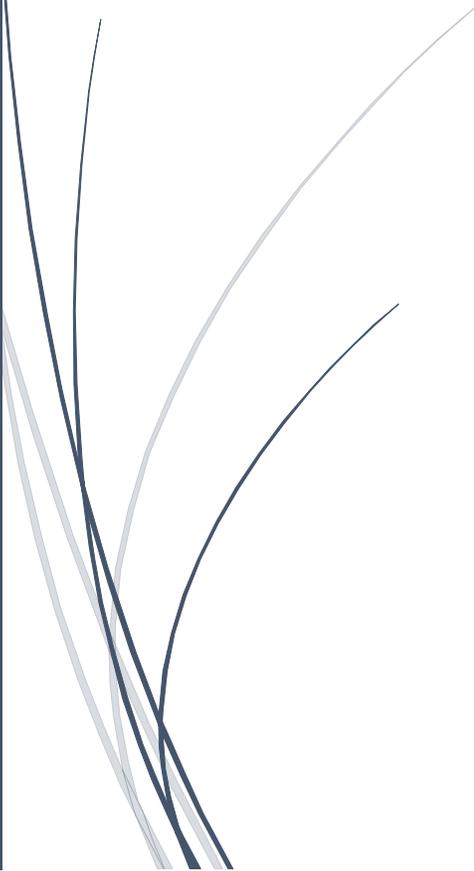


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May 2020

A Watershed-Based Approach to Flood Hazard Mitigation in the Raritan Region

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Abstract

This study examines the flood mitigation plans of the seven counties of the Raritan River watershed to better understand local government flood mitigation planning in the region. In addition, key informant interviews were conducted with federal, state, and county representatives to better understand their perspectives. This study examines how county agencies analyze flood risks and mitigation strategies at the watershed level, the challenges that hazard mitigation planners face when thinking and acting at the watershed scale, as well as the challenges that come with preparing for future conditions.

Introduction

Hazard Mitigation Planning

Hazard mitigation involves acting before a hazard occurs to lessen the negative effects of the hazard on people, property, and the economy. A Hazard Mitigation Plan (HMP) lays out how a government intends to take action to prepare for hazard events (Coastal Hazards Center et al., n.d.). The Disaster Mitigation Act of 2000 mandates that local governments across the United States create HMPs, to be reviewed and approved by the Federal Emergency Management Agency (FEMA), before their community can receive federal funding for hazard mitigation and disaster recovery (Frazier et al., 2013).

FEMA requires that every Hazard Mitigation Plan cover the entire mitigation planning process, from the identification and prioritization of hazards affecting the community to a list of intended government actions to prepare and protect the community (Frazier et al., 2013). Federal regulations also stipulate an ongoing update process: local governments must publish HMP updates every five years to maintain their federal grant eligibility (FEMA, 2011).

Although FEMA dictates the HMP planning process, local governments can control the plan's geographic scope. HMPs can cover a single jurisdiction (i.e. municipality) or multiple jurisdictions (i.e. a county and its municipal jurisdictions). In New Jersey, counties create multi-jurisdictional HMPs. New Jersey counties spearhead the planning effort and create a plan that profiles hazards and mitigation actions for each of their municipalities; once adopted by a municipality, the county plan meets the federal mandate for that municipality.

Hazard Mitigation Planning and a Watershed-Based Approach

Multi-jurisdictional hazard mitigation planning need not be only a county and its municipalities; rather, multi-jurisdictional hazard mitigation planning, or flood mitigation planning, can have a nature-based geographic scope rather than a human-based geographic scope. For example, a watershed-based approach was taken by the Delaware River Basin Commission (DRBC) in 2008. DRBC published the *Multi-Jurisdictional Flood Mitigation Plan for the Non-Tidal NJ Section of the Delaware River Basin* along with the New Jersey Department of Environmental Protection (NJDEP) and the New Jersey Office of Emergency Management (NJOEM). The plan's geographic scope included forty-three municipalities from Hunterdon, Mercer, Warren, and Sussex counties in New Jersey that all experience flooding from the Delaware River and its tributaries (DRBC, 2008).

A watershed-based approach, in the words of the DRBC (2008), “ensure[s] that final mitigation actions address both local jurisdictional needs and regional multi-jurisdictional needs”. This is because a watershed-based approach accounts for the ways in which upstream

land use decisions impact downstream flood conditions. In a watershed, precipitation falls and can either seep into the ground or flow as runoff into a storm drain or waterbody (NOAA, 2018). When precipitation falls on impervious (paved) surfaces, it rapidly flows as runoff, which increases the likelihood of a flood event (NOAA, 2018; Frazer, 2005; National Research Council, 1999). Further, increased impervious surface cover upstream increases the volume of runoff that flows into storm drains and rivers and can extend this increased possibility of flood to downstream communities (Asdak et al., 2018). Increased development changes the “historical frequency” of flood events in that area, meaning that the stormwater flowing into streams that have historically experienced much less runoff are more likely to result in “a catastrophic flood” (Frazer, 2005).

