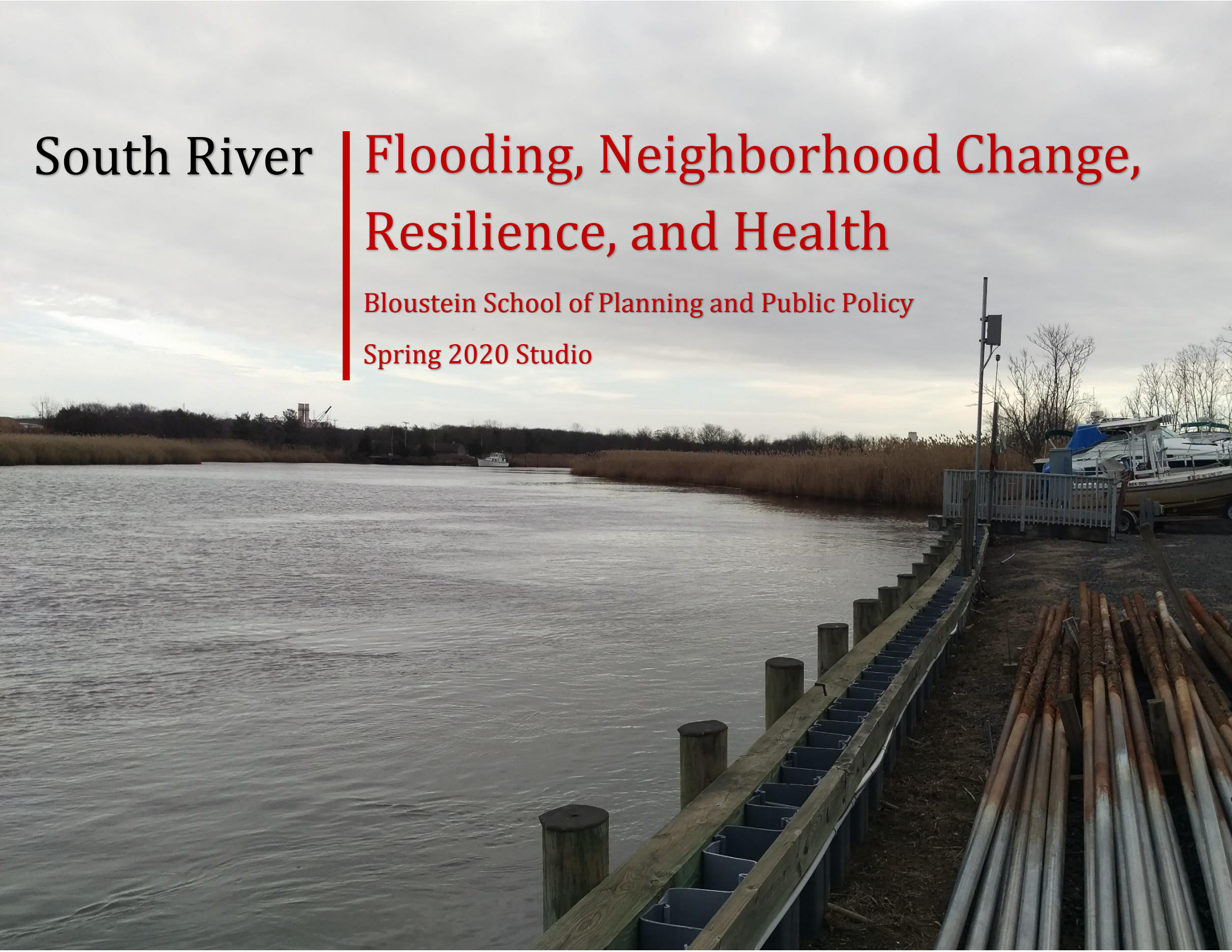
South River

Flooding, Neighborhood Change, Resilience, and Health

Bloustein School of Planning and Public Policy

Spring 2020 Studio



Environmental Planning Studio
Course: 970:511:02

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Source: South River Historical and Preservation Society

EXECUTIVE SUMMARY

Rutgers University students worked with community partners including the Lower Raritan Watershed Partnership, South River Green Team, and the Middlesex County Office of Planning in preparation for a New Jersey Department of Environmental Protection (NJDEP) "Raritan River and Bay Regional Resilience Grant". This grant, pre-COVID-19, was scheduled to launch in the Borough of South River, NJ in May, 2020. South River is one of five municipalities in the regional team led by Middlesex County Office of Planning and the Lower Raritan Watershed Partnership. Other municipalities include Old Bridge, Perth Amboy, Sayreville and Woodbridge. The Resilience Grant is designed to support regional Coastal Resilience Plan development, creating a blueprint for protection of property, lives, infrastructure, and natural environments by guiding policies, regulations, resources, and funding.

