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Abstract

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Disciplines

Economics | Environmental Sciences | Physical Sciences and Mathematics | Public Affairs, Public Policy and Public Administration

Credit Downgrade Threat as a Non-regulatory Driver for Flood Risk Mitigation and Sea Level Rise Adaptation

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May 2018



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Introduction

At a time when existing and proposed regulations and climate change science are being politically challenged, it is instructive to look at another driver that will encourage decision makers, even reluctant ones, to take action on flood and sea level rise risk. Vulnerability has an influence on government credit ratings¹ that results in greater borrowing costs, and as a consequence, an increase in taxes. Monetization of flood and sea level rise risk via financial services companies are beginning to be recognized.² Expectations are that the threat of credit downgrades will cause an uptick in motivation to mitigate and adapt to future conditions and thus become more resilient to risk.³ Christopher Flavelle of Bloomberg quotes Shalini Vajjhala of Re:Focus Partners in saying that sovereigns⁴ are looking for market indicators to champion resiliency and climate adaptation measures, and "Outside of the rating agencies, it is not obvious who else could send a meaningful market-wide signal."⁵ Investors will drive rating agencies toward increasingly sensitive evaluations of climate change risk.

The purpose of this whitepaper is to introduce the concept of climate stress on municipal credit and the state of influence to municipal officials and practitioners, and what can be expected. It is also a call to action on flood and sea level rise risk due to the market-based driver of the higher costs of borrowing. The credit rating industry is starting to look at climate change risk as an exposure to investors.⁶ The White House Office of Management and Budget (OMB) cites the recent relevance of community resilience to municipal credit rating criteria.⁷ A lower credit rating means borrowing will cost more in paying off the debt for capital projects. OMB states that "Ratings analysts can be expected increasingly to factor resilience and vulnerability to extreme weather and climate change into their rating methodologies."⁸ This white paper synthesizes recent industry publications on this topic,

"Ratings analysts can be expected increasingly to factor resilience and vulnerability to extreme weather and climate change into their rating methodologies."

— *Office of Management and Budget*

presents local government reactions to the threat of climate change, and encourages further research and study of the credit downgrade threat incentive to government preventative actions.

State of Policy and Federal Regulations

The Trump administration has championed the rollback of policy and federal regulations addressing flood risk and climate change by the Obama administration. Two examples are: the withdrawal of the United States from the 2015 Paris Accord on climate change, and the rescission of the Federal Flood Risk Management Standard.

On June 1, 2017, President Trump announced that the United States would withdraw from the Paris Accord, thus becoming the only country in the world to reject its commitment to emissions reductions.⁹ Ironically, using the rationale of protecting America and "...the wellbeing of American citizen," Mr. Trump called for ceasing the implementation of the agreement in reducing carbon emissions that he tied to costing American jobs.¹⁰ He also terminated payments from the Green Fund that aids developing countries with alternative energy production and adaptation to worsening vulnerability that they had little influence on. The President's action matches his view of climate change being a "hoax" and extrapolated, that the risks from increasing vulnerabilities from sea level rise and excess precipitation are to be discounted. Still, even with the concerted international efforts made in the Paris Agreement to address climate mitigation, sea

level rise will continue to be unrelenting and extreme weather will be on the rise.¹¹

President Obama's EO 13690, signed on January 30, 2015, called for higher standards for Federal infrastructure and disaster rebuilding investments, to account for future conditions with a factor of safety. This was met by widespread support, except for homebuilders. The National Association of Home Builders continues to assert that greater standards result in higher building costs, which in turn leads to higher costs of homes and decreased supply. The Association, with much political clout, pressed this logic on the new executive. The Federal Flood Risk Management Standard was rescinded by President Trump on August 15, 2017, thus losing the mandate to Federal agencies to require climate adaptation in rebuilding after a disaster. President Trump's order took place only weeks prior to Hurricane Harvey's destruction in the state of Texas, with attribution to climate change in its rainfall totals.^{12, 13}

Signals from the Federal government may lead communities to delay planning and adaptation to sea level rise and increasing flood risk. The rollback of the Federal Flood Risk Management Standard and withdrawing from the Paris Accord set a tone for inaction in dealing with future risk. In lieu of regulatory and policy incentives, there are monetary drivers that will get the attention of municipal governments. The Federal government's oversized role in paying for disaster recovery has continued through the 2017 hurricane season. However, there is a developing proposal to tighten the Federal purse post disaster in the form of a deductible. Rating agencies have taken notice.

Federal Disaster Assistance and a Disaster Deductible

Moody's issued a report in August 2017 on the Trump administration's proposed cuts to FEMA's budget.¹⁴ In this report the credit rating agency pointed to the Disaster Relief Fund, under the Stafford Act, as "the most

important FEMA program for state and local government credit quality."¹⁵ Record supplemental appropriations of \$130 billion¹⁶ for damage resulting from the 2017 hurricane season shows us that Congress continues to be generous in its disaster aid, and this provides credit stability for state and local governments who do not allocate sufficient reserves to match the needs of a major disaster. Moody's comments that "Federal aid helps to avoid a severe depletion of liquidity or increase in debt, and also helps in the rebuilding of tax bases following disasters."¹⁷ If Congress would tighten aid to state and local governments in disaster supplemental appropriations, or FEMA via a Public Assistance Disaster Deductible,¹⁸ this would stress fiscal stability in a time of need and weigh negatively on credit. Credit rating agencies would take notice of the lessening of disaster assistance and necessarily factor in evaluations of municipal credit risk.^{19, 20} As such, states and communities would be sensible to get ahead of economic stresses with proactive flood mitigation to stabilize property values and the tax base.

Flood and Sea Level Rise Threat to Real Estate

Higher sea levels propagate coastal storms further inland causing additional damage. This has the greatest effects on lower lying, densely developed communities. Some of these areas are also experiencing subsidence, thus further exacerbating the flooding. Increased rainfall from moisture laden warmer air is increasing precipitation intensity and totals that exacerbates areas that are already floodprone. Chronic flooding from sea level rise in tidal waters, and storm events causing storm surge and excess precipitation, will have financial effects on the building stock and infrastructure.

