources Conservation Service Soil Survey. Soil hydrologic groups A and B (indicating well-drained soils) were assigned a value of 0, while areas falling into groups C, D, A/D, B/D, and C/D were given a value of 1, indicating a higher flood potential. This was an input in the final stormwater flooding potential index.	Categorical	0-1	30m
Land use	LULC_FIGUSED	Resampled 1 meter resolution data to 30 meter raster categorized into 2, 4, 6, 8, and 10 based on contribution to stormwater flooding potential index.	Categorical	1-10	30m
Slope	SLOPE_FIGUSED	Slope was derived from the input Digital Elevation Model (DEM) used in the calculation of stormwater flooding potential index. (normalized 0-1)	Continuous raster	0-1	30m
Elevation	DEM_FIGUSED	Digital Elevation Model (DEM) used in calculation of stormwater flooding potential index. (normalized 0-1)	Continuous raster	0-1	30m

Proximity to drainage networks	DRAINAGE_FIGUSED	Drainage network density grid created using flowline data from the National Hydrology Dataset. (normalized 0-1). This was an input to the final stormwater flooding potential index.	Continuous raster	0-1	30m
Urban Heat Index	URBAN_HEAT_INDEX	Urban heat index calculated from remotely sensed data from the Landsat 8 program. Data contains relative heat on a scale of 1 (mild) to 5 (severe).	Categorical raster	0-5	30m