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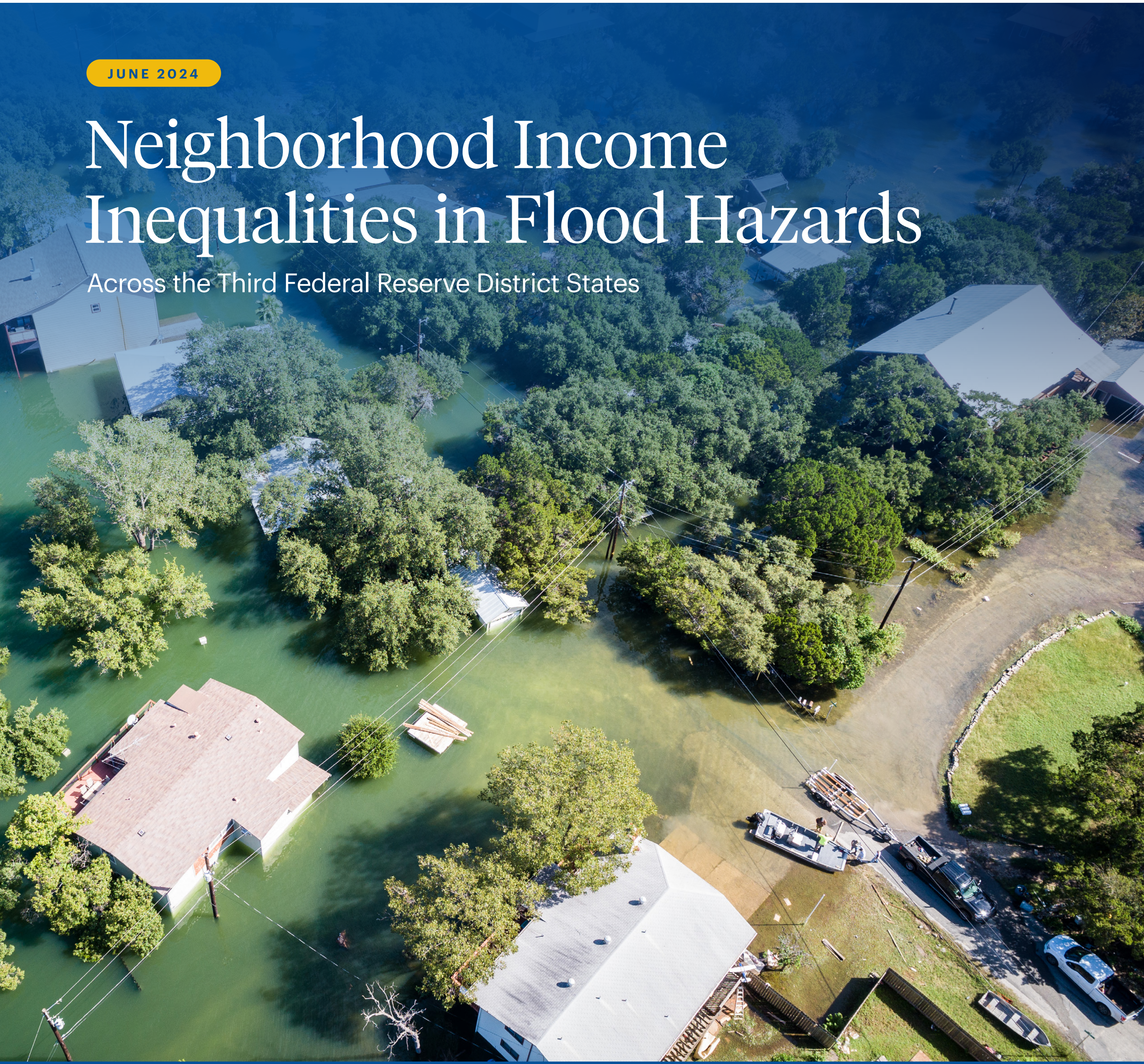
Neighborhood Income Inequalities in Flood Hazards

Across the Third Federal Reserve District States



COMMUNITY DEVELOPMENT AND REGIONAL OUTREACH

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* The views expressed here are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System. The authors thank Xudong An, Alaina Barca, Eileen Divringi, Mallick Hossain, Theresa Singleton, Keith Wardrip, and Sisi Zhang for their helpful feedback, and Anna Benoit for her research support.

Background

Flooding is the most common — and often the most damaging — natural disaster. Millions of homes in vulnerable communities in the U.S. face substantial, and likely rising, hazards from flooding, putting residents in those communities in danger of damaged or destroyed homes, residential displacement, and personal harm. These dangers may be especially acute for lower-income households and neighborhoods, which are more likely to be located in flood-prone regions,[1] generally have more limited access to resources and insurance, and often take longer to recover from natural disasters (Lee and Jung 2014, Wing et al. 2022).

It is thus important to understand how residents in lower-income communities would be affected by flood hazards, which should help inform policymakers and practitioners on how they can prioritize their target areas when developing disaster and climate-risk preparedness plans. This study provides a descriptive analysis of flood hazards in the Third Federal Reserve District states (Pennsylvania, New Jersey, and Delaware) that employs new flood data produced by the nonprofit First Street Foundation (FSF). It uses several hazard measures related to *current exposure* (the chances a flood will occur), *risk* (how serious will the flood be if it occurs), and *cumulative future exposure and risk* from flooding across neighborhoods distinguished by their income levels. This research is part of the Federal Reserve's ongoing work to promote economic growth and financial stability for low- and moderate-income (LMI) individuals and communities.

Specifically, we address these research questions:

1. Do properties in LMI neighborhoods in Third District states bear significantly higher exposure to flooding and/or risks from flooding than properties in middle- and upper-income (MUI) neighborhoods?
2. Which areas in the Third District bear a higher exposure to flooding and/or risks from flooding, now and in the future?

As an overview, we find that coastal areas near the Atlantic have a significantly higher (1) cumulative chance of flooding over a 30-year period (90.1 percent versus 36.6 percent), (2) current expected losses from flooding ($3,814 versus $838 per building), and (3) exposure and risks from future flooding (21.3 percent versus 7.0 percent of properties), compared with noncoastal areas. LMI neighborhoods in the Third District states face greater flood hazards, as measured by the three previous indicators, only in noncoastal areas; the relationship is the opposite for coastal areas. There are a few exceptions to these generalities in particular states, however.

Data

We rely on data from the First Street Foundation (FSF) Flood Model to determine differences in present flood exposure and risk in Third District states between LMI and MUI neighborhoods based on whether a neighborhood's median family income falls below or above the area median.[2] FSF provides nationwide property-level data on the risks of multiple climate perils in 2022 and 30 years into the future to help individuals better understand the potential outcomes of environmental change over time in a given area.[3]

For this analysis, we focus on flooding outcomes pertaining to the median output of FSF's flooding models. These results can be considered the middle-of-the-road estimates between the least and most pessimistic scenarios.[4] FSF's probabilistic model shows any property's hazards from all types of flooding combined: rain, rivers, tides, and storm surges. Table 1 shows the FSF indicators used in this analysis and how the indicators relate to each category of flooding outcome.