Further, future conditions in New Jersey expect to also increase the severity of flooding. Research indicates that climate change will increase the frequency and severity of major rainfall events in New Jersey (Broccoli, 2019). Flooding will also likely be exacerbated due to increased impervious surface cover, decreased riparian areas, and increased pressure on underperforming stormwater infrastructure in the Raritan River Basin in particular (Malone et al., 2018). Future conditions amplify the urgency for comprehensive flood mitigation action.

A watershed-based approach draws its power from its regional perspective, connecting upstream and downstream communities and accounting for regional land use practices. Challenges arise when there are multiple government entities with the watershed. Critically, cooperation is necessary because although a watershed approach looks beyond municipal boundaries, municipalities alone have control over land use decisions such as impervious surface cover ordinances (Brody, 2004).

This study examines the flood mitigation plans of the seven counties of the Raritan River watershed to better understand local government flood mitigation planning in the region. It examines how county agencies analyze flood risks and mitigation strategies at the watershed level, the challenges that hazard mitigation planners face when thinking and acting at the watershed scale, as well as the challenges that come with preparing for future conditions.

Research Methodology

This study involves both a review of the most recent HMP updates of the seven counties in the Raritan River watershed (as of Spring 2019) as well as key informant interviews with federal, state, and county representatives working on hazard mitigation planning in the region.

The study area for this analysis was the Raritan River Basin (or Raritan River watershed). In the Raritan River watershed, the Raritan River and its tributaries flow through north-central New Jersey into the Raritan Bay in Middlesex and Monmouth counties (Malone et al., 2018). The Raritan River watershed covers 1,105 square miles; it is the largest watershed entirely located in New Jersey. In total, seven counties contain jurisdictions in the watershed. Ninety-eight municipalities have land within the watershed boundaries; a majority of these municipalities can be found in Hunterdon, Middlesex, and Somerset counties (Malone et al., 2018).

The HMP updates are publicly available, and were taken from each county website for the following New Jersey counties: Hunterdon, Mercer, Middlesex, Monmouth, Morris, Somerset and Union. All HMP updates were multi-jurisdictional, all-hazard plans. All HMP

updates were approved by FEMA between 2014-2016 except for Somerset County's HMP update, which was a 2018 Draft version. The HMP updates were reviewed for the following content: (1) damage caused by flooding; (2) discussion of flooding at a watershed scale; (3) discussion of coordination with other counties and municipalities outside of the county's jurisdiction; and (4) discussion of future conditions (climate change, sea level rise, and future development). This study also examined the possible challenges to watershed-based coordination.

Key informant interviews were conducted with federal, state, and county staff members involved in hazard mitigation planning in the Raritan River watershed. Interviewees were informed that the interviews were not for attribution. As Rutgers is a research institution, the interview questions and protocol were submitted to the Internal Review Board. The IRB determined the study was exempt from their review.

Representatives from Hunterdon, Middlesex, Monmouth, Morris, and Mercer counties were available for interviews during Summer 2019. An interview with representatives from Somerset County was postponed until the Somerset County Board of Chosen Freeholders could pass a resolution allowing for participation in Rutgers studies. The Somerset County Board of Chosen Freeholders approved the county's participation in research projects on August 13, 2019 (Somerset County Board of Chosen Freeholders, 2019). Union County representatives could not be reached. Interviewees had experience in emergency management, planning, and engineering; many worked for their government entity for over a decade. Potential interviewees were identified through attribution on the HMP updates, county websites, and through expert recommendation. Interviews collected information on watershed-based mitigation actions, cross-jurisdictional coordination, and the consideration of future conditions in flood mitigation planning. A full list of interview questions can be found in Appendix I.

Results

Damage from Flooding in the Raritan River Watershed

Review of HMP Update

Both Middlesex and Union counties cite flooding as “the most frequent, destructive, and costly natural hazard” in their counties (Middlesex County Office of Emergency Management, 2015, p.4-83; Union County OEM, 2016). Flooding in Middlesex County has resulted in seventy-three injuries, seventy-two of which were related to flooding from Hurricane Floyd in 1999. From 1996 to the writing of the 2014 HMP update, Monmouth County flooded 129 times, injuring two and incurring over \$10 billion in property damage. Ten billion dollars of property damage alone was caused by Hurricane Sandy (URS, 2014). Between 1996 and 2017, Somerset County was flooded 171 times, incurring over \$655 million in property damage, two fatalities, and 100 injuries (Somerset County MPC, 2018). The Green Brook Sub-Basin, in Union, Middlesex, and Somerset counties, was the site of “major flood events in 1973, 1996, and 1999 (Tropical Storm Floyd)” (Union County OEM, 2016). “Two deaths and approximately \$80 million in damages within the Green Brook Sub Basin” resulted from Tropical Storm Floyd (Union County OEM, 2016).

Interview Findings

County representatives recounted the geographic scope of their flood challenges, as well as hot spots that tend to flood often. County representatives mentioned challenges from riverine,

coastal, and nuisance flooding from the Raritan River and its tributaries as well as other waterbodies. For example, interviewees from counties on the western side of the state focused on flooding from the Delaware River and its tributaries. Some interviewees did not believe flooding from the Raritan was significant in their county.