Catastrophic flooding, experienced most recently in the 2005, 2012 and 2017 hurricane seasons, has been recognized to cause major financial losses in the United States, totaling for these three seasons \$553 billion that

includes damage to, and destruction of, real estate.^{21, 22} Flood and hurricane losses in the future are likely to increase due to more intense hurricanes and sea level rise.²³ By 2050, average annual losses from hurricane and nor'easters will likely grow to \$5.8 to \$13 billion nationwide under RCP 8.5,²⁴ a 21 percent to 48 percent increase from current levels, due just to mean projections of sea level rise.²⁵ J.P. Morgan Asset Management found that "Real estate, infrastructure, sovereigns, and utilities" will be "Highly Impacted Sectors" with regard to physical risk.²⁶

Coastal municipalities have operated for decades, even centuries, with the assumption that the sea level is constant, or nearly so. The age of stationarity, where the past can be predictive for the future is now ended and communities will have to adapt to future conditions since real estate values will be impacted. According to Hugh Gladwin, professor of anthropology at Florida International University, in speaking about Miami, Florida in an article by The Guardian, "In any coastal area there's extra value in property, [but] climate change, insofar as it increases risks for those properties from any specific set of hazards – like flooding and storm surge – will decrease value."²⁷

“Real estate investment may no longer be just about the next hot neighbourhood, it may also now be about the next dry neighbourhood.”

— taken from *Scientific American*

In the same Guardian article,²⁸ Scientific American is credited as writing "Real estate investment may no longer be just about the next hot neighbourhood, it may also now be about the next dry neighbourhood." Mark Pfeiffer, assistant director of Rutgers' Bloustein Local Government Research Center, comments that people have emotional ties to the shore and this in part drives real estate demand.²⁹ Pfeiffer observes "If you own a

property, you tend to look at the short term instead of the long term."³⁰ This does not match the needs to prepare for future exposure. It is no different than elected officials that look to the next election and what helps him or her in the short term get reelected. Local officials tend to be myopic and this hinders progress in addressing climate change, which is a long term threat.³¹ In a National Public Radio piece, Broward County, Florida's chief resiliency officer stated that "It can be difficult for a policymaker to justify a big investment when the associated benefits or risks seem a long way down the road."³² With acknowledgement of sea level rise and the expectation of more impactful hurricanes and nor'easters, communities will have to engage in long-range planning. Relative to the maintenance of municipal revenue, there are unknowns when it comes to climate change and its full effect on coastal real estate, but there are indications that property values will drop, as the following example from Hampton, Virginia, and analysis of Zillow home value data show.

According to the Chief Resiliency Officer for the City of Norfolk, "the [United States] Corps [of Engineers] is one of several federal agencies the city is working with to develop strategies for reducing risks from the flooding that is almost certain to increase as the waters go higher."³³ This is important as housing values are already seeing impacts of sea level rise. Also in the Hampton Roads region, as reported in a 2017 article in the Daily Press,³⁴ one waterfront neighborhood, Pasture Point adjacent to the Hampton River, has seen assessments decline 15 percent to 20 percent due to chronic flooding and increases in flood insurance premiums. While this is not the case for all of Hampton, Virginia waterfront neighborhoods, there is an expectation that the trend will expand. The article concludes that "Fears about flooding and sea level rise, entwined inextricably with increasingly expensive insurance to deal with such events, are now giving people pause when they go to purchase a home with a view."³⁵

Concluded in a paper titled “Disaster on the Horizon: The Price Effect of Sea Level Rise,” that examines data from Zillow, properties exposed to sea level rise already sell at a 7 percent discount when compared with those of similar characteristics.³⁶ The authors say they “...provide the first evidence on the price of [sea level rise] risk and its determinants.”³⁷ They say that even though the properties will not be inundated for the next half century, real estate investors are discounting the value currently, especially in the last decade.³⁸ The authors write that “Our findings that investors price long-run [sea level rise] risk is also relevant from a policy perspective because it suggests that on average investors believe that [sea level rise] will materially affect coastal economies over the coming decades.”³⁹ In correspondence with the City of Hoboken’s Chief Resiliency Officer, there is awareness that “...commercial real estate investment trusts are divesting from the floodplain” which is significant to the tax base in urban areas.⁴⁰ An article in Bisnow quotes pension fund STRS Ohio’s acquisition manager as cautioning “You have to start paying attention to [rising sea levels] when looking at real estate and making sure cities are addressing it or addressing assets correctly, or just decide not to invest in certain markets.”⁴¹

Participants and Mechanics of Municipal Bonds

Issuers

Local governments issue bonds to fund community improvements such as public and municipal facilities, infrastructure and flood control projects. For projects that will not generate revenue, unlike a toll highway or parking garage charging a fee, general obligation bonds are most appropriate. When communities issue bonds, they are incurring debt. In doing so, the local government is obligating its resources to paying back bondholders, backed by the “full faith and credit” of the municipality, through taxation and/or by additional debt issuance.

Publicly sold bonds have two initiation tracts available to an issuer. For greater borrowing with a longer term, the issuer would go to bond markets. In more limited borrowing with a shorter term, the issuer can enlist a single bank.⁴² Bonds can have different terms of length, of 10, 20, or up to 40 years typical, are frequently rated a week before issuance.⁴³ Rating will influence bond yields, with a lower rating signifying a higher likelihood of default. Issuers with a lower credit rating have to pay higher interest to attract investors. Higher interest rates mean that the issuer is paying more to borrow money and this in turn means that more revenue is needed to support borrowing, and this typically comes in the form of increased taxes.

“Investors believe that [sea level rise] will materially affect coastal economies over the coming decades.”

— *Bernstein et al.*

General obligation bonds have traditionally been a safe investment due to the ability to raise revenue through taxation, typically through property and real estate taxes.⁴⁴ Municipal bond defaults traditionally are exceedingly rare. Banks will purchase bonds, but most of those issued are being bought by institutional investors and retirement funds. According to Bloomberg reporting, Moody’s recognizes fewer than 100 defaults by municipal borrowers it rated between 1970 and 2014.⁴⁵ Some bonds are insured and this gives investors reassurance and will be attractive with a lower interest rate due to the safety of the investment.