Our goal is to provide a comprehensive picture of flood hazards by using three indicators offering complementary, but distinct, perspectives on the phenomenon. Any flood is likely to impose serious human and financial costs, so the chance that one may face this is important to know.[5] We convert the *current* average annual chance of flooding values provided in the FSF data into

[1] Of course, not all areas with high susceptibility to floods are lower-income areas, as there are concentrations of high-income residents in areas with higher flooding risk but also high natural amenities (e.g., shorelines) (Qiang 2019).

[2] Low- and moderate-income derives from the definition in the Federal Financial Institutions Examination Council (FFIEC) 2022 Census File: Tracts where the median family income is less than 80 percent of the broader metropolitan statistical area/metropolitan division (MSA/MD) median income were identified as LMI, while tracts where the median family income is equal to or greater than 80 percent of the area median were identified as MUI. Properties in tracts without a FFIEC income classification were excluded from the analysis. FFIEC Census Flat File accessed at: www.ffiec.gov/censusapp.htm

[3] For details on FSF's methodology, see firststreet.org/methodology/flood/.

[4] More precisely, FSF's median output corresponds to the 50th percentile outcomes based on the 21 climate models FSF uses to calculate the values related to flooding hazards. The models use representative concentration pathway (RCP) 4.5 to derive these outcomes; they do not incorporate different RCPs.

[5] However, note that this and other FSF indicators do not distinguish between vacant and occupied buildings.

values that present the cumulative exposure of neighborhoods in Third District states over a 30-year period by income group.[6] Buildings are not of equal size, construction materials, and other physical characteristics, however, so the expected value of what may need to be repaired *currently* in the event of a flood is another distinct aspect of hazard. Finally, given the increasing frequency of major floods in the U.S., it is vital to measure the cumulative *future* exposure and risk from flooding predicted over the next three decades.[7] While estimates for these indicators are available for 2022 and 2052, this brief focuses on the 2022 values to underscore current flood hazards across the Third District states. Our sample from FSF contains nearly 9.6 million properties — both residential and nonresidential — in Pennsylvania, New Jersey, and Delaware.

Methodology

We analyze properties in coastal and noncoastal tracts separately.[8] For both coastal and noncoastal areas of each state in the Third District and in the Third District states overall, we compare the mean values of our indicators for properties located in LMI census tracts with those of properties located in MUI tracts. Our goal is to ascertain, for each geographic area, whether the means of each of our three indicators significantly differ depending on tract income category using a two-sided t-test[9], in which p-values ≤0.01 are deemed statistically significant.

TABLE 1 **Flooding Hazards and Corresponding Indicators Included in the Analysis**

Hazard Type	Indicator	Definition
Current Exposure	Cumulative Chance of Flooding over 30-Year Period Based on Current Annual Chance of Flooding	Probability of a building experiencing at least one flooding event of at least 5 centimeters from 2022 to 2052 based on the median output of FSF's climate models. This conversion only reflects a property's current exposure, as it assumes that the annual chance of flooding over the 30-year period remains the same. We select a 30-year interval because this interval reflects the likelihood of flooding over the timespan of the most popular mortgage term.
Current Risk	Annual Loss per Property	A building's expected repair costs (not structure value lost) due to flood damage in 2022 based on FSF's median modeling output. The annual loss value is missing in the data if there is no building present on the property or if the property falls outside of the modeled area.
Future Exposure and Risk	High-Risk Flood Factor Rating	A measure of a building's cumulative future flood exposure and risk combined. FSF determines a property's Flood Factor score based on its likelihood of flooding and its aggregated expected annualized depths in 2022 and 2052. Flood Factor scores range from 1 to 10, in which a score of 1 indicates minimal risk of flooding, while a score of 10 indicates extreme risk. We identify properties with a Flood Factor of 7 or higher as high-risk ones, which signals a severe or extreme hazard in FSF terminology, i.e., a building both more likely to flood and more likely to experience a deep flood during the next 30 years.

Sources
Climate Data via First Street Foundation.

6 To calculate the average probability of flooding over a 30-year time period (or cumulative exposure), we use the formula: $(1-(1-p)\ 30) \times 100\%$, where p is the probability of flooding in the current year (2022). See Table 1 for more information on this indicator.

7 Other studies on flood "impact" have examined how different communities have borne the costs of recovering from past floods. Such a perspective is beyond the scope of this brief.

8 We analyze properties in coastal and noncoastal tracts separately for two reasons. First, flooding outcomes can vary greatly depending on a census tract's proximity to the coast. Second, coastal areas possess attractive amenities associated with water proximity that may partially offset the flood hazards. We define a census tract as coastal if its boundary intersects the National Shoreline as outlined by the National Oceanic and Atmospheric Administration (NOAA). The shapefile used to determine tracts as either coastal or noncoastal can be found on NOAA's website: shoreline.noaa.gov/data/datasheets/medres.html.

9 We use a two-sided, two-proportion z-test in the case of the Flood Factor–based share of properties at high risk, since the values consist of proportion values.