Flooding at a Watershed Scale

Review of HMP Update

Some sub-watershed areas and municipalities cause particular concern to the counties in the region. The Green-Brook sub-watershed is of particular concern to Middlesex, Somerset, and Union counties (Middlesex County OEM, 2015; Somerset County MPC, 2018; Union County OEM, 2016). Bound Brook (in the Green Brook Sub-Basin) and Manville (in the Millstone River Sub-Basin) receive notable attention in the Somerset County HMP update.

Some counties have jurisdictions in multiple watersheds. Besides the Raritan River watershed, counties in this region also overlap with the Delaware River watershed (Hunterdon, Mercer, and Morris counties) and the Passaic River watershed (Morris and Union counties) (Tetra Tech, 2015; Tetra Tech, 2016a; Tetra Tech, 2016b; DRBC, 2008). As a result, although flooding may be an issue in each of these counties, the source of that flooding may not be related to the Raritan. Of the “eight main waterways creating significant flood prone areas in Hunterdon County,” seven are found in the Delaware River watershed and one, the Third Neshanic River, is found in the Raritan River watershed (Tetra Tech, 2016a). A majority of Morris County is in the Passaic River Basin, and most of the county’s flooding comes from the Passaic, Pompton, Rockaway, and Whippany Rivers. Morris County does not consider the Raritan River as one of the “major rivers creating significant flood prone areas in Morris County” (Tetra Tech, 2015).

Interview Findings

Some representatives interviewed felt that the counties in the Raritan River watershed effectively address the effects of flooding and flooding on a sub-watershed level, but are poor at addressing flood hazards from a watershed perspective. While there are geographic descriptions of watersheds in each county’s HMP update, there is little coordination among counties regarding how mitigation actions will affect its hydrologically connected neighbors. One interviewee acknowledged that increased impervious cover in upstream communities stresses the system overall, and that “there’s a disconnect between the political boundaries and the geographic reality that’s out there”.

Coordination with Other Counties

Review of HMP Update

A number of multi-jurisdictional flood control commissions exist in the Raritan River Watershed. A regional body meant to oversee flooding in the Green Brook sub-watershed, the Green Brook Flood Control Commission, is composed of volunteers from Middlesex, Somerset, and Union counties, municipalities from each county, and the state of New Jersey (Union County OEM, 2016). A more recent commission, the South Central Middlesex County Flood Control Commission, was created in 2005 in response to flooding in the Helmetta, Jamesburg, and Spotswood municipalities in Middlesex County. Flood control actions by the Commission extend beyond Middlesex into Monmouth Counties (Middlesex County OEM, 2015). The Raritan & Millstone Rivers Flood Control Commission is not very active at the moment, but was active about two years ago during a United States Army Corps of Engineers (USACE) Flood Control

Feasibility Study in Manville. The project did not pass the cost-benefit analysis test and therefore was not implemented (Sara Malone, personal communication, 2019).

Union County is currently involved in a multi-year feasibility study by the USACE on flood mitigation in the Rahway River Basin, which includes portions of Essex, Union and Middlesex counties. The USACE has also been involved in flood mitigation projects in the Green Brook Sub-Basin of the Raritan River Basin (Union County OEM, 2016).

Hunterdon County has a history of working with other counties on hazard mitigation actions. Hunterdon County crafted their original Hazard Mitigation Plan alongside Mercer, Sussex, and Warren Counties as part of the Northern Delaware River Region Steering Committee. While drafting the 2016 Plan update, Hunterdon and Warren Counties jointly tackled acquisitions of severe repetitive loss (SRL) properties in their jurisdictions. Hunterdon County became involved in this joint process as a way to meet their goals of educating communities about flood mitigation actions and finding property owners interested in buy-outs. In total, nine municipalities (five of which are in Hunterdon County) agreed to help the counties contact SRL property owners in their municipalities for eventual acquisition. After three meetings with property owners, “20 SRL property owners expressed interest in being acquired, had current National Flood Insurance Program (NFIP) flood insurance, and would be willing to be a part of a FEMA Flood Mitigation Assistance (FMA) grant application” (Tetra Tech, 2016a).

Many counties considered or are considering “regionalization or consolidation of hazard mitigation planning, administration, and/or implementation at the county level” (Tetra Tech, 2016b; Tetra Tech, 2015; Middlesex County OEM, 2015; Union County OEM, 2016). While Mercer and Morris counties no longer want to move forward with regionalization, Union County called it a medium priority and Middlesex County called it a high priority (Tetra Tech, 2016b; Tetra Tech, 2015; Middlesex County OEM, 2015; Union County OEM, 2016). Many counties want to collaborate with other government entities to prioritize Repetitive Loss (RL) and Severe Repetitive Loss (SRL) property mitigation, including Hunterdon, Mercer, Middlesex, Morris and Union counties (Tetra Tech, 2016a; Tetra Tech, 2016b; Tetra Tech, 2015; Middlesex County OEM, 2015; Union County OEM, 2016).