With the goal of ensuring equitable health outcomes in resilience planning, project partners seek detailed documentation of demographics, health, water infrastructure, and housing security for the Borough of South River. In particular, project partners have asked for the studio team's assistance to highlight health and other statistics for South River's Census Tract 69. Census Tract 69 faces the problem of local inequity regarding life expectancy and other health issues; compared to the other two Census tracts within South River, life expectancy is lower in Census

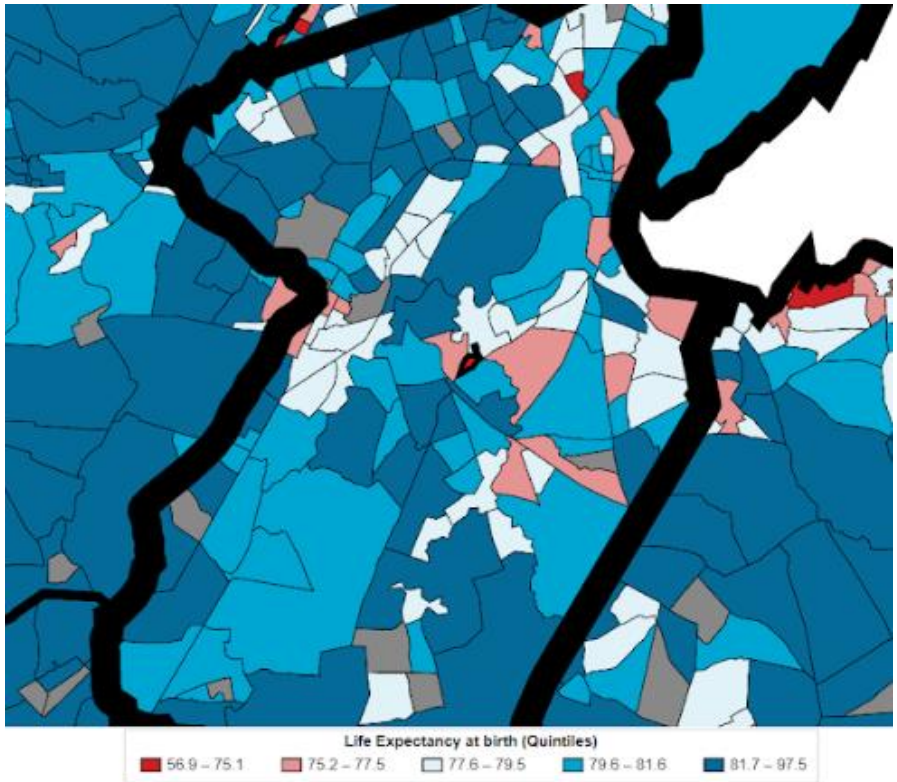
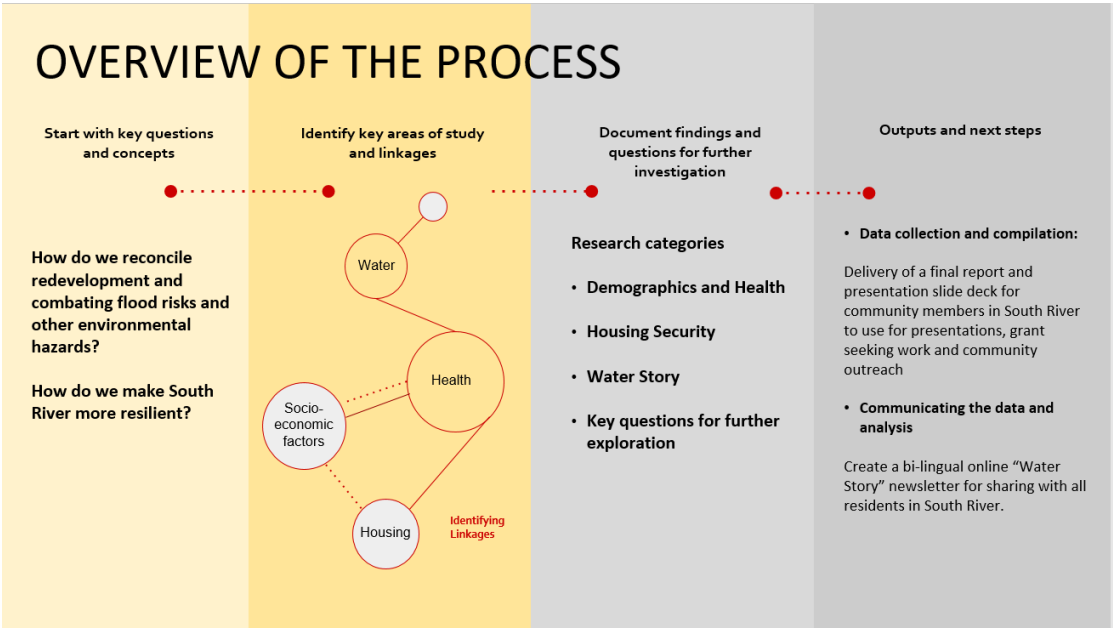