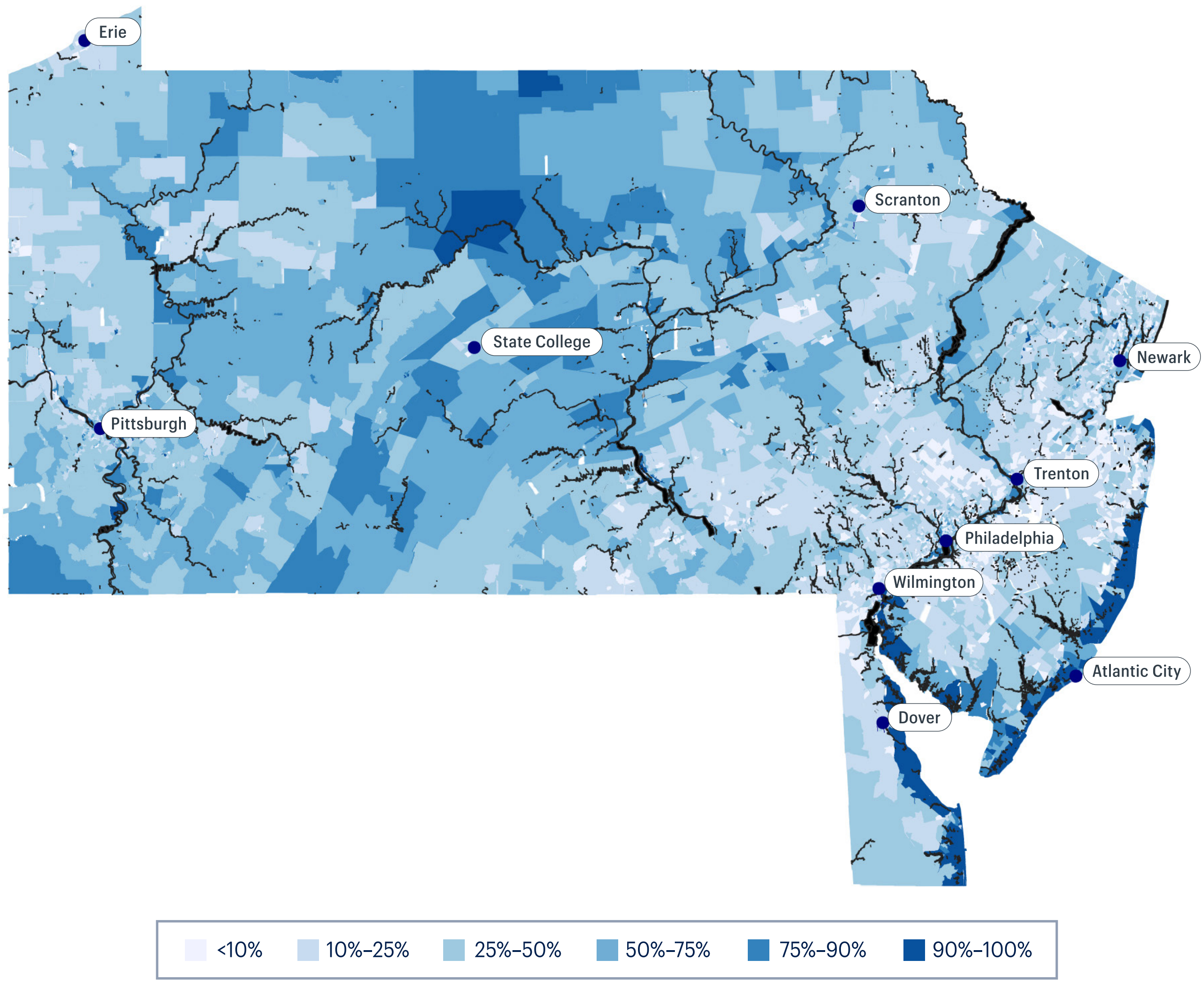
Results

CURRENT EXPOSURE TO FLOODING

The cumulative probability that properties in a Third District state's census tract will experience a flood over 30 years is mapped in **FIGURE 1**. It is immediately obvious from examining Figure 1 that the highest cumulative exposures by far — greater than 90 percent in some tracts — are concentrated along the Atlantic coast in New Jersey and Delaware. Substantial exposures are also present along Pennsylvania's inland river valleys.

How these exposures vary according to the income category of the census tract depends on whether one is considering coastal or noncoastal areas; see **FIGURE 2**. For coastal areas in the Third District states as a whole, properties in LMI tracts on average have much lower exposures than properties in MUI tracts. Properties in coastal MUI tracts, on average, have a 92.2 percent chance of experiencing a flood of at least 5 centimeters in Third District states over a 30-year period with the current level of exposure, while properties in coastal LMI tracts have a 78.9 percent chance of the same, on average. These large differences are driven mainly by properties in coastal tracts in New Jersey and Delaware. The relationship is reversed for noncoastal areas: Properties in LMI tracts have a cumulative exposure of 40.6 percent over a 30-year period, which is about five percentage points higher than the average chance of flooding over the same period in noncoastal MUI tracts.[10] These differences exist in both Pennsylvania and New Jersey, but they are reversed slightly in Delaware.

FIGURE 1 Geographic Pattern of Current Cumulative Chance of Flooding Across Third District States Over a 30-Year Time Period

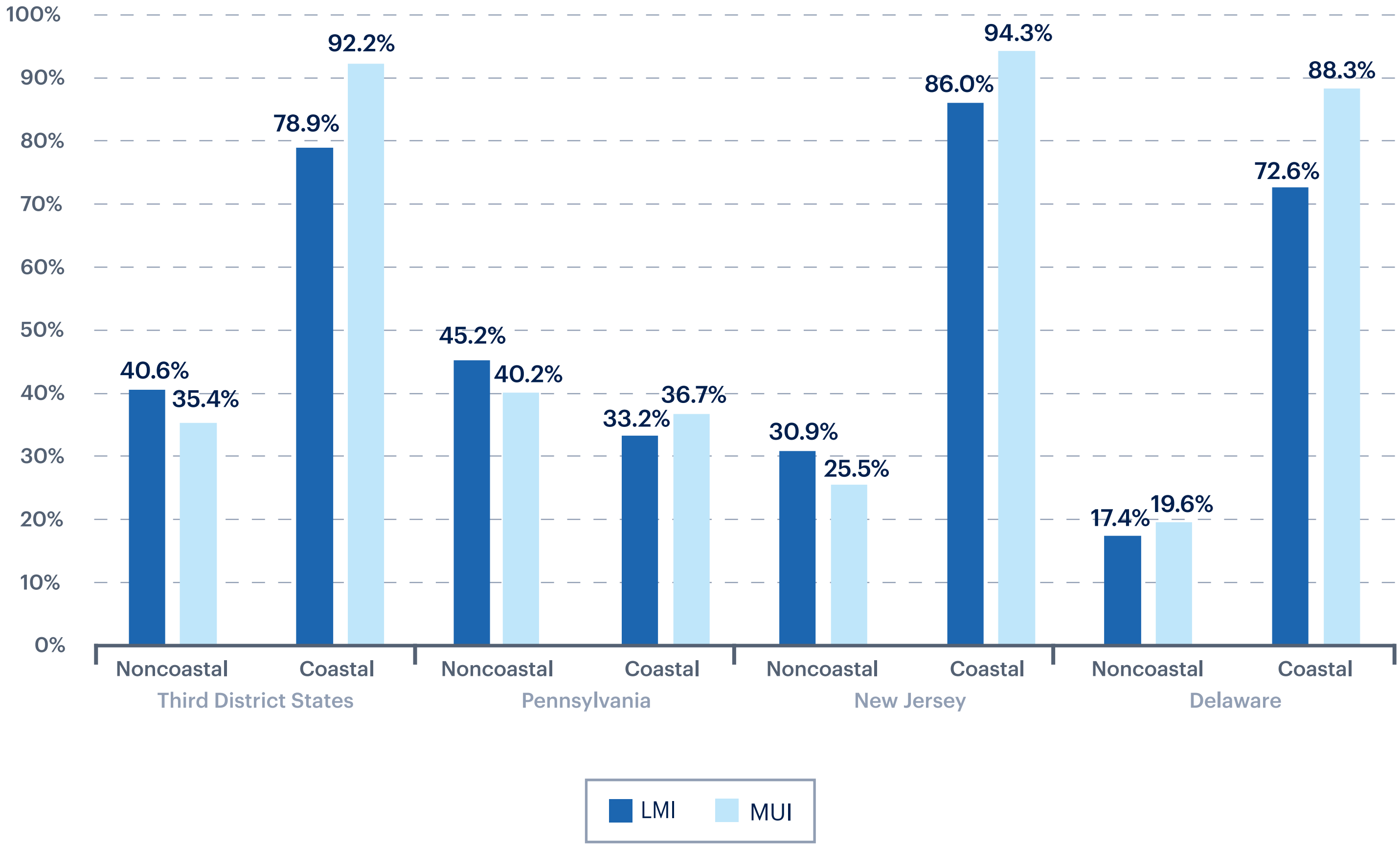


Sources
Calculation based on Climate Data via First Street Foundation.

[10] Although modest, this difference is statistically significant.