Unfortunately, some of the past mitigation actions by the counties of the Raritan River watershed were watershed-based, inter-jurisdictional plans that encountered financial issues. Regional “Stormwater Management Hydrological and Drainage Studies (Project #2A)” in Monmouth County were halted due to lack of known funding sources and lack of staff (URS, 2014). Somerset County sought to “Support Completion of Millstone River Flood Study (SC7)” but the US Army Corps of Engineers (in their 2016 Millstone River Basin, NJ Flood Risk Management Feasibility Study report) could not find an alternative in which benefits outweighed the costs and so did not recommend the Millstone federal project move forward (Somerset County MPC, 2018).

Interview Findings

While counties have to give notice and invite other counties into the planning process for an HMP, most counties do not actively pursue the involvement of other counties in their HMP planning process. One interviewee mentioned that every county has Mutual Aid Agreements with one another for assistance during times of disaster. However, as another interviewee remarked, these contracts pertain more to post-disaster recovery than mitigation.

Two counties mentioned coordinating with four regional county partners along their borders. A couple counties brought up previous regional flooding-related plans from 2008 and 2011 as examples of cross-jurisdictional coordination. That said, interviewees did not discuss the specifics of these plans, their successes or failures.

Community Rating System (CRS) User Groups seem to be a helpful forum for sharing information with municipalities and with other counties. Three counties in the Raritan River watershed have CRS User Groups: Middlesex, Monmouth and Morris counties. One county mentioned that as a part of their CRS User Group, they held an all-morning event with speakers from their county's Planning and OEM departments, as well as state, federal, and non-profit entities to discuss stormwater management and flooding.

Another forum for possible coordination (as mentioned previously) are flood control commissions. One county mentioned several challenges in making flood control commissions effective. Losing active leaders on commissions and repeated failures to secure permits for projects has hindered the efficacy of regional flood control commissions and regional stormwater mitigation projects in at least two counties.

Interviewees mentioned that larger regional projects are usually the purview of the USACE, and many of the regional projects mentioned were from many years ago. Interviewees felt that the planning process is isolated and not well socialized across counties and municipalities.

Future Conditions: Climate Change and Sea Level Rise

Review of HMP Update

Each of the counties within the Raritan region address climate change in their Flood Hazard Profiles. Hunterdon County acknowledges local climate change and references the rise in temperature in northeastern United States as well as the increase in “the frequency of intense precipitation events” in the New York metro region. Hunterdon, Mercer, and Morris counties acknowledge that more precipitation will lead to more flooding, habitat loss for birds and commercial fish, which may possibly be compounded by sea level rise (Tetra Tech, 2016a; Tetra Tech, 2016b; Tetra Tech, 2015). Middlesex County summarizes the findings of a 2013 New Jersey Climate Adaptation Alliance report on local sea level rise projections (Middlesex County OEM). Monmouth County, while describing the probability of a flood hazard event, notes that “anticipated sea level rise will increase the risk of damages/losses due to future coastal flooding events. Rising sea level over time will shorten the return period (increasing the frequency) of significant flood events” (URS, 2014).

The Raritan River is tidal in Monmouth, Middlesex, and Union counties. These three counties profiled sea level rise utilizing a mapping tool created by NOAA, FEMA, and the USACE to visualize sea level rise projections after Superstorm Sandy. Counties also used sea level rise projections by NOAA with four possible projections: lowest, intermediate-low, intermediate-high, and highest. While Monmouth County only mapped the high scenario, Middlesex County mapped all four scenarios. Union County mapped the impact of sea level rise for 2050 and 2100 for the county as well as the City of Linden and the City of Rahway in particular. Union County also summarized the findings of the Resilience-Preparing for Climate Change report (Union County OEM, 2016).

Interview Findings

The discussion on climate change was particularly illuminating regarding officials' perceptions of climate change. One interviewee mentioned that this last plan was the first time the state really addressed climate change, which the interviewee attributed to a change in political climate. Further, as the state was late to address climate change in hazard mitigation planning during the mid-2010s, so were the counties. The interviewee thought there may be a larger discussion of the impacts of climate change in the counties' early 2020s plans.

Across counties and levels of government is an acknowledgement of climate change and sea level rise. One county impacted by the flooding tides surmised that their community acknowledges the reality of sea level rise but may disagree about its causes. This pattern was evident in interviews as well; some interviewees were more willing than others to discuss the anthropogenic aspects of climate change and its projected impacts. One interviewee noted their reliance on outside consultants for providing the county with climate science and future climate change projections. Further, the effects of climate change on flooding, like increased precipitation, are not felt uniformly across the region. One storm may cause severe flooding downstream, but only cause high winds upstream. One interviewee also conjectured that current barriers to cross-county coordination (discussed below) will become more surmountable as the reality of climate change begins to manifest.