Figure 1: Life Expectancy at birth in Middlesex County with Census Tract 69 in red. Source: Center for Disease Control, CDC.com

Tract 69 (see Figure 1). This project strives to research and address contributing factors to this discrepancy. South River is also the smallest and least resourced of the municipalities involved in the NJDEP Resilience Grant. Thus, the project and its resulting products will help South River build local capacity for, and establish an equal footing to engage in, future resilience and other grant seeking.

Finally, making the link between public health and water issues, including contamination, stormwater and wastewater overflows, flooding risks, and aging water infrastructure, project partners have asked for assistance in developing educational material telling the municipality's "Water Story". In this we worked to develop a set of materials (a powerpoint slide deck and the "Water Story" portion of this report) that explain how water is used and how it moves through the community. That is, we document flooding risk, and also explain water infrastructure in South River (water supply, wastewater, stormwater) for distribution to Borough residents as a basis for municipal and other actions to advance resilience and improve water quality, supply and access.

This report includes development of detailed case study analyses of housing security and water resources in South River for presentation to the South River Green Team and sharing with South River residents. In the process, the studio team identified relevant planning, design, and community development issues for South River. Amongst these issues were natural hazard mitigation within the local context of a diverse community, the question of vacant and neglected Blue Acre buy-out lots in the municipality, a growing trend of disinvestment, and the matter of equitable responses which consider population groups and Census tracts equally. The work done in developing the report was conducted with the expectation that our findings and our outlined short-, mid- and long-term actions will aid the South River Green Team, South River Community, and organizations like the Lower Raritan Watershed Partnership address the planning, design, and community development issues.



This project sought to:

- Identify linkages, especially between climate and health. This involved work to:

-Compile basic demographic, health, and housing data for South River to use in future grant-related work and other projects

-Better understand opportunities for equitable community (re)development and resilience

-Better understand disparities in health outcomes, especially in Census Tract 69

-Better understand South River's vulnerabilities to hazards related to flooding and climate risks

- Gather community member's stories about water, documenting them as part of South River's oral history
- Support a holistic understanding of water resources via the creation of South River's "Water Story," using Sustainable Jersey guidelines as the tool of choice
- Develop materials to help South River communicate vulnerabilities to climate hazards and opportunities for resilient redevelopment.

Due to the COVID-19 pandemic, which began during the second half of the Rutgers University semester, the studio team was unable to accomplish all its goals. Some goals are now included in the "Next Steps" section, and are suggested as action items for community partners and future Rutgers studios. Some "Next Steps" include: further exploration and community engagement on local housing markets and the threat of "bluelining" (see the Housing section); deeper census tract-level analysis of income and health; public participation to prioritize the water issues facing South River (see Water Story section), and more. COVID-19 has made apparent deep inequities within American communities, and South River must similarly take stock of and address any lines of division the pandemic has made apparent within its boundaries. Finally, the most pressing next step is the dissemination of the information gathered in this project to South River locals in an understandable, equitable, and (visually) appealing manner.

GUIDING PERSPECTIVES: *Equity and Watershed Considerations*

Equity

Cities are increasingly focused on the idea of resilience. This is something particularly relevant when it comes to the intersection of disaster risk management and climate change adaptation[1]. However, communities' resilience is highly unequal. "Resilience runs the risk of passivity, favoring the already advantaged and privileging existing power relations"[2]. We know that "hazards disproportionately impact low-income and minority communities; they receive fewer resources to recover, and disruptions often exacerbate already existing inequalities"[3]. This is indeed the case in South River Borough.