FIGURE 2

Current Cumulative Chance of Flooding Across Third District States Over a 30-Year Time Period, by Neighborhood LMI or MUI Status and by Coastal and Noncoastal Areas



Notes

All differences between the means of LMI tracts and the means of MUI tracts by state and coastal status shown above are statistically significant ($p \leq 0.01$) based on the results of a two-sided t-test. We conducted statistical testing on the average annual chance of flooding values before converting these values to the cumulative chance of flooding over a 30-year period.

Sources

Calculation based on Climate Data via First Street Foundation and the 2022 FFIEC Census Flat File.

OVER A 30-YEAR PERIOD, PROPERTIES IN THIRD DISTRICT STATES HAVE A...

40.6%
chance of experiencing flood in noncoastal LMI tracts

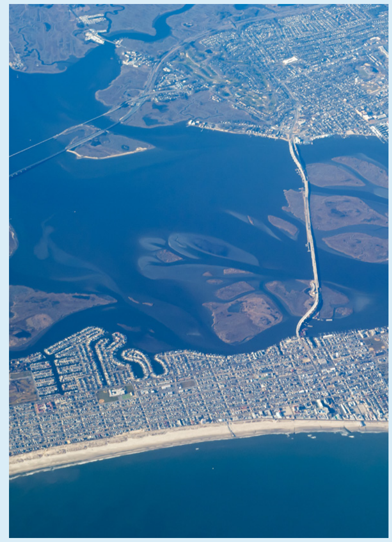
35.4%
chance of experiencing flood in noncoastal MUI tracts

92.2%
chance of experiencing flood in coastal MUI tracts

78.9%
chance of experiencing flood in coastal LMI tracts

CASE STUDY: OCEAN CITY, NJ

Compared with other metropolitan statistical areas (MSAs) in the Third District, the coastal MSA of Ocean City, NJ, has the highest cumulative chance of flooding, at 98.4 percent over a 30-year period, demonstrating that coastal areas bear the greatest flood exposure in the Third District. Almost 39 percent of total properties in the shore town are at high risk of flooding, according to FSF's Flood Factor measure (scoring 7 or higher). Unsurprisingly, Ocean City also has the highest average annual expected loss ($5,047) of any Third District MSA. As a vacation destination, properties in the area are more costly and face increased risk of flood damage because of the potential magnitude of flooding that may occur, resulting in higher annual expected losses in relation to inland MSAs. The total annual expected losses for all properties within the MSA is roughly $439.9 million. Ocean City has a relatively small share of properties located in LMI neighborhoods (6.9 percent); still, 30.8 percent of properties in LMI neighborhoods are considered high risk per FSF's Flood Factor score.



CASE STUDY: STATE COLLEGE, PA

The cumulative chance of flooding in State College is 49.8 percent over a 30-year period, and 10.9 percent of properties are at high risk of flooding. In State College's LMI neighborhoods alone, 13.4 percent of properties are at high risk of flooding, which is roughly 3 percentage points higher than the share of high-risk properties in the town's MUI neighborhoods. The average annual expected loss due to flood damage for properties in LMI neighborhoods is $377 more than it is for properties in MUI neighborhoods, although properties in LMI communities have a lower average assessment value in the area. Additionally, although 21 percent of properties in State College are located in LMI neighborhoods, these properties bear a slightly disproportionate share of the total annual expected loss for the MSA. Of State College's $53.8 million in total annual expected losses, about 24 percent ($13.0 million) of these costs would result from flood damage to properties in LMI neighborhoods.

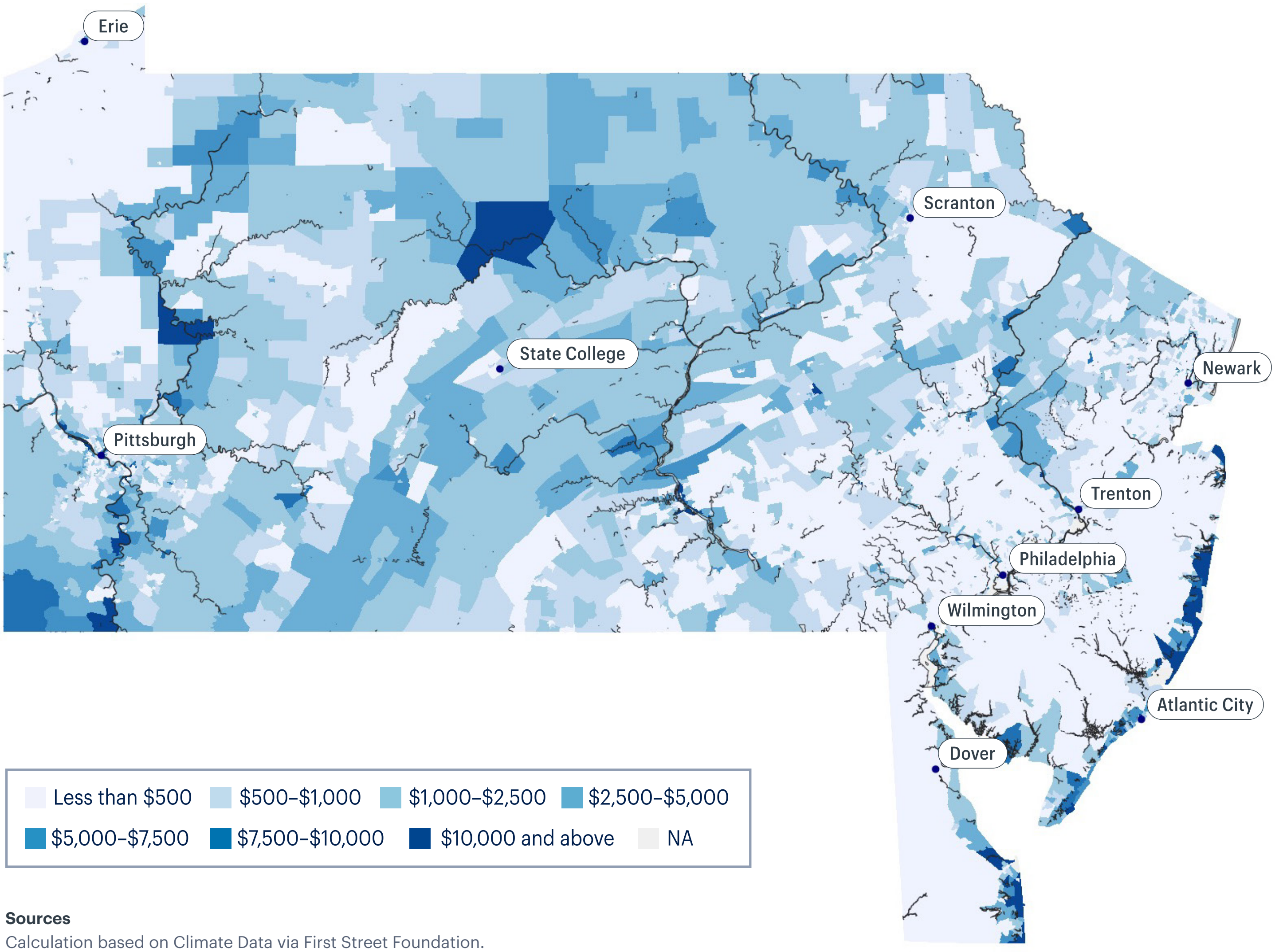
CURRENT RISKS FROM FLOODING

The geographic pattern of current expected loss per property due to flooding is displayed in **FIGURE 3**. Although roughly similar to the exposure map in Figure 1, the risks are more widely spread across coastal and inland areas. This is because the estimated risk is based on both the projected depth and likelihood of flooding and the assessed value of a property that will be damaged.[11] Although expected average annual losses of $10,000 or more

[11] FSF uses a depth-damage analysis adopted from the Federal Emergency Management Agency Hazus framework to determine the expected percentage of a structure damaged by flooding based on its full risk profile in a given year. This percentage is then multiplied by a property's assessment value and its improvement portion. More details on the construction of the average annual loss can be found on Risk Factor: help.riskfactor.com/hc/en-us/articles/6016946455831-Average-Annual-Loss-AAL-Data.