Future Conditions: Future Development

Review of HMP Update

Many of the counties mapped their planned developments alongside their flood zones to illustrate the impact of floods on future development. Morris County took this approach, mapping the addresses and parcels of planned new developments alongside 100-year and 500-year flood maps (Tetra Tech, 2015). In Somerset County's Jurisdictional Annex, they identify planned future development and infrastructure for the next five years and note if these developments would be in a known hazard zone (Somerset County MPC, 2018). Monmouth County analyzed the potential for future development to impact flood hazard vulnerability for a number of delineable hazards, including flood hazards. Monmouth County compared population projections from 2010 to 2040 with the area of vacant parcels able to be developed and its current flood hazard areas to determine if and to what degree future development will be impacted by flooding. Further, Monmouth County also compared these variables to sea level rise projection for 2050 to account for the possible expansion of flood zones in the near future (URS, 2014).

Interview Findings

One interviewee mentioned that he imagines that the lower part of the Raritan River watershed, if not more, is likely fully developed.

One interviewee praised other counties in the watershed for being vigorous in pursuing farmland and open space preservation and underscored the importance of acquiring open space as an intelligent land use strategy. This interviewee seemed concerned with his county's future population growth. Yet this individual noted that the county can only really control land use on the properties they own, mentioning some sustainable land use practices on county-owned land and facilities.

Representatives from one county discussed the joint issue of increased rainfall and impervious surface cover. First, interviewees noted that the county has been experiencing intense precipitation over a short period of time, and that impervious surfaces increase the speed of runoff during precipitation events. County representatives noted that old stormwater infrastructure needs to be replaced but may be cost-prohibitive to most municipalities.

Most counties seemed to at least acknowledge and at most actively partner with their planning departments on projects and programs related to hazard mitigation. One county mentioned having a Resilience Element in their Master Plan. Overall, one interviewee mentioned the difficulty in assessing future conditions in hazard mitigation planning while the issues of current conditions have yet to be fully addressed.

Representatives from one county mentioned that, while counties receive site plans from their municipalities, county engineers and planners may only assess how planned developments would influence county roads and drainage. While reviewing drainage allows the county to ensure each site properly mitigates stormwater runoff, they still review sites in a piecemeal fashion rather than comprehensively. Regarding implementing more stringent stormwater management regulations, this county would prefer to defer to the state so that stormwater management standards would be the same across the state.

Challenges to the Watershed Approach

Limits of County Authority

The greatest challenge to effective hazard mitigation at the county level is the lack of direct authority. Counties must mediate between federal, state, and municipal demands. Federal and state governments control the planning guidance, technical assistance, and funding aspects of hazard mitigation planning. In New Jersey, a fully-incorporated state, municipalities control land use decisions, and decide the mitigation actions in an HMP. Within this framework, the counties, who are responsible for writing HMPs, struggle to find their role. One county's representatives described how they try to act as an umpire, determining which areas are most in need of assistance based on impacts or damages and letting the federal or state government send their resources there first. At this same time, this county confessed that if municipalities do not identify an issue, then the county cannot take action on it.

Funding

It was the opinion of one interviewee that the way that the current FEMA program is structured is not conducive to a watershed-based approach. The FEMA grant program is structured such that the state is the grantee and a municipality is a sub-grantee; there are certain federal and state rules that make cross-boundary projects difficult. Financially, the scale of the watershed approach is beyond the current funding structure of hazard mitigation planning; regional projects are usually more expensive than the kinds of projects funded through FEMA hazard mitigation grant. As previously mentioned, interviewees were of the opinion that larger scale projects are usually the purview of the USACE.

Multiple counties mentioned budget constraints in interviews. Although some FEMA grants cover 75% of the cost of a project, the municipalities must cover that other 25%. It may be tough for towns to come up with 25% for projects that cost millions of dollars. Mitigation actions continue to be ongoing across HMPs due to lack of funding. Further, the project start-up and

beginning phases are the most difficult because of the high cost to get shovel ready. Counties need money to develop proof of concept, and even after that upfront cost, they still might not get the grant. Permitting also costs money.

Need for a Policy Window

A focus on mitigation has arisen out of crisis. In other words, the policy window for mitigation planning has opened. Policy windows occur when public concern and attention focuses on a particular issue due to a significant event; this creates a window of opportunity in which policymakers must act to create change before public interest dwindles (Kingdon, 1984). While no one wants a natural disaster to occur, major storms like hurricanes Irene and Sandy create interest around hazard mitigation. But as the memory of those events fade in public consciousness, interest in flood mitigation policy fades too. This message came from the federal level, the state, and four of the counties interviewed. For example, one county identified that their CRS User Group resulted from municipal interest in the CRS program shortly after Irene. Further, this riverine county felt that the momentum built after Irene may have suffered because of the statewide shift to coastal flooding resulting from Superstorm Sandy; current efforts to mitigate riverine and coastal flooding may be less effective now that the memory of Hurricane Irene is less fresh. On the other hand, coastal communities centered the conversation around Superstorm Sandy and its role in gaining momentum for flood mitigation. Further, another county mentioned that mitigation funding is granted to a community undergoing a declared disaster. Outside of a declared disaster, mitigation funding is nationally competitive.

Small Staff Size and Expertise

In their HMP updates, Middlesex and Union counties both state that they believe “regionalizing hazard mitigation efforts...would not work,” and that municipal emergency managers should remain in charge. Middlesex and Union counties cite “limited staffing at the county level that would not allow the close coordination needed to effectively manage a program of this type.” (Middlesex County OEM, 2015; Union County OEM, 2016).