Broker/Dealer and Underwriter

Professionals with experience in bond services and market awareness will act on behalf of the bond issuer. Broker/dealers and underwriters prepare bond issuances for a negotiated sale on behalf of the issuer. Brokers

interact closely with bond rating agencies. As part of the materials that accompany the bond, the broker provides background and reports on the issuer to the rating agency that becomes the “official statement” linked to the bonds.⁴⁶ Projections of sea level rise for coastal communities are not part of standard documents in the official statement. As a commentary in the Wall Street Journal⁴⁷ points out, bond prospectuses for certain California issuances contained no information for investors to assess the climate change risk. According to the author who is a “...former hedge-fund manager who specialized in sovereign debt” elected officials, representing the issuer, are prone to understate risk in prospectuses.⁴⁸

During the due diligence process, where the broker works with the issuer, environmental risks may be discovered. It is typical for a broker to ask an issuer “is there anything that we don’t have that would be of material interest to an investor?” The underwriter and issuer have to be prudent in evaluating the risks of default. The underwriter is legally exposed for not doing due diligence in evaluating and capturing the risks in the bond issuance. The Securities and Exchange Commission (SEC) oversees the process and has enforcement power over the broker/dealer. Reported by Christopher Flavelle of Bloomberg,⁴⁹ the SEC is unlikely to sanction issuers that have not disclosed climate risks. He quotes Michael Gerrard, director of the Sabin Center for Climate Change Law at Columbia University in saying that “...the SEC took no enforcement action against cities or companies for failing to disclose climate risk...” under President Obama, and he sees no change in the Trump Administration.⁵⁰ Therefore, investors will be the main driver of transparency in the rating process by credit rating agencies, and will demand more disclosure of climate risk for bond issuances.

Credit Rating Agencies

Credit rating agencies Moody’s, Standard & Poor’s and Fitch evaluate the risk of municipal bonds. Municipal

credit ratings are set by a committee of analysts informed by a presentation by a lead analyst.⁵¹ Bond ratings are updated from the initial 2-3 year rating, where credit rating agencies that initially rated the bond will perform surveillance. Fixed-rate interest does not change but rating changes do affect bond investor trading. Subsequent evaluations of bonds that may consider climate risk and could change the rating after the bond is held by investors. In an article by Bloomberg, Eric Glass, a fixed-income portfolio manager at Alliance Bernstein said that credit rating agencies “...are supposed to identify risk to investors,” and that storms and flooding exacerbated by climate change “...is a material risk.”⁵² Evaluation of climate change risks have heretofore been marginally included in the Environmental, Social and Governance criteria, with environmental risk not being a primary driver of credit evaluation, but a stressor that limits fiscal flexibility.⁵³ Climate change is a new actor that has no history to guide practice. The SEC “highly regulates” credit rating agencies, according to Tiphany Lee-Allen of Moody’s Investors Service,⁵⁴ but as with the Broker/Dealer/Underwriters, it can be expected that investors will drive the revolution in assessing the risk of flooding to municipal revenue.

Credit Rating of Municipalities with Flood Risk

To date, disclosure of climate change risks has been muted for the \$3.8 trillion (USD) municipal bond market, but this is changing.⁵⁵ The equity market is ahead of the bond market on risk to investments. According to a Blackrock report on the impact of climate change on investor’s portfolios, “Long-term asset owners worry about extreme loss of capital and/or ‘stranded’ assets (holdings that need to be written down before the end of their expected life span).”⁵⁶ JPMorgan Chase & Co. in April 2017, driven by investors, announced that climate change impacting long-term assets would be further scrutinized.⁵⁷ A white paper written for Deutsche Asset Management by

Four Twenty Seven, a specialist in economic consequences of climate change, states:

*Natural disasters have always been with us. However, they are now becoming more frequent, more intense, and importantly, more predictable. Climate science points to an increase in extreme weather events and long term climatic changes that will dramatically alter the environment upon which human societies and economic activity depends. Ignoring this extensive body of climate science and the unambiguous signals of long-term risks is a massive market failure.*⁵⁸

While lagging behind, there is increasing investor demand to know what risks are inherent to municipal bonds. There was an assumption that municipal issuers are a low credit risk due to the ability of government to increase revenue by increasing taxes. However, there is a limit to how much the public is able to absorb an increase or redistribution as the tax base is inundated by sea level rise. There is a political reality that the public will only tolerate a marginal increase in taxes and when stressed too much will call for a change in leadership. In the case of sea level rise, inundated property will lead to a population exodus placing an additional burden on the remaining tax base. There is also the case in a catastrophic event, such as Hurricane Katrina, where loss of population results in a major loss in revenue.⁶³ It remains unanswered on what point does the loss of tax base due to flood risk challenge municipal commitments. The impacts due to sea level rise inundation are less

pronounced than acute disasters and will not be met by disaster supplemental aid from the Federal government as is typical in an extreme weather declared disaster. As such, sea level rise may ultimately be the greater driver of credit risk.

The Regional Plan Association, an urban research and advocacy organization, published its Forth Regional Plan covering the New York City region in 2017, highlighting flooding effects to communities:

*Adapting our municipalities for long-term and permanent flooding will require significant public investment, and could ultimately result in lost tax revenue from lucrative waterfront properties. National flood insurance rates will begin to rise over the coming years, perhaps making affordability along the coast even more difficult and buyouts a more attractive option. All adaptation tools—from walls and pumps to buyouts—will require a large and stable source of funding.*⁶⁴

Policies purchased from the National Flood Insurance Program have been the mainstay for coastal development and the municipal tax base. The private flood insurance industry has seen little business, as according to the GAO,⁶⁵ less than 5 percent of policies are written by the private sector. Moody's acknowledges the National Flood Insurance Fund, with US Treasury backstop, as "...very important to state and local government credit quality...."⁶⁶

Toms River, New Jersey

Toms River Township has the distinction of accumulating a record of NFIP claims paid dollars totaling \$599,217,545, as a single municipality, which is greater than 38 individual states, including California at \$556,382,927.⁵⁹ To say that Toms River is vulnerable is an understatement. Six months after Hurricane Sandy made landfall, Toms River was downgraded from Aa2 to Aa3 by Moody's that evaluated the tax base that "...experienced significant declines due to a recently completed reassessment and short-term losses from significant storm damage...."⁶⁰ Standard & Poor's cites municipal officials estimates of \$2.1 billion in Sandy damages, with a reduction in ratables of \$2 billion or 12.4% of the total tax base.⁶¹ As of a Moody's report in March 2017, the township maintained its post-Sandy downgraded Aa3 rating.⁶²