Equity is emerging as a core component of sustainability and resilience. Our work with the South River community made clear the need for equity considerations, and we integrated equity as central factor. But how do we define equity? And equity for whom?[4] Our studio built on the widely accepted conception of Schlosberg and adopted a tripartite framework of social equity that includes distributional (of goods and benefits), recognitional (of agency), and procedural (participation, not only in process but in formulating and defining the solutions) equity

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[1] Meerow, Sara , Pani Pajouhesh , y Thaddeus R. Miller. «Social equity in urban resilience planning. » *Social equity in urban resilience planning, Local Environment, 24:9*, 2019: 793-808.

[2] Matin, Nilufar, John Forrester, y Jonathan Ensor. «What is equitable resilience? » *World Development 109*, 2018: 197-205.

[3] Meerow, Sara , Pani Pajouhesh , y Thaddeus R. Miller, p.794.

[4] Park, Angela. *Equity in Sustainability: An Equity Scan of Local Government Sustainability Programs.* USDN Urban Sustainability Directors Network, 2014.

dimensions. We understand that all three dimensions of (in)justices shape communities' resilience in all its forms[5].

Adopting this framework implies envisioning urban planning in South River as a collective exercise, an ongoing demonstration of democratic principles at the community level. In other words, resilience must be conceived as a community-led project. Thus, our work with South River community members was about collaborating in equal terms to generate and achieve the best possible output. It was about establishing a process of active involvement and participation of all members of the community.

Watershed Scale Considerations

Working with the Lower Raritan Watershed Partnership as a client raised awareness of watershed management approaches vs. New Jersey's Home Rule approach in the face of climate change, sea level rise, and stormwater runoff and other flooding.

New Jersey's "Home Rule" bias in land use decision-making means that municipalities are not required to take into consideration the impact on regional growth patterns, existing or planned land uses in adjacent municipalities, or watershed and larger ecological systems impacts. Examples of undesired regional impacts of local land use decisions include flood control decisions that displace flood waters to neighboring municipalities, and fragmentation of habitat that compromises regional environmental health. Local impacts are felt in low income

[5] Meerow, Sara , Pani Pajouhesh , y Thaddeus R. Miller.

communities that are not only not prioritized for flood protection or environmental clean-ups, but that also continue to be identified for siting of locally undesirable land uses (LULUs).

On the other hand, watershed planning demands integrated thinking and coordination. And watershed management of large ecosystems is inherently science-driven. Climate change has brought attention to the need for science-based land management. Watershed land management is a science-based approach, and watersheds play an increasingly important role in establishing a context for federal, state, and local policy. As such there is increased opportunity for watershed-level planning to guide land use decision-making in the state.

With respect to the work of our studio we found that the watershed management perspective offered a valuable alternative to Home Rule approaches in that it:

1) situates planning, landscape design, and land use policy in a larger regional context;

2) includes considerations of ecosystems and hydrologic functions in discussions of water infrastructure management;

3) promotes healthy communities and resilience through equity considerations at larger scales; and

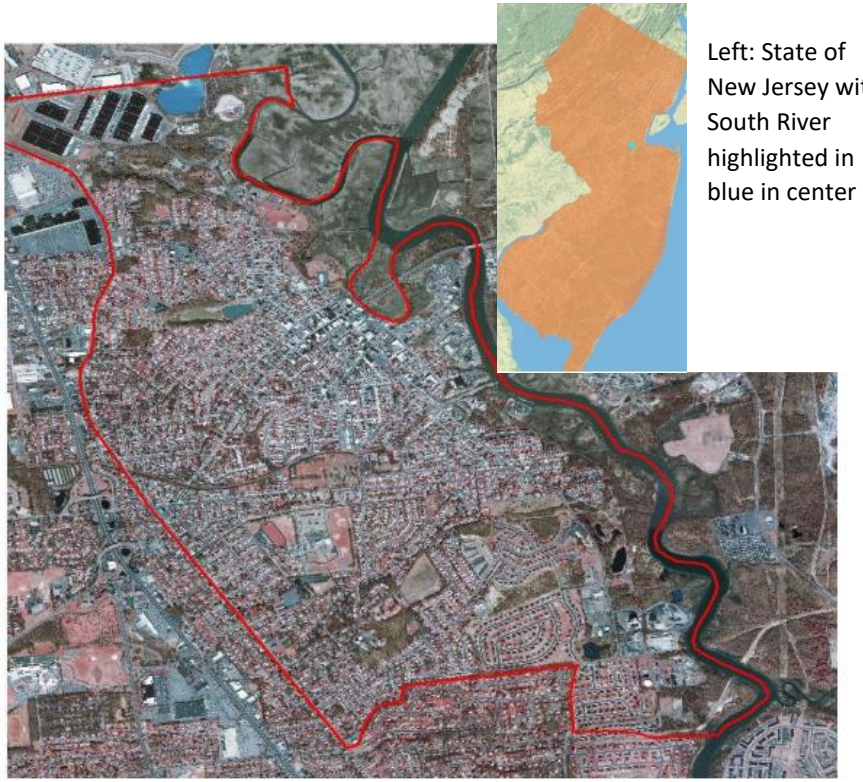
4) identifies ways to optimize environmental assets and environmental awareness in context of climate change, sea level rise, and other flooding at the municipal level for larger watershed benefits.