In interviews, counties noted that small staff sizes require individuals to take on multiple roles. They rely on resources provided by the state and outside consulting firms, because state agencies and outside consulting firms have employees that specialize in one area, and county employees must prioritize breadth of responsibilities over depth of expertise. While counties may have the knowledge needed for and desire to implement regional projects, county employees have many competing priorities.

Lack of Leadership

One interviewee also acknowledged that, in order to get things done, one would need a “group of committed individuals.” That said, the state has thus far shown a reluctance to dictate mitigation policy at the local level.

Lack of Information Sharing

According to the Middlesex County HMP update, lack of good data prevented Middlesex County from conducting a quantitative study of nor’easters (Middlesex County OEM, 2015). In addition, Hunterdon County was not able to conduct a quantitative analysis of the risks from dam failure due to data confidentiality (Tetra Tech, 2016a). Data quality and accessibility hinder the ability of a county or inter-county organization from properly assessing and mitigating hazards.

Identifying and Partnering with a Variety of Levels of Government

Multiple counties discussed issues with identifying and partnering with other government agencies. Roadway jurisdiction was a common example. If flooding impacts a roadway, and the community wants it raised, the municipality must identify who has jurisdiction over that road and coordinate with the owner. Counties may find it overwhelming to coordinate with their municipalities, who each have their own interests. On top of this, counties must be in conversation with other counties and a variety of state agencies. One interviewee mentioned that all government entities may not understand how it all connects, particularly with transportation infrastructure. There is a need for cross-jurisdictional coordination to prevent situations in which lack of communication could lead to disaster.

Changing Faces in Government

One county also felt that staff turnover at federal agencies, state agencies, and municipal governments limits the institutional knowledge about local issues, reduces the number of built relationships across governments and leads to changing issue priorities that undercut political will around nascent projects.

Barriers to Planning for Climate Change and Sea Level Rise

The barriers to planning for climate change and sea level rise include all those previously mentioned, and a few distinct challenges as well.

While the representatives I spoke with all acknowledged the existence of climate change and sea level rise, they remarked on the difficulty of convincing municipalities to restrict development in future inundation areas, especially in counties with coastal communities. One interviewee said that we “need a culture of acceptance that sea level rise is happening,” and mitigation efforts must be enacted now. Municipalities and residents must also realize that mitigation will not eliminate flooding but will ensure life can continue alongside the flooding.

Counties are worried about the expense and political feasibility of the major infrastructure projects needed to prepare for climate change. Stormwater infrastructure improvements involve tearing up, repaving and closing roads, which are expensive and politically unfavorable. Designing an elevated bridge is expensive and time-consuming, and seemed futile to one interviewee if based on FEMA Flood Insurance Rate Maps (FIRM) that do not account for sea level rise. Further, sometimes physical constraints make certain ideal projects impossible.

Counties also noted the lack of clear guidance on what to do, and how to deal with unprecedented events. One engineer remarked that classifying recent storm events is difficult: instead of recording inches of rain by day, they have to record inches of rain by hour. Another interviewee called on the state to look into more stringent restrictions in stormwater management.

Other interviewees conjectured that market forces will eventually dictate where people can and cannot live anymore, but now, more people are moving to the water’s edge. A real fear for municipalities is retreat: when a municipality’s population retreats, the tax ratables of a small community will decrease, and so the community cannot pay for municipal services for the remaining residents. This, as well as community pride, may result in hard-fought battles by community members to save their town.

Echoing this sentiment, one interviewee noted that, as climate change continues to progress, issues will start arising when critical infrastructure fails, and difficult choices will have to be made about servicing communities in particularly hazard-prone areas. Because the state must protect its critical facilities and infrastructure first, climate change may strain resources such that there may be trade-offs. Because of this possibility, this interviewee emphasized that communities must plan their adaptive strategy for 2050. Such forethought is necessary when dealing with the uncertainty and unprecedented challenge of climate change.

Possible Avenues to a Watershed-Based Approach

Municipal Solutions

Integrating Mitigation into Local Land Use

One interviewee noted that integrating HMPs into local Master Plans is a critical step to connecting flood mitigation to better land use practices. The interviewee stressed the importance of engaging land use professionals and local land use boards in hazard mitigation planning, as the interviewee perceived a lack of knowledge of the existence of HMPs and an inadequate consideration of flooding in current land use practices. This interviewee emphasized that while flooding cannot be stopped from happening, land use practices can be altered to accommodate future flooding.

County Solutions

Integrating Mitigation into Local Land Use

Offices of Emergency Management that do not often meet with their planning departments should consider building a stronger partnership. During one interview, there were representatives from the planning, engineering, and OEM departments present. This led to a good amount of inter-departmental discussion. Counties should consider periodic inter-departmental meetings on issues related to flooding, stormwater management, and climate change.

While counties do not have land use control, they do oversee county-owned infrastructure, such as roads, bridges, and stormwater systems. Counties should consider leveraging this control to create countywide policy.