According to the OMB,⁶⁷ the Southeast Florida Regional Climate Change Compact,⁶⁸ Fitch Ratings,⁶⁹ Moody's Investors Service,^{70, 71} and Standard & Poor's⁷² communities and regions that have had credit rating evaluations that consider water hazard risk include: New Orleans, Louisiana; Galveston, Texas; Toms River and Seaside Heights, New Jersey; Miami-Dade County, Florida; Hampton Roads, Virginia; and most recently, Rockport, Texas.⁷³ Credit rating agencies are looking at tropical cyclones and floods and what that means to creditworthiness.⁷⁴ New Orleans, Galveston, Toms River, Seaside Heights⁷⁵ and Rockport⁷⁶ credit ratings were downgraded due to residual economic effects of major storms,⁷⁷ while the Hampton Roads municipalities in Virginia and Miami-Dade County were recognized for taking proactive measures and thus thwarting a ratings downgrade, for now.^{78, 79} Fitch points to Miami-Dade, Broward, Palm Beach, and Monroe counties that formed the Southeast Florida Regional Climate Change Compact Counties and developed a climate action plan.⁸⁰ Credit rating agencies do evaluate municipal participation in regional resiliency efforts and in the context of state policies regarding climate change.⁸¹ It is important for municipalities to not take on climate change alone but to form regional collaborative groups to leverage knowledge, resources and funding.

Credit Rating Agencies' Position on Climate Change

Credit rating agencies evaluate a host of threats to sovereign governments. The analysis is based on what are the material risks and how do these influence the community's ability to service its debt. While the vulnerability of infrastructure has been considered in the overall evaluation of a municipality, the multitude of threats that sea level rise pose is only recently being considered. In September 2015 Fitch stated that "To date, sea level rise has not played a material role in Fitch's assessment of the fundamental credit characteristics of any of its rated issuers."⁸² This has since changed. Climate

change is a new factor gaining attention in bond rating evaluations.

An evaluation of a municipality will include short and long-term capital needs, existence of a reserve fund, the review of a Capital Improvement Plan, what planning has been realized and what projects have been completed. Several factors will influence municipal revenue as sea level rise becomes more pronounced. An increase in flood insurance rates will place additional burdens on homeowners and reduce the market price of properties. Land use regulations will increasingly become more restrictive to account for increasing health and safety exposures and reduced services in inundated areas. The cost of new construction and maintenance of existing buildings will increase due to higher standards and risk reduction retrofitting measures. These will all have an impact on the tax base. Taken together, these factors challenge the financial resiliency of the community and how the municipality is able to adapt to risk. Governing magazine columnist Frank Shafroth recognized natural disaster as a "threat to state and local government fiscal stability" in his January 2016 piece.⁸³

Moody's has been the earliest and most active of the credit rating agencies in its calls to municipalities to consider climate change risk. In 2015 Hampton Roads Virginia communities were sent a survey to collect municipal responses on what was being done to counter sea level rise and chronic flooding. Virginia Beach had a comprehensive submittal to Moody's on March 6, 2015, which can be characterized as taking a bold approach to confronting risk: no retreat, protection of jobs and quality of life and protection of economy.⁸⁴ The below is adapted from the survey of the City of Virginia Beach with headings and probing inquiries, followed by Virginia Beach's paraphrased responses in *italics*:⁸⁵

Debt and Long Term Obligations

- The City's Capital Improvement Plan: how Virginia Beach flooding was impacting that plan and did the

plan contain flood mitigation and resiliency measures;

Virginia Beach is spending \$3 million on a Comprehensive City Response Plan that uses planning horizons for sea level rise; \$135 million on implementation is expected to be spent over the next 10 years; Operation and Maintenance costs are necessary over projects' lives;

- What the City spent on flood mitigation efforts for the last 3-5 years;

Infrastructure projects have totaled \$43.8 million in the last 5 years to manage recurrent flooding;

- Provide details on resiliency projects;

The City provided three examples of projects: retrofitting an existing stormwater management basin to increase flood storage, installation of a pump station, and placement of check valves and tide gates to prevent backflooding;

- Financial consequences of inaction on sea level rise;

Inaction is more expensive than being proactive; City Council has made sea level rise and chronic flooding a priority;

“Inaction is more expensive than being proactive; City Council has made sea level rise and chronic flooding a priority.”

— *City of Virginia Beach*

Finances

- Flooding effects on the City's budget and mitigation impacts on future budgets;

Stormwater utility fees have covered costs of flood mitigation;

- Unexpected expenditures due to flooding; line item in the City's budget for flood disaster costs;

The City has flexibility in budgeting should flooding require adjustments; rare extreme events have had unanticipated minor costs;

- Expectations for federal flood mitigation funding;

The City has worked with FEMA funding and as a partner to the USACE; a bill passed in the Virginia legislature that requires Hampton Roads communities to factor sea level rise in comprehensive planning;⁸⁶

- Estimate on the number of days of flooding (chronic) and how this is included in planning;

Virginia Beach does not track recurrent flooding, only severe events;

Tax Base and Economy

- Waterfront development and how extreme weather is considered in building;

Waterfront development and redevelopment is occurring and the City has adopted a 2-foot freeboard standard; a seawall provides protection for a majority of Atlantic Ocean facing development; the City promotes engineered solutions, accommodation for more water dependent uses, and land use regulation to promote open space;

- Has waterfront development been built to future conditions of sea level rise;

Virginia Beach instituted a 2-foot freeboard elevation standard and this is enforced in the permitting process;

- Zoning and planning recognition of waterfront exposure to future flooding;

The City has limits on fill and prohibits new residential development in the southern portion of the City; density credits are included in the City's ordinance; flood resiliency is incorporated in City planning documents; 38% of the Special Flood Hazard Area is protected open space; the City participates in regional groups to share knowledge on flood risk reduction;

- Does present day flooding retard development in downtown and waterfront areas;

There has not been a halt to development, but the approval process is lengthier;

- Estimate of waterfront development in next 5 years; what was investment and tax base in waterfront areas in last several years;

The City anticipates a \$70 million investment in the next 5 years; City infrastructure has been minimally affected by sea level rise and severe weather and is covered by insurance;

The City’s Comprehensive Sea Level Rise and Recurrent Flooding Response Plan is under development;

- Estimate on impacts of flooding and sea level rise;

The City will account for this in the Comprehensive Sea Level Rise and Recurrent Flooding Response Plan.