FIGURE 3

Geographic Pattern of Current Expected Annual Loss per Property Due to Flooding Across Third District States



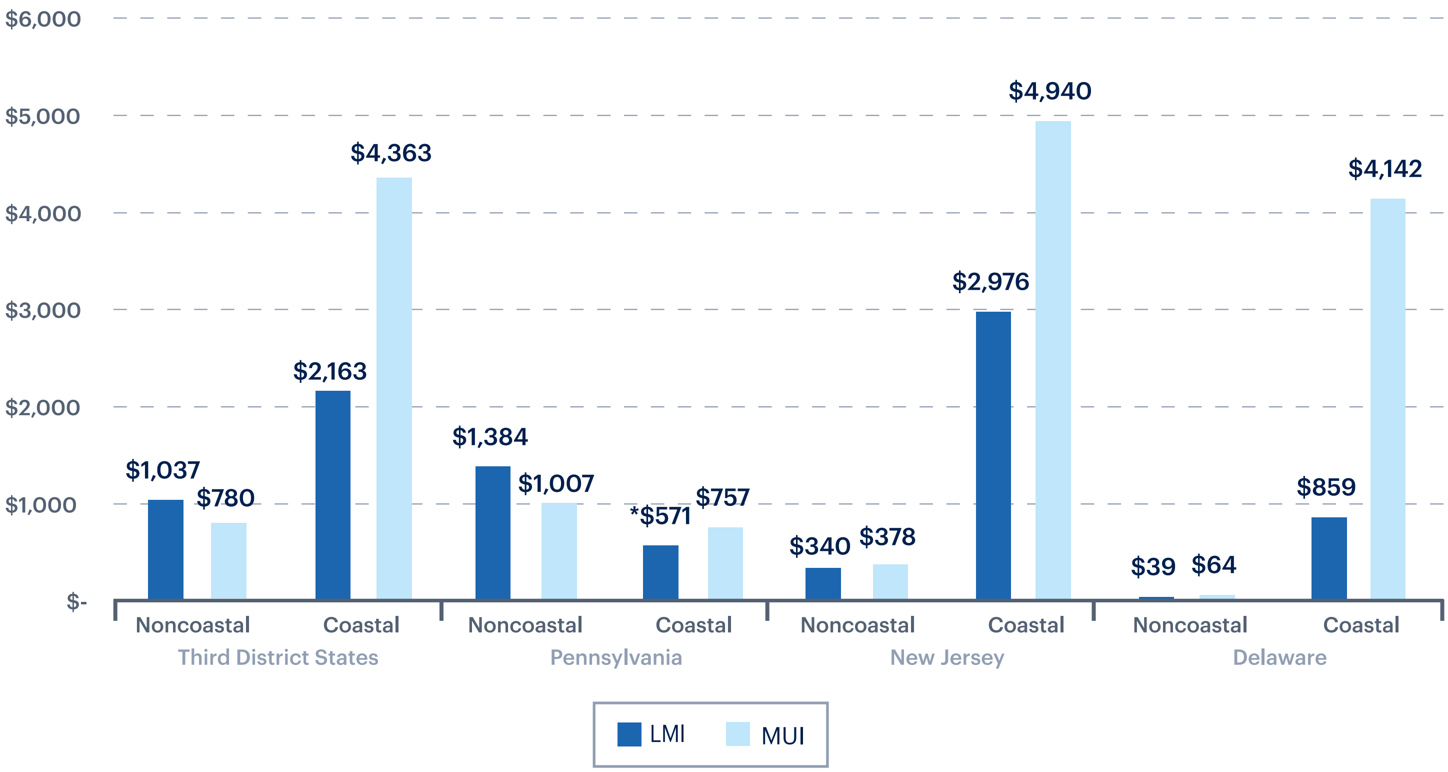
Sources
Calculation based on Climate Data via First Street Foundation.

are common in tracts along the Atlantic coast, they are also prevalent in tracts along the river valleys of central and western Pennsylvania. Overall, the average risk of loss is higher in coastal areas than it is in noncoastal areas in both Delaware and New Jersey, but the opposite is true in Pennsylvania; see **FIGURE 4**.[12] As with exposures, whether properties in LMI tracts have higher flood damage risk depends on whether coastal or noncoastal areas are being considered. Figure 4 demonstrates that, across coastal areas in the Third District states, the annual loss per property expected from flooding averages $4,363 for properties in MUI tracts but only $2,163 — roughly half as much — for those in LMI tracts. By contrast, these figures are $780 in MUI tracts and $1,037 in LMI tracts for noncoastal areas, although this contrast is mainly driven by the higher average annual expected loss in noncoastal properties in Pennsylvania. Of course, without accounting for the cost and coverage of flood insurance, the estimated losses are not necessarily the same as the actual losses for property owners; the broader issue of who will bear the costs of flooding is the direction of our future research.

[12] Roughly 3 percent of tracts in Pennsylvania are coastal tracts, compared with 36 percent of tracts in Delaware and 20 percent of tracts in New Jersey. The coastal tracts in Pennsylvania are located along the Delaware River in Delaware, Philadelphia, and Bucks counties and along Lake Erie in Erie County.

FIGURE 4

Average Annual Dollar Value of Current Expected Loss per Property Due to Flooding Across Third District States by Neighborhood LMI or MUI Status and by Coastal and Noncoastal Areas



Notes

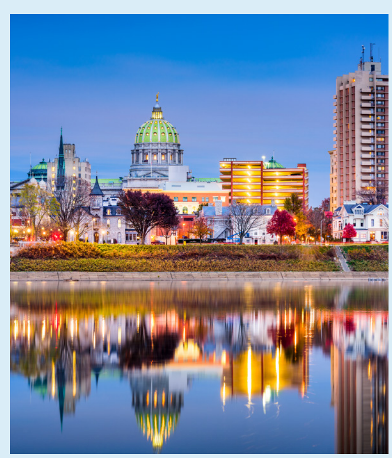
An asterisk (*) preceding a value indicates that the value is not significant. All other differences are statistically significant at p≤0.01.

Sources

Calculation based on Climate Data via First Street Foundation and the 2022 FFIEC Census Flat File.