Creating Community Rating System (CRS) User Groups

One possible forum for interdepartmental and intergovernmental communication and coordination is the CRS User Group. One interviewee remarked that the CRS program does create avenues that incentivize watershed-based thinking. Counties note the value of these CRS User groups as forums for information sharing. Counties that currently do not have a CRS User Group may want to consider starting one. In this way, counties may have a role as “a supplier of expertise and knowledge to complement the municipalities,” as one interviewee defined it.

State Solutions

Updating Stormwater Regulations

One interviewee discussed Pennsylvania’s Act 167. While New Jersey has the same stormwater management standards across the state, under Act 167, Pennsylvania releases water quickly in downstream areas of a watershed but retains water for a longer period of time upstream. This approach prevents exacerbated flooding from a deluge of stormwater discharge.

The state should consider updating its stormwater guidance and should consider encouraging the adoption of watershed-based stormwater regulations on the municipal level.

Federal and State Solutions

Incentives for Mitigation Efforts

Federal and state entities control flood mitigation funding. One solution offered by two interviewees was “rewarding good behavior” and “dis-incentivizing free-riders.” This strategy would reward best practices by prioritizing funding communities that have already made efforts towards resilience. With the limited amount of total available resources, federal and state entities may reward those who have already shown a commitment to resilience, because then they know that that jurisdiction will be a cooperative and active partner in the mitigation process. Efforts towards resilience would include high insurance penetration rate, municipal funding toward resilience, resilient land-use planning, and CRS participation. Federal and state representatives may also encourage counties and municipalities to go beyond FEMA requirements with incentives and statewide mandates.

Disincentives for Developing in Hazard Areas

One interviewee suggested enacting disincentives for developing in particularly dangerous hazard areas. Instead of prohibiting development, which could qualify as an unconstitutional “taking,” federal and state entities could discontinue federal or state funds for infrastructure.

Academic Solutions

Improve Knowledge About Data Tools

One interviewee remarked that “our best resource is probably information.” One interviewee mentioned a desire for an academic entity to provide regional information on climate change. Interviewees from multiple counties remarked that free modelling software to analyze the risk of flood hazards to their structures and infrastructure would be very useful. Interviewees from one county remarked one storm in which municipalities were re-routing traffic based on their own needs and were rerouting traffic into other municipalities' flood prone areas. Establishing regional emergency routes not subject to flooding would be one project regional mapping software could solve. Another community requested future projections for the frequency and intensity of rainfall in 2030. It could be that these resources exist, but counties do not know about them. Academics that have developed open source data tools may want to consider greater effort in outreach to local governments to encourage them to utilize these tools.

Further, urban planning programs could provide county governments with a toolbox of model resilient zoning ordinances, cases studies, and pilot programs to show local governments options they may not have heard of before. While national resources may exist, one county thought it would matter more if resources came from a local academic institution.

Graduate student studios are also an opportunity for students to study the feasibility of possible mitigation projects. Students could study the benefits and negatives of impacts of projects, identify properties that need mitigation, and/or identify worthy projects that meet FEMA cost/benefit standards.

NGO Involvement

Watershed organizations should consider getting involved in the hazard mitigation planning process to support watershed-based thinking.

Climate Adaptation and an "Adaptive Mindset"

Integrating Hazard Mitigation and Climate Adaptation Plans was suggested by one interviewee, who hinted at the integrated state plan in Massachusetts. This interviewee also discussed how in Charlotte-Mecklenburg, North Carolina, the county wanted to account for larger future floodplains so they managed for the future floodplain rather than the current one. Mecklenburg did a build-out analysis and now regulates to a fully built-out floodplain.

Areas for Further Research

Low-Income Households, Renters, Socially Vulnerable Populations and Hazard Awareness

Representatives from three counties and one non-county interviewee touched on issues surrounding low-income households, housing tenure (whether a resident is a homeowner or renter), social vulnerability and hazard awareness.

Representatives from one county lamented that renters may be unaware of the hazards their new waterside community poses.

Representatives from another county lamented that low-income renters and older adults may be living in affordable housing units built in the floodplain; while it is a legal mandate in the state of New Jersey to provide opportunity for low-income people to find housing within their means, those with limited finances and mobility may have a particularly difficult time preparing for, coping with, and recovering from flood events. For example, one interviewee brought up the difficulty in rescuing elderly adults with wheelchairs and oxygen tanks who have been trapped by a flood. This representative was also concerned that low-income renters may not have flood insurance.

One representative discussed a possible phenomenon in their county in which people buy the tax lien on abandoned homes and then flip them as cheap rental property. While mortgage companies typically require flood insurance, those who do not require a mortgage (i.e., renters) need not buy flood insurance as the NFIP policies are voluntary. Therefore, renters may become unduly burdened.

One non-county representative explained that FEMA mitigation funding after Superstorm Sandy for elevations or acquisitions was only applicable to homeowners, and that renters are only eligible for Individual Assistance. As such, mitigation funding may only target those who can afford homeownership. This representative underscored the importance of government keeping poor people who can't afford insurance outside of the floodplain, as the expense of going through the disaster cycle multiple times will likely end in personal bankruptcy. While people often speak of the moral hazard of the NFIP, this interviewee spoke of the moral hazard caused by mitigation dollars paying to keep the uninsured in harm's way. This interviewee then reiterated the necessity to prevent low-income households with a diminished capacity to cope with flood hazards out of harm's way.