“Planning and adaptive investments would need to continue to maintain property tax revenue to allay credit downgrades.”

— Lee-Allen et al.

Management

- City management’s understanding of impacts from sea level rise;

Virginia Beach will protect as many areas as possible for tax base and economic purposes;

- Management’s view of extreme weather risk;

The City will adapt to extreme weather events;

- Does an action plan exist or in progress;

After collecting the surveys from the Hampton Roads municipalities, Moody’s issued its findings in a June 2015 report called “Virginia’s Hampton Roads Region Responds to Flood Risk.”⁸⁷ The publication cited land use and risk planning, building codes and implementation of flood control projects as mitigating credit rating impacts, but that planning and adaptive investments would need to continue to maintain property tax revenue to allay credit downgrades.⁸⁸ Moody’s credits regional municipal cooperation and alliance with the ubiquitous US Department of Defense (“world’s largest naval base”) with its dedication to future conditions planning, plus the large port complex.⁸⁹ As the Hampton Roads’ municipalities are dependent on property taxes, Moody’s notes that “Flood risks could drive housing values down in flood-prone neighborhoods, negatively impacting property values and ultimately a municipality’s tax revenue.”⁹⁰ The report specifically mentions Virginia Beach’s Comprehensive Sea Level Rise and Recurrent Flooding Response Plan and calls attention to community adoptions of higher standards, in the form of freeboard, ranging from 3 feet to 1.5 feet for Chesapeake, Portsmouth,

Inflection points in climate change and municipal bond rating

March 6, 2015	Moody’s Questionnaire returned by Virginia Beach
June 18, 2015	Moody’s issues report on Hampton Roads, Virginia municipalities
September 16, 2015	Fitch: sea level rise may play greater role in rating
October 17, 2017	Standard & Poor’s issues FAQ on municipal ratings and climate change
November 28, 2017	Moody’s issues report describing how climate change is evaluated in rating
January 8, 2018	Breckinridge Capital issues press release on sea level rise score

Virginia Beach, Norfolk and Hampton.⁹¹ Moody's writes:

Municipalities that take rising sea levels into consideration in long-term planning and new construction are better positioned to maintain their economic vitality. Further, land use policies that consider areas most vulnerable to sea-level rise and recurrent flooding are crucial to credit strength.

Standard & Poor's issued these questions for local officials to consider in an October 2017 report titled "Understanding Climate Change Risk And U.S. Municipal Ratings":

- *Have you undertaken an assessment of your current vulnerabilities to natural disaster and long-term climate change risks?*
- *How are infrastructure assets exposed to climate change risk, and how are you mitigating any risks?*
- *Does your capital planning incorporate any costs to address any exposures or investment in adaptation?*
- *Have you sought insurance and other forms of risk mitigation?*
- *How would long-term changes in the environment affect population and demographic trends, land use, employment, and other parts of your local economy?*⁹²

While these questions are informative to municipalities, correspondence with Standard and Poor's reveals that a ratings analysis is more subjective. Ted Chapman, S&P Global's Senior Director of the U.S. Public Finance Infrastructure Group states that "The most common unifying thread across all sectors of public finance credit ratings...is the management team['s]" competence and that they are "...thinking far beyond just the current fiscal year."⁹³ S&P reiterates this in its March 2018 article.⁹⁴

Not only was Moody's the earliest to examine climate change risks, it has been the most vocal of credit rating

agencies in warning issuers to prepare for climate change. In a November 2017 report, Moody's warned about the risk of inaction and the risk of credit rating downgrades as a consequence. A National Public Radio piece on the report has Moody's vice president Michael Wertz cautioning inactive states and locals "If you have a place that simply throws up its hands in the face of changes to climate trends, then we have to sort of evaluate it on an ongoing basis to see how that abdication of response actually translates to changes in its credit profile."⁹⁵ The Moody's report may provide the economic case for communities to make a commitment to planning and adaptation projects. While deteriorating future conditions are in the decades ahead, financial consequences of inaction via credit rating are a present day motivator.

The November 2017 Moody's report,⁹⁶ with regard to hydrological changes, speaks to precipitation and rising sea levels, causing chronic flooding and worsening coastal impacts. Moody expects climate mitigation and adaptation strategies will be implemented to lessen damages, but costs are expected to be realized, especially to coastal exposures in damage to infrastructure and buildings. While the report goes into a high level discussion of considerations in evaluating issuers, Moody's believes that its current approach properly evaluates credit risk with "...local governments that face a higher risk of climate shocks are specifically asked by analysts during the rating process about their preparedness for such shocks and their activities in respect of adapting to climate trends."⁹⁷ Moody's evaluation of an issuer currently is cursory in a quantitative sense and relies on posing questions to the issuer and the judgement of the analyst.

Moody's defines "climate trends" as slower movers in the form of sea level rise and evolving precipitation patterns. It defines "climate shocks" as extreme and acute weather events, such as hurricanes, nor'easters and resulting floods. Moody's discloses that ascertaining impacts to credit rating from climate trends is difficult, and is not considered explicitly in its analysis. The agency says that

“...credit challenges that climate change poses are captured in our analysis of economic strength and diversity, capital asset management, fiscal strength and governance, among other credit factors.”⁹⁸

In the case of climate shocks, Moody’s evaluates “...an issuer’s economy, fiscal position and capital infrastructure, as well as management’s ability to marshal resources and implement strategies to drive recovery” and this will be more pronounced as climate change has larger contributions to the severity of events.⁹⁹ The pressures of climate change will result in stressors to the community that include decreasing revenue; increased costs in replacing and repairing infrastructure, staff overtime and debris removal; damaged property; disruption of economy; more costly insurance; and increasing debt service and these will continue even with a decrease in carbon emissions.¹⁰⁰ Population exodus,¹⁰¹ both short term and long term, can have a negative influence on the local economy due to a decreased tax base and reduced collection of sales tax.¹⁰² Moody’s analysts ask more questions of issuers that are exposed to climate shocks in how the local government is preparing and what activity the community is championing to address the risk.¹⁰³ In a Bloomberg article on the report, Moody’s managing director Lenny Jones is quoted as saying:

*What we want people to realize is: If you’re exposed, we know that. We’re going to ask questions about what you’re doing to mitigate that exposure.*¹⁰⁴

The November 2017 report has been praised and expectations are that it will be used as a stimulus in municipalities to take action. Cooper Martin, of the Sustainable Cities Institute at the National League of Cities, found the November 2017 Moody’s report to be transformational:

Moody’s had earlier stated its interest in the ways cities are confronting climate, “but they weren’t going to proactively or preemptively make changes based on

climate,” Martin said. “They would look at the ability to pay, rebuild, and recover, and factor that in, but until late November or early December [2017], they weren’t proactively factoring climate change. This is a big reversal in that sense.”¹⁰⁵

However, there has also been criticism of the report being too topline and absent of details. Shannon Cunniff, of the Environmental Defense Fund, points to the November 2017 Moody’s report as a “good start” but is critical of the lack of change in the evaluation of climate change and the lack of detail, and states “Without more specific information on Moody’s methods...it’s hard to know if they will adequately capture all negative credit risk implications.”¹⁰⁶ She calls for greater transparency in the analysis so that communities have a signal on what measures are required to maintain the municipal credit rating.¹⁰⁷

Risk to Investors and Demand for Transparency

Investor’s interest in the impacts of climate change is growing. Christopher Flavelle of Bloomberg writes “Eric Glass, a fixed-income portfolio manager at Alliance Bernstein, said real transparency required having a separate category or score for climate risk, rather than mixing it in with other factors like economic diversity and fiscal strength.”¹⁰⁸ One fixed income investor, Breckinridge Capital Advisors, did just that.

Breckinridge Capital Advisors has set an inflection point in teaming with the science wing of Climate Central¹⁰⁹ in producing a quantitative flood risk score for coastal municipalities. Breckinridge, a self-described specialist in “investment grade fixed income portfolio management,” in a January 2018 press release¹¹⁰ states that “Impacts of climate change are increasingly a concern for the bond market,” and according to a Bloomberg article in May of 2017, Breckinridge Capital Advisors was getting impatient for the bond rating agencies to make a move.¹¹¹

“Breckinridge Capital Advisors was getting impatient for the bond rating agencies to make a move.”

— Interpretation of *Bloomberg*

As a holder of \$30 billion of municipal bonds, the tool will help analysts assess future risk. According to the press release and interview with Climate Central,¹¹² human population exposure over a multiyear horizon is used as a surrogate for impacts to municipalities:

Municipalities are assigned a value on a scale of 0 to 100 based on what percentage of the population is at risk from expected flooding events. Breckinridge analysts take this score into account when assessing an issuer’s environmental, social and governance (ESG) risks.¹¹³

Breckinridge advanced a method ahead of the bond rating agencies and it may be that investors take the lead on the development of methods to quantify risk or at least to push the ratings agencies to do so. It is expected that the industry will get more sophisticated in assessing the vulnerability of municipal bond issuers to climate change by necessity.

Sea Bright and the New Jersey Coast – A Case Study in Exposure

While the Borough of Sea Bright, New Jersey has recovered five years since Hurricane Sandy, and according to a Borough official¹¹⁴ has a greater tax base in 2017 than before the 2012 disaster, future conditions are going to be challenging for this small municipality. The Borough’s Strategic Recovery Planning Report¹¹⁵ contains a section that analyzes the tax base exposure to sea level rise and 1 percent annual chance flooding with sea level rise. For this municipality, the report concludes that “...impacts will occur in what is presently the most densely populated portions of Sea Bright and the area of the municipality’s

downtown commercial activity currently occurs.”¹¹⁶ In a year 2050 time horizon,¹¹⁷ when the report was authored in 2014, SLR was expected to be just shy of 1.5 feet.¹¹⁸ With this level realized, 20 percent of the Borough’s tax parcels will have some permanent inundation, which represents 17 percent of the tax base determined by structure and land market value.¹¹⁹ This inundation will impact 43 percent of the commercial tax base. Considering the same sea level rise in 2050 with 1 percent annual chance flooding, Sea Bright will experience a dramatic 91 percent inundation of tax parcels and 95 percent of the tax base will be impacted.¹²⁰ The commercially assessed parcels see a nearly total impact at 99 percent with residential properties faring no better at 95 percent.¹²¹ The Mayor of Sea Bright, in an interview with CBS New York in October 2017, points to 103 house elevations, the strengthening of the sea wall and the construction of bulkheads as realized resiliency measures.¹²² But without a continuous elevated bulkhead along the western flank of the barrier island, which is difficult to construct and fund for this 1.29 square mile borough, elevated homes with inundated property will drop in value.

The same analysis was conducted in Strategic Recovery Planning Reports for five other New Jersey coastal municipalities: Commercial and Maurice River Townships, Cumberland County; Highland Borough, Monmouth County; and Little Egg Harbor Township and Tuckerton Borough, Ocean County. Impacts to the tax base from sea level rise ranged from 30 percent to 1 percent, and for 1 percent Annual Change flooding with sea level rise, 50 percent to 16 percent. A number of factors influence the vulnerability of a municipality, to include the topography or relief of the incorporated area, the location, type of existing development, and the existence of any flood protection, therefore a municipal-level assessment is necessary to understand impacts. Wholesale, average annual losses from hurricanes and nor’easters in New Jersey will likely increase by between 64 percent and 174 percent by 2050 in a RCP 8.5 scenario.¹²³ According to the

lead manager on the Strategic Recovery Planning Reports, “...few [New Jersey] municipalities have done anything at all to address the future conditions they are going to be facing.”¹²⁴

The New York Times found that nearly five years after Hurricane Sandy impacted the New Jersey coast, Ocean County municipalities, one of the hardest hit counties by Hurricane Sandy, were 8 percent shy of the pre-storm tax base.¹²⁵ Federal aid was essential to making up the difference in the lost tax base in the few years following the disaster. According to Bloomberg, Ocean County issued 20-year bonds in the summer of 2016 without being asked by Moody’s or Standard & Poor’s about any risk to investors due to climate change.¹²⁶ That is not likely to continue in the future with the recent emphasis by the credit rating agencies and investor hunger to have more disclosure.