PROJECT PARTNERS

This project was a collaborative effort to gather information about climate and health related vulnerabilities facing South River in the years since Super Storm Sandy. How has South River recovered from the flooding and other damages suffered during that 2007 event? How well prepared is South River to weather future flood events? This project was also conceived to build capacity across agencies to better deal with current and future environmental, social, and health-related issues, specifically surrounding water and flooding in South River and the larger coastal Lower Raritan River region. This studio would not have been possible without the active engagement of the partners listed below.

The Borough of South River

The 2.9 square mile Borough of South River is in Middlesex County. Its shape is defined by the tidally-influenced South River to the East, and it is bordered by East Brunswick and Sayreville (Figure 2). The Borough is governed by the town council and Mayor John Krenzel, who was a participant in some of the outreach events conducted throughout the semester. Demographic information about South River is included later in this report.



Left: State of New Jersey with South River highlighted in blue in center

Figure 2: Map of the Borough of South River, with the South River on east border[6]

[6] New Jersey Department of Environmental Protection, Bureau of GIS. 2020.

Lower Raritan Watershed Partnership (LRWP)

Founded by Heather Fenyk, who also served as the lead faculty for the studio, the non-profit Lower Raritan Watershed Partnership (LRWP) aims to restore, enhance, and conserve, the natural resources of the Lower Raritan Watershed through science-based stewardship, education and innovation. The LRWP brings a watershed perspective to landscape management and resilience planning. The organization's day-to-day work focuses on activities including water quality monitoring of rivers and streams, watershed restoration, and environmental education and outreach. The LRWP is community outreach lead on the NJDEP "Raritan River and Bay Regional Resilience Grant".

> ***Coastal resilience must be looked at holistically and regionally. We must include engineering, nature-based, economic, and social solutions to successfully mitigate long term-impacts. Coastal states and communities must focus on developing the capacity for regional coastal resilience management plans that integrate businesses, communities, non-profits, academic institutions, and government (at all levels). Without proper stakeholder engagement, coordination, and participation our proposals will continue to fall short of what is needed to prepare for sea level rise."***
>
> ***-Johnny Quispe, LRWP Board Member***

Middlesex County Office of Planning

The Middlesex County Office of Planning's primary responsibility is to prepare a Comprehensive Master Plan (CMP) that outlines development and growth for the County, and to monitor its implementation. CMP elements include the Open Space and Recreation Plan; the Farmland Preservation Plan; the Wastewater Management Plan; and the Housing and Land Use Element. Another key responsibility of the Office of Planning is review and processing of all revisions and

amendments to the countywide future wastewater service area (FWSA) map. Middlesex County also runs a Community Rating System (CRS) Users Group to assist municipalities enrolled in the National Flood Insurance Program's (NFIP) voluntary floodplain management program.

New Jersey Department of Environmental Protection

NJDEP is a state agency tasked with protecting environmental quality and public health to create vibrant sustainable communities. This Studio worked most closely with climate and flood resilience representatives within the NJDEP.

South River Green Team

The South River Green Team is an appointed body of residents that is tasked with identifying challenges, creating action plans, and overseeing different environmental projects. The Green Team is a special commission designed to help the community obtain Sustainable Jersey certification and then progress through the increasing levels of certification which are designed to improve municipal sustainability and open new grant opportunities.

Sustainable Jersey

Sustainable Jersey (SJ) is a New Jersey based non-profit and municipal certification program that seeks to empower communities to build a better world for future generations with the tools, training, and financial incentives they need to pursue critical sustainability initiatives. As part of this project our studio piloted a draft SJ action called the "Municipal Water Story," a tool designed to lead a municipality through the collection of data to create a shared narrative that describes water.

OVERVIEW OF ISSUES

This section briefly outlines the major resilience-related issues faced by the community of South River. Although most of these problems are multidimensional and require the collaboration of individuals across specializations to achieve resolution, for the sake of simplicity, they are categorized under the umbrella terms of planning (including housing), design, and community development. The three subsections describe the kinds of issues encompassed by these broader terms and how they play out in the context of South River.

Planning for Resilience