CASE STUDY: HARRISBURG-CARLISLE, PA

Properties in the Harrisburg-Carlisle MSA have a cumulative chance of flooding of 51.9 percent over a 30-year period. While the central Pennsylvania MSA is far from the Atlantic coast, almost 12 percent of all properties within the MSA have a high risk of flooding, partially because of fluvial flood risk from the Susquehanna River. Sixteen percent of properties in LMI neighborhoods in the MSA are high risk. Harrisburg-Carlisle has one of the highest average annual expected losses based on building repair costs across the Third District, at $2,741. In LMI neighborhoods, the total annual expected losses would amount to over $200 million, which is 38.5 percent of the aggregated annual expected losses for all properties in the MSA. This is a substantially greater share than the 19.5 percent of all properties that are located in LMI neighborhoods in the area.

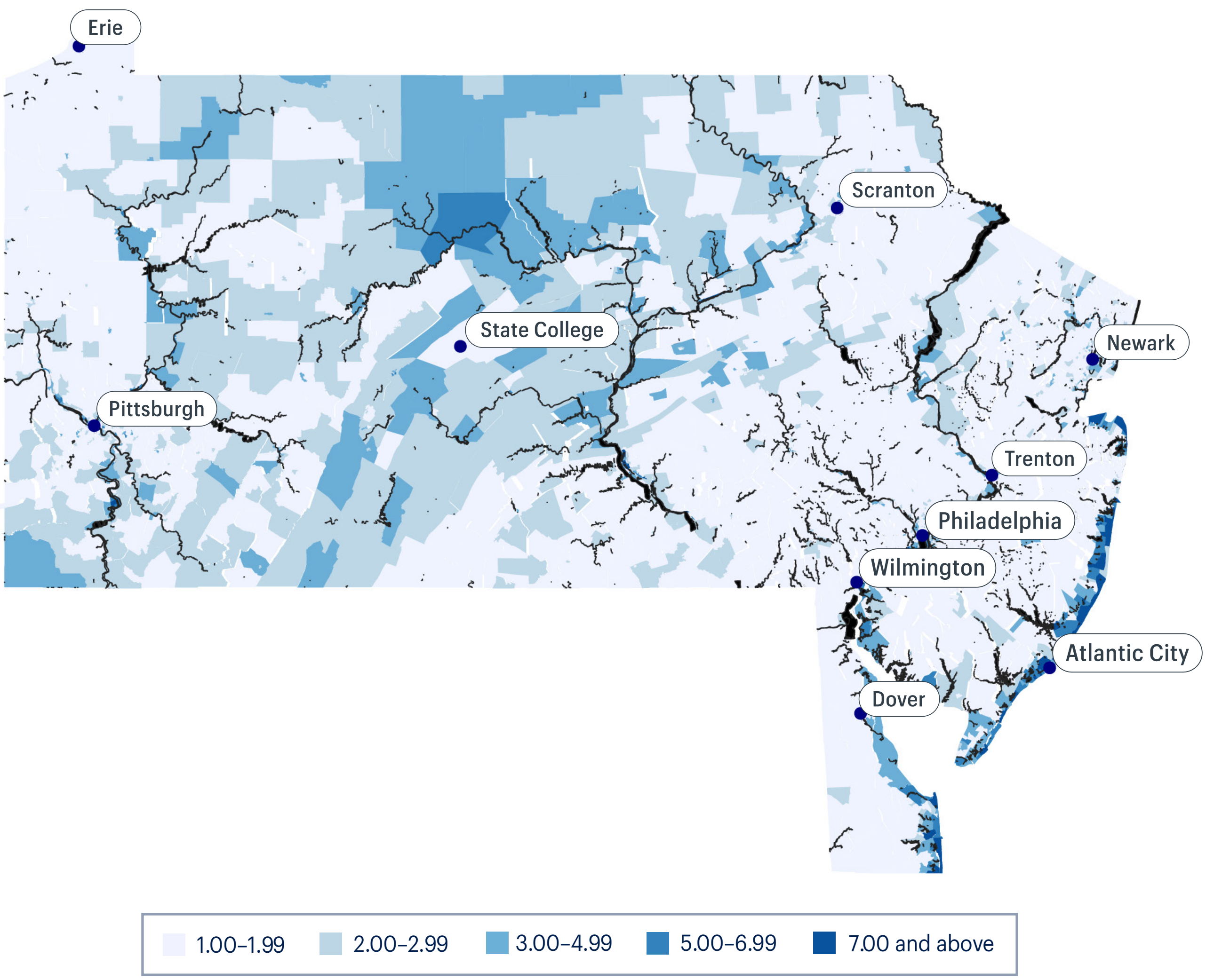


FUTURE EXPOSURE AND RISKS FROM FLOODING

FIGURE 5 shows the predicted dangers from flooding over the next 30 years using FSF's Flood Factor scores of cumulative combined exposure and risk of flood probability and depth. Although there are worrisome patterns in Pennsylvania's inland river valleys, the greatest future dangers from floods clearly concentrate in a narrow band of coastal communities along the Atlantic Seaboard. This geographic portrait is reinforced by the statistics presented in **FIGURE 6**, which shows the share of properties at high-risk of flooding by geography and neighborhood income level. A property with a Flood Factor score of 7 or higher indicates that flooding poses a *severe* or *extreme* future danger to the property. Regardless of neighborhood income status, coastal areas in New Jersey and Delaware have a much higher share of properties that fall into this high-risk category: over one in five in New Jersey and over one in seven in Delaware.

Figure 6 also reveals that, as with our prior indicators of current flood exposure and risk, our indicator of future exposure and risk varies in opposite ways across neighborhood income status depending on whether coastal or noncoastal neighborhoods are considered. Across the three states overall, 22.8 percent of properties in MUI neighborhoods were rated in the *high-risk* categories, compared with only 16.6 percent of those in LMI neighborhoods. Although these gaps in relative dangers appeared in coastal areas across the states, the gaps were largest in New Jersey and Delaware. A different relationship is revealed in noncoastal areas: In Pennsylvania and New Jersey, a higher share of properties in LMI neighborhoods are in the high-risk category; in Delaware, it is a slightly lower share. In all cases, the LMI-MUI gaps are smaller in noncoastal neighborhoods compared with coastal neighborhoods.