Avoiding credit downgrade of municipalities

The Insurance Institute for Business and Home Safety that is funded by insurance companies thinks that “local officials aren’t doing enough to prepare for the threats of climate change.”¹²⁷ According to an interview with Fitch, it made no ratings actions per Hurricane Sandy in 2012, but this was in large part due to the massive disaster response by the Federal government.¹²⁸ This is unlikely to

be sustainable in the future. Gregory Unruh, professor at George Mason University, writes in the Harvard Business Review that “Business leaders and politicians need to begin wrapping their heads around the big idea that climate change may mean huge financial losses in the world’s great coastal metropolises.”¹²⁹ Municipalities, such as Atlantic City, New Jersey, with low revenue might invite risky development to expand the tax base, but over time would degrade revenue and would require additional resources in the aftermath of a disaster. Communities lacking the vision and capacity for climate change planning may need states to intervene to direct development to areas with less future vulnerability.

Jill Gambill, Coastal Resilience Specialist and Public Service Faculty at the University of Georgia Marine Extension and Georgia Sea Grant, points to the Moody’s November 2017 report and states¹³⁰ that “In order to protect their credit rating, it will be important for Georgia’s coastal communities to demonstrate that they are preparing for and adapting to sea level rise....” Standard & Poor’s Rating Service, in a December 2015 publication with an article titled “Climate Resilience Can Protect Ratings From Sea-Level Rise And Threats To U.S. Coastal Infrastructure” stated that “Entities taking steps now to protect credit quality long-term will not necessarily incur damage to current credit ratings.”¹³¹

“Few [New Jersey] municipalities have done anything at all to address the future conditions they are going to be facing.”

— *David Kutner*

Hoboken, New Jersey

“Hoboken sees hazard mitigation as a vitally important economic development and social stability tool.” — *City of Hoboken*

The dense urban and floodprone City of Hoboken, Hudson County, New Jersey, is 1.28 miles square in area with over 50,000 residents.¹³² Over seventy percent of the City is in the FEMA delineated Special Flood Hazard Area, the one percent annual chance floodplain.¹³³ Due to its location on the Hudson River, a legacy of development on filled marshlands, and an undersized combined sewer system, the City has a storied history of impacts from floods. None were more disruptive to the community than the devastation from Hurricane Sandy, which caused \$500 million in damages to buildings, contents and business interruption.¹³⁴

In response to the damages and disruption from Sandy, the City took concerted steps to address its exposure, in the form of planning and implementation of projects. Hoboken reviewed its Master Plan and ordinances with a view to integrate and strengthen policies and regulations to increase safety, maintain operations, minimize business interruption, reduce physical damages, and relieve resident’s emotional turmoil from repetitive flooding.¹³⁵ Listed under the goals of the Green Building and Environmental Sustainability Element of its Master Plan for coastal flooding, Hoboken commits to “Adapt to climate variability, sea level rise, and change to avoid or mitigate coastal flooding impacts.”¹³⁶

Hoboken recognizes its shared vulnerability with its neighboring communities of Jersey City and Weehawken and has partnered with them on a \$230 million Rebuild by Design tidal surge resistance project.¹³⁷ For new construction and substantial improvements, the City adopted a higher freeboard standard in the Coastal High Hazard Area than that of the State of New Jersey. The City issued Resilient Building Design Guidelines to direct strategies by residents, business owners and developers on how to realize reduced vulnerability to existing and proposed buildings. It progressed a Resilient Capital Improvement Plan with retrofits to existing municipal buildings and infrastructure “...that enhance[s] the City’s capacity to withstand, respond to and recover from future natural hazards.”¹³⁸ Additional steps have been taken that are not listed here.

In addition to its exposure to hurricanes and nor’easters, Hoboken expects more frequent and intense rain events that can result in urban flooding.¹³⁹ Pumping stations have been installed in the worst areas of localized flooding. The City has also embraced green infrastructure and higher stormwater management standards to mitigate localized flooding and has created three resiliency parks, integrating public recreation and stormwater management, in addition to stormwater retrofits at the City Hall and installation of bioswales and rain gardens throughout the City.¹⁴⁰

Hoboken has a dedicated chief resiliency officer and a chief sustainability officer, and has demonstrated its long-term commitment to reducing its vulnerability. According to a City report summarizing planning and engineering work funded through post-Sandy funds: “Hoboken sees hazard mitigation as a vitally important economic development and social stability tool.”¹⁴¹ Included in the Sustainability Element of the Master Plan is the statement:

*Hoboken is extremely vulnerable to the effects of climate change, but it is also well-equipped to adapt to and mitigate these effects. Hoboken can, and should, be a model for urban coastal cities to take local action to reduce flood risk and greenhouse gas emissions.*¹⁴²

The above described commitment to planning and actions reinforce the City’s financial health and support Hoboken in maintaining its current credit rating in a bond rating analysis.

Based on the review of credit rating agencies' reports, interviews and experience with community actions, there are some broad actions that a community should commence in order to be less susceptible to a credit rating downgrade.

“Municipalities must get ahead of a credit evaluation in planning and implementation of risk reduction measures.”

— adapted from *Smart Growth America*

Recommendations to communities to buttress resiliency and credit rating:¹⁴³

- Municipalities must get ahead of a credit evaluation in planning and implementation of risk reduction measures;
- Prior to a credit rating, make an assessment of revenue maintenance with the time horizon matching the term of the bond; consider demographic changes due to sea level rise;
- Build flexibility into the municipal budget; have contingencies for unanticipated events;
- Update land use policies to be consistent with future risk, such as integrating Hazard Mitigation Plans¹⁴⁴ with Comprehensive (Master) Plans and updating ordinances;
- Adopt higher standards, such as greater freeboard to account for future conditions of sea level rise and stronger severe weather events; adopt the latest International Building Code;
- Address how existing community assets will be protected using the risk assessment in the Hazard Mitigation Plan; insure what cannot be mitigated;
- Establish a schedule or incorporate flood mitigation (i.e. elevations and voluntary buyouts) in a Capital Improvement Plan and work with state and Federal agencies (e.g. FEMA) to fund

projects; develop mitigation projects ahead of disasters

- Investigate new financial tools, such as insurance-linked securities, in the form of catastrophe or resilience bonds;
- Consider creating a flood control district or stormwater utility to raise and dedicate funding to flood mitigation projects;
- Take credit in the FEMA Community Rating System for flood mitigation, deed restricted open space, emergency management, public works and other actions to reduce vulnerabilities and realize discounts in the National Flood Insurance Program;
- Make and direct investments in the community that will not increase vulnerability;
- Work with your neighboring communities and state in addressing climate change;
- Develop metrics to measure progress and to report to credit rating agencies;