With these comments in mind, some necessary next steps include research on:

- The exposure and vulnerability of renters to flood hazards in the region
- Whether renters in the region are aware of flood hazards prior to leasing their apartments
- How to ensure the region's housing is both affordable and resilient

Conclusion

A watershed-based approach requires all levels of government to coordinate so that regional land use and stormwater management practices effectively minimize flood hazards and sea level rise. A review of recent publicly available HMPs in the Raritan River watershed and interviews with regional stakeholders illuminated many challenges in implementing a watershed-based approach. These challenges include limited county authority, funding limitations, the need for a policy window, small staff size and expertise, lack of leadership, lack of information, challenges in identifying and collaborating with multiple government partners, and changing faces in government. Climate change and sea level rise exacerbate these challenges, particularly multiplying the strain on financial resources.

Fortunately, there are currently a number of steps that municipal, county, state and federal actors can take towards a watershed-based approach. First, municipal planning and zoning boards should consider becoming acquainted with their HMP and consider flood mitigation in their local land use decisions. Counties should also consider mitigation in their land use decisions. Second, counties should consider creating a CRS User Group if they do not already have one. Third, state agencies should consider updating stormwater regulations to treat upstream and downstream areas differently. Finally, federal and state actors should consider ways to incentivize local mitigation efforts and disincentivize development in particularly hazardous areas. In summation, governments at all levels should consider strongly mainstreaming flood mitigation into their land use and stormwater management decisions and fostering interdepartmental relationships in the same government and with governments in the same watershed region.

Acknowledgements

I would like to thank my interviewees for their time, information, and interest in the project.

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Appendix I: Interview Questions

Group A– County Employees

A.1. In updating the County Hazard Mitigation Plan, does your county address flooding at a watershed level? (Could be yes, no, not sure; if yes, go to A.2; if no, go to A.3)

A.2. If so, what are some of your county’s past successes in addressing flooding at a watershed level? Any areas of improvement for your county in addressing flooding at a watershed level?

A.3. What barriers may prevent your county from addressing flooding at watershed level? For reference, barriers could include a lack of information, lack of legal authority, lack of time, budget constraints, political or policy priorities, etc.

A.4. Are there any resources necessary to better address flooding at a watershed level? For reference, these resources could be scientific or technical expertise, accessible data tools, funding sources, etc.

A.5. In updating the County Hazard Mitigation Plan, does your county coordinate flood mitigation strategies with other counties or municipalities not within your county borders? (Could be yes, no, not sure; if yes, go to A.6; if no, go to A.7)

A.6. If so, what are some of your county’s past successes in coordinating with other counties/non-county municipalities on flood mitigation actions? Any areas of improvement for your county in coordinating with other counties/non-county municipalities on flood mitigation actions?

A.7. What barriers may prevent your county from coordinating with other jurisdictions on flood mitigation actions? Again, barriers could include a lack of information, lack of legal authority, lack of time, budget constraints, political or policy priorities, etc.

A.8. Are there any resources necessary to better coordinate with other jurisdictions on flood mitigation actions? Again, these resources could be scientific or technical expertise, accessible data tools, funding sources, etc.

A.9. In updating the County Hazard Mitigation Plan, does your county consider future conditions such as changing climate conditions and future development patterns (increased impervious surface cover, water use, etc.)?

A.10. What are some past successes for your county in considering future conditions? Any areas of improvement for your county in considering future conditions?

A.11. What barriers may prevent your county from considering future conditions? Are there any resources necessary to better consider future conditions?

Group B – NJOEM or FEMA

B.1. In assisting the counties of the Raritan River watershed in hazard mitigation planning, do these counties effectively address flooding at a watershed level?

B.2 If so, what are some past successes in addressing flooding at a watershed level? Any areas of improvement in addressing flooding at a watershed level?

B.3. In assisting the counties of the Raritan River watershed in hazard mitigation planning, do these counties effectively coordinate mitigation strategies with other counties or municipalities not in their county borders?

B.4. If so, what are some past successes in coordinating with other counties/non-county municipalities on flood mitigation actions? Any areas of improvement in coordinating with other counties/non-county municipalities on flood mitigation actions?

B.5. In assisting the counties of the Raritan River watershed in hazard mitigation planning, do these counties effectively consider future conditions such as changing climate conditions and future development (increased impervious surface cover, water use, etc.)?

B.6 What are some past successes in considering future conditions? Any areas of improvement in considering future conditions?

B.7. Please provide some examples of exceptional cross-county coordination in New Jersey and/or the United States that you would like to see implemented in the Raritan River watershed.

B.8. What are the biggest barriers to cross-county coordination on flood mitigation?

B.9. What resources are necessary to improve cross-county coordination on flood mitigation?

Thank you so much for speaking with me today. I hope that what we have discussed today can lead to improved hazard mitigation planning in the Raritan region in the future.