FIGURE 5 Geographic Pattern of Neighborhood Average Flood Factor Score Across Third District States



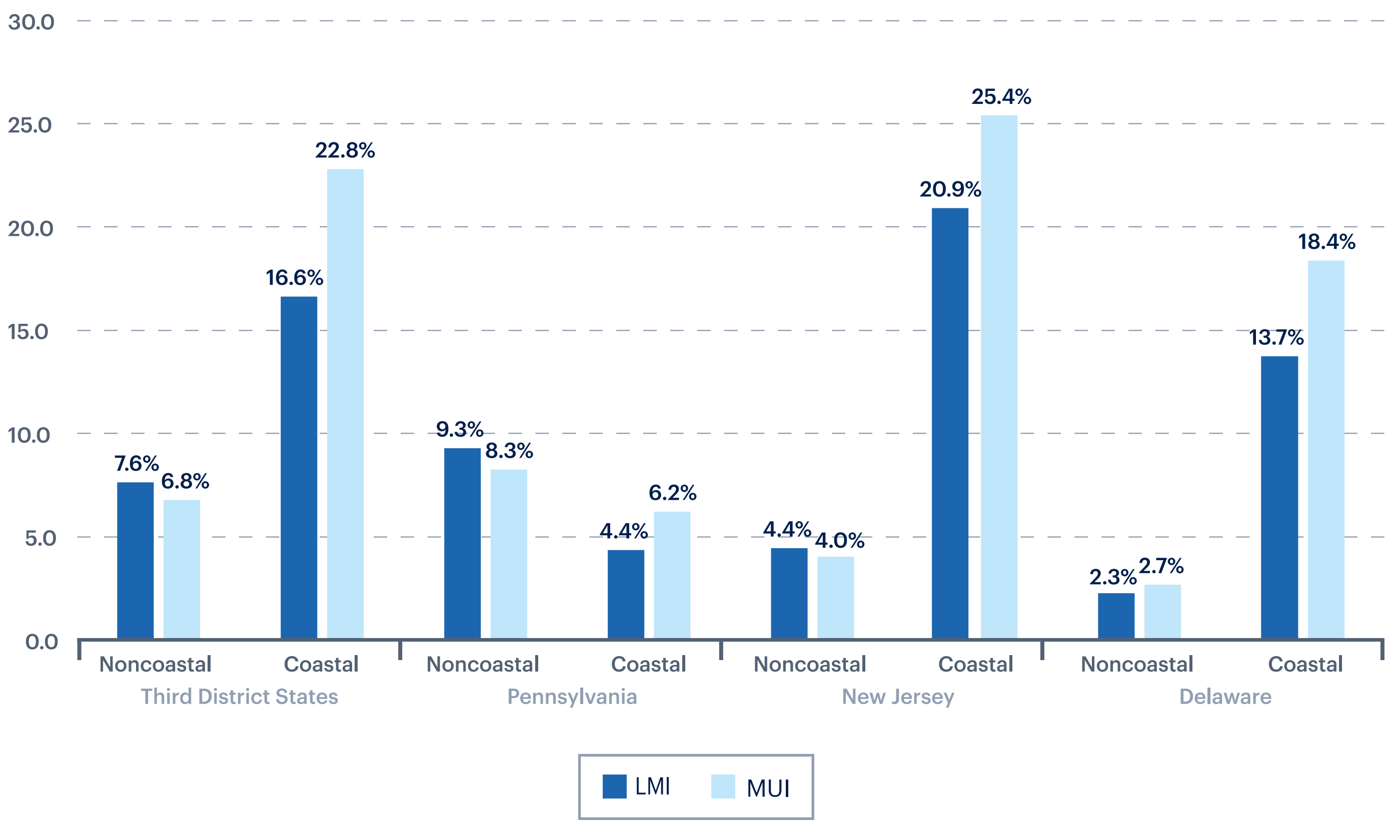
Sources
Calculation based on Climate Data via First Street Foundation.

CASE STUDY: WILLIAMSPORT, PA

Properties in the Williamsport, PA, MSA have an average cumulative chance of flooding of 67.9 percent over a 30-year period, the highest average among noncoastal Third District MSAs. Fifteen percent of all properties in Williamsport are at high risk of flooding. Of the 6.0 percent of total properties located in LMI neighborhoods, 29.2 percent are at high flood risk. Many high-risk properties in the MSA are clustered around the Susquehanna River, which borders the city of Williamsport. The average annual expected loss due to flooding for properties in the MSA is $1,656; this is the fourth largest figure among MSAs in the Third District, behind Ocean City, NJ ($5,047); Harrisburg-Carlisle, PA ($2,741); and Bloomsburg-Berwick, PA ($2,196). For properties in LMI neighborhoods, the total annual expected losses from flood damage stand around $1.8 million, about 2.8 percent of the total $64 million of losses in the MSA due to expected flooding.

FIGURE 6

Percentage of Properties with High Risk (Flood Factor Score 7+) from Flooding Across Third District States by Neighborhood LMI or MUI Status and by Coastal and Noncoastal Areas



Notes

All differences between the proportion of properties in LMI tracts and MUI tracts by state and coastal status shown above are statistically significant (p≤0.01) based on the results of a two-sided, two-proportion z-test.

Sources

Calculation based on Climate Data via First Street Foundation.

Discussion

Flood hazards vary dramatically across the Third District states. By far, the largest current chance of experiencing a flood, the current expected value of property that needs to be repaired in the event of a flood, and the future exposure and risk from cumulative flooding over the next 30 years are borne by properties along the Atlantic coasts of New Jersey and Delaware. Substantial hazards, as measured by these three indicators, also exist in Pennsylvania's inland river valleys.

In the Third District states, the relative hazards borne by neighborhoods based on their income status are contingent on whether coastal or noncoastal areas are the focus. Conventional wisdom posits that lower-income communities in inland areas may face higher dangers from floods because properties are less expensive in flood-prone areas, making them more affordable for those with lower budgets (Shr and Zipp 2019). This is true in noncoastal areas in Pennsylvania and New Jersey, although the substantive differences in all of the flood hazard indicators are small. In coastal areas, properties in higher-income neighborhoods face much greater current and future flood hazards, regardless of how we measure them.

These empirical findings can be partly explained by the long-dominant force driving property development along the Atlantic coasts of Delaware and New Jersey: tourism. For generations, the beach communities along the Jersey and Delaware shores have been built primarily to serve the needs of vacationers, retirees, and part-time residents drawn to the obvious natural charms of the area. As with any housing market, vacant parcels with the most attractive natural amenities — in this case, proximity to the beach — would command the highest price per acre. This, in turn, means that individual and corporate purchasers of these parcels would both command considerable purchasing power and be incentivized to build more expensive buildings on these sites. The result would be that neighborhoods with the closest proximity to the beach would be disproportionately occupied by higher-income households. Neighborhoods in coastal regions farther from the ocean would, for opposite reasons, tend to be occupied by households of lesser means, who more likely would be employed in industries catering to tourism.

The aforementioned dynamics suggest that shore-dwelling higher-income households likely find the amenity of proximity to the beach more valuable than the prospective financial and personal losses associated with heightened flood hazards. The question this raises is whether these households' loss estimates are badly understated, either because of peoples' underestimates of current or future flood hazards or because of their access to flood insurance and other resources permitting them to recover relatively quickly and completely after a flood. At the same time, there are lower-income residents, who are neither tourists nor workers in the service industry, living at the beach for a variety of reasons. The heightened flood hazards in these areas would inevitably add significant risk for these households, which already face significant financial challenges. Indeed, we hasten to add that we plan to measure the differing abilities of neighborhoods, distinguished by their income status, to recover from floods. There are likely substantial inequalities in insurance coverage and personal financial resources that would render the impact of floods more severe in lower-income communities, regardless of location, given the findings of previous studies (Netusil et al. 2021, Atreya et al. 2015, Masozera et al. 2007).