According to Moody's, actions, not ideology are important.¹⁴⁵ The politicization of climate science may be inhibiting the use of certain terms like “climate change” but actions are more powerful than the words used. A case in point is Savannah, Georgia, where work on resiliency is ongoing. An interview¹⁴⁶ with Heath Lloyd, Savannah's chief infrastructure and development officer explains how reducing exposure counts:

Even though we don't do stuff primarily as a function of climate change we do do a lot of things to be more resilient. And that resiliency shows. That resiliency has a huge economic impact. The quicker we can get the city back up running, get people back home, get business open, then obviously that makes this a more resilient city when we have events like hurricanes and those kinds of things.

Findings

Broad findings can be assembled from what was covered in this white paper. They are presented to elected officials, municipal officials, chief resiliency officers, planners, engineers and floodplain managers to take action on flood and sea level rise risk.

- Credit rating agencies are beginning to look at the climate change threats to municipal revenue; interest will increase especially in coastal areas;
- Investors are asking questions about climate change as a material risk and will be driving transparency, detail and refinement in climate change risk evaluation; expect investors to demand more detailed assessments;
- Climate change is a stressor to municipal debt service; extreme weather can be an additional challenge causing impacts that limit fiscal flexibility;
- Federal government's disaster aid (Disaster Relief Fund) buffers municipal revenue loss after a disaster; if this tightened (e.g. FEMA Public Assistance Disaster Deductible), credit downgrades are more likely;
- The NFIP (National Flood Insurance Fund) is important for credit stability in the aftermath of disasters;
- Regional approaches to sea level rise and shared services are attractive to credit analysts;
- Bonds get rerated after 2-3 years via surveillance; investors will be increasingly cautious of future downgrades if later trying to sell the bonds;
- Harvey and Irma are attracting more attention to the issue of credit ratings and water hazards;
- Local government must start planning and being proactive; they don't want to have empty answers for credit agencies and investors;
- Ideological disagreement with or inattention to climate change science will increase costs of

borrowing, thus requiring an increase in revenue and higher taxes;

- Additional study of this issue is warranted to help guide the realization of climate change influences on revenue and debt, and to assist communities with measures that are appropriate responses to credit risk.

“Investors are asking questions about climate change as a material risk and will be driving transparency, detail and refinement in climate change risk evaluation; expect investors to demand more detailed assessments.”

Future Research

Future flooding and climate change influence on bonds is in its infancy. There are a number of investigative paths that would be of value to those interested in the maturation of this topic. Advancement in the knowledge base would include contact with fixed income investors to assess their wariness of exposure risk, to ascertain how investors are influencing the recent attention being given by the credit rating agencies, and to probe how investors are self-informing internal evaluations of bond issuers (e.g. Breckinridge Capital). To further risk disclosure, a quantitative model would be of value to project property value declines due to inundation and the corresponding decrease in municipal revenues. This would inform implementation of resiliency strategies and project prioritization by local government. Since there will be a limit to adaptation funding, an evaluation of what can reasonably be protected by public works, vacation of the most vulnerable lands, and what risk must be assigned to

insurance mechanisms would be of great value to decision makers. The role of public-private partnerships in closing the adaptation financing gap should be explored in relation to bond liabilities. This white paper was intended to be a commencement of a broad acknowledgement of an additional driver of risk adaptation – further study and refinement would progress this work.

Conclusion

While federal policies and regulations with higher standards, in response to climate change and sea level rise, are being rolled back by the Trump Administration, the threat of credit rating downgrades are expected to be growing non-regulatory drivers to future risk planning and community physical adaptation. Direct financial losses and decreasing tax base produced by increasing water hazards present a greater probability of default by local government.

Municipalities face a changing climate that will add a material risk to debt holdings. This consequence is receiving increasing credit rating agency attention and it is anticipated that scrutiny of a municipality's stance will grow as climate change further manifests and as investors demand greater transparency. Investor Alliance Bernstein bluntly stated that when a municipality is asked how it is managing the threats of climate change, and it doesn't have a satisfactory answer, "We will not invest, period."¹⁴⁷

“When a municipality is asked how it is managing the threats of climate change, and it doesn't have a satisfactory answer, ‘We will not invest, period.’”

— Taken from *Bloomberg*

Coastal communities will have to demonstrate that they have planned for and have begun to execute climate

adaptation actions. Standard & Poor's admonishes local governments:

*To the extent we viewed risks associated with exposure from climate change as material to the rating, the absence of such a plan would be a credit negative. In our view, all else being equal, municipal issuers that have plans – and reasonably attempt to provide funding for those long-term plans, including emergency preparedness -- will most likely exhibit relatively less risk to creditworthiness from exposure to climate change.*¹⁴⁸

Standard & Poor's continues in its March 2018 article that “...may adjust our view of management conditions downward if a management team creates a plan and does not execute on it.”¹⁴⁹

A sensitivity analysis on revenue projections will be valuable in considering loss of tax base due to ratable inundation and population migration. Fitch warns that “...local governments that respond hesitantly to climate change may face higher mitigation costs and potentially much higher disaster recovery costs in the future, particularly should federal support mechanisms decrease over time.”¹⁵⁰ While Congress was generous in supplemental appropriations to responding to the devastation of the 2017 hurricane season, Hurricanes Harvey and Irma seemed to have increased the tempo in investor and credit rating interest in climate change risk.¹⁵¹

Local governments are expected to be influenced by increasingly sensitive credit ratings that necessitate greater tax revenue to cover bonding expenses. Communities that prepare and adapt to future flood and sea level rise risks will not only be safer and more resilient in recovering from inundation and storm events, but will be more fiscally sustainable and economically secure with public support offered to proactive elected officials and professionals.

“Communities that prepare and adapt to future flood and sea level rise risks will not only be safer and more resilient in recovering from inundation and storm events, but will be more fiscally sustainable and economically secure with public support offered to proactive elected officials and professionals.”

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