The comparably higher current exposures, average annual losses, and future exposures and risks borne by LMI communities in the noncoastal areas of Pennsylvania can be traced to a different industrial legacy. Formerly heavily industrialized river valleys have undergone an extended period of economic decline, leaving behind communities close to waterways that once provided an economic base but that now primarily pose a danger.

The results have important policy implications. Most of the federal response to flood events has focused on helping communities and households recover from disasters; more research is still needed to understand how FEMA flood insurance programs and other federal programs reduce the exposure, losses, and disaster-related suffering of flooding for households in LMI communities. More programs have also become increasingly proactive in protecting households from future flooding events. For example, under the current CRA framework, banks could receive CRA credit for certain activities that help LMI communities recover from natural disasters but not necessarily disaster preparedness activities themselves.[13] The final rule issued in October 2023 to strengthen and modernize the CRA, however, proposes that banks could get CRA credit for eligible disaster preparedness and climate resiliency activities, which would encompass activities that help LMI individuals and communities prepare for or proactively mitigate the potential effects of disasters and climate-related risks.[14]

[13] For example, banks can receive consideration for financial assistance for services to individuals who have been displaced from designated disaster areas or for rebuilding needs. Current CRA guidance, however, does not explicitly include activities related to helping LMI individuals or communities prepare for disasters or build resilience to future climate-related events.

[14] See the October 24, 2023, notice from the Federal Reserve System, the Office of the Comptroller of the Currency, and the Federal Deposit Insurance Corporation for a summary of the Final Rule: www.federalreserve.gov/aboutthefed/boardmeetings/files/frn-cra-20231024.pdf.

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Appendix

TABLE A1 Flooding Exposure and Risk in MSAs in Third District States

MSA	Current Exposure			Current Risk						Future Exposure and Risk		
	Average Chance of Flooding in 30-Year Period (%)	Average Chance of Flooding in LMI Neighborhoods in 30-Year Period (%)	Average Chance of Flooding in MUI Neighborhoods in 30-Year Period (%)	Average Annual Loss ($)	Average Annual Loss in LMI Neighborhoods ($)	Average Annual Loss in MUI Neighborhoods ($)	Total Annual Loss (in Thousands of $)	Annual Loss for LMI Tracts (in Thousands of $)	Annual Loss for MUI Tracts (in Thousands of $)	Share of Properties with High Flood Risk (%)	Share of Properties in LMI Neighborhoods with High Flood Risk (%)	Share of Properties in MUI Neighborhoods with High Flood Risk (%)
Allentown-Bethlehem-Easton, PA-NJ	32.0	31.7	32.1	844	943	813	244,970	66,696	178,275	6.0	5.8	6.0
Altoona, PA	58.5	50.8	60.2	1,349	940	1,455	63,587	9,069	54,518	13.4	10.3	14.1
Atlantic City-Hammonton, NJ	77.4	95.6	69.7	1,208	1,792	1,092	121,477	29,720	91,757	16.9	34.8	13.6
Bloomsburg-Berwick, PA	66.3	47.1	67.6	2,196	655	2,350	68,149	1,848	66,301	18.6	8.4	19.4
Chambersburg-Waynesboro, PA	40.2	32.6	40.9	664	484	682	37,777	2,553	35,224	7.8	5.2	8.0
Dover, DE	32.9	72.1	18.5	101	482	20	5,975	5,015	960	3.9	10.4	2.4
East Stroudsburg, PA	33.9	25.7	34.6	1,033	707	1,064	75,338	4,420	70,917	6.4	4.2	6.6
Gettysburg, PA	29.1	38.8	26.4	541	1,013	418	20,290	7,818	12,472	5.4	7.9	4.8
Harrisburg-Carlisle, PA	51.9	62.8	48.8	2,741	5,461	2,089	537,759	207,043	330,716	11.9	16.4	10.8
Johnstown, PA	52.6	76.2	47.1	952	1,378	879	53,739	11,409	42,330	12.1	24.6	10.1
Lancaster, PA	24.0	33.2	22.2	584	1,229	466	100,947	32,798	68,149	4.2	6.2	3.8
Lebanon, PA	26.1	37.4	23.2	500	544	489	24,461	5,073	19,389	4.5	6.4	4.0
Ocean City, NJ	98.4	96.8	98.5	5,047	9,169	4,752	439,928	53,339	386,590	38.8	30.8	39.3
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	25.9	31.6	23.4	301	284	308	576,623	155,703	420,919	3.9	4.6	3.6
Reading, PA	33.5	36.9	32.6	619	837	568	86,836	22,472	64,364	6.3	6.9	6.1
Scranton–Wilkes-Barre, PA	45.1	38.0	47.1	1,008	615	1,134	207,258	30,574	176,684	11.2	8.5	12.1
State College, PA	49.8	57.1	47.8	1,140	1,445	1,068	53,761	12,989	40,772	10.9	13.4	10.2

Appendix

MSA	Current Exposure			Current Risk						Future Exposure and Risk		
	Average Chance of Flooding in 30-Year Period (%)	Average Chance of Flooding in LMI Neighborhoods in 30-Year Period (%)	Average Chance of Flooding in MUI Neighborhoods in 30-Year Period (%)	Average Annual Loss ($)	Average Annual Loss in LMI Neighborhoods ($)	Average Annual Loss in MUI Neighborhoods ($)	Total Annual Loss (in Thousands of $)	Annual Loss for LMI Tracts (in Thousands of $)	Annual Loss for MUI Tracts (in Thousands of $)	Share of Properties with High Flood Risk (%)	Share of Properties in LMI Neighborhoods with High Flood Risk (%)	Share of Properties in MUI Neighborhoods with High Flood Risk (%)
Trenton-Ewing, NJ	28.1	41.8	17.9	389	599	264	44,772	25,638	19,133	4.0	6.1	2.7
Vineland-Millville-Bridgeton, NJ	57.3	46.9	59.5	529	386	571	24,995	4,103	20,892	8.3	6.4	8.8
Williamsport, PA	67.9	74.6	67.4	1,656	685	1,726	64,009	1,777	62,232	19.8	29.2	19.2
York-Hanover, PA	29.7	28.0	29.9	801	334	878	119,855	7,048	112,806	5.6	4.7	5.8
PA, NJ, DE Counties Not in an MSA (rural)	57.8	70.1	56.1	1,637	2,233	1,564	1,012,863	150,689	862,174	14.0	19.6	13.4
PA, NJ, DE Counties in Non-Third District MSAs	53.9	51.0	54.8	1,576	1,618	1,563	4,824,214	1,162,365	3,661,849	9.0	9.7	8.8
Total	49.1	47.8	49.4	1,160	1,172	1,156	8,809,582	2,010,159	6,799,423	8.7	8.8	8.7

Notes
The listed metropolitan areas reflect the MSA boundaries in the Third District as of the 2020 redrawing. The values above only include properties that fall in Third District states (Delaware, New Jersey, and Pennsylvania). Properties in MSAs that fall partially in Third District states, but are not located in Delaware, New Jersey, or Pennsylvania, were excluded from the analysis. The total annual loss shows the sum of repair costs due to flood damage by neighborhood income group.

Sources
Calculation based on Climate Data via First Street Foundation and the 2022 FFIEC Census Flat File.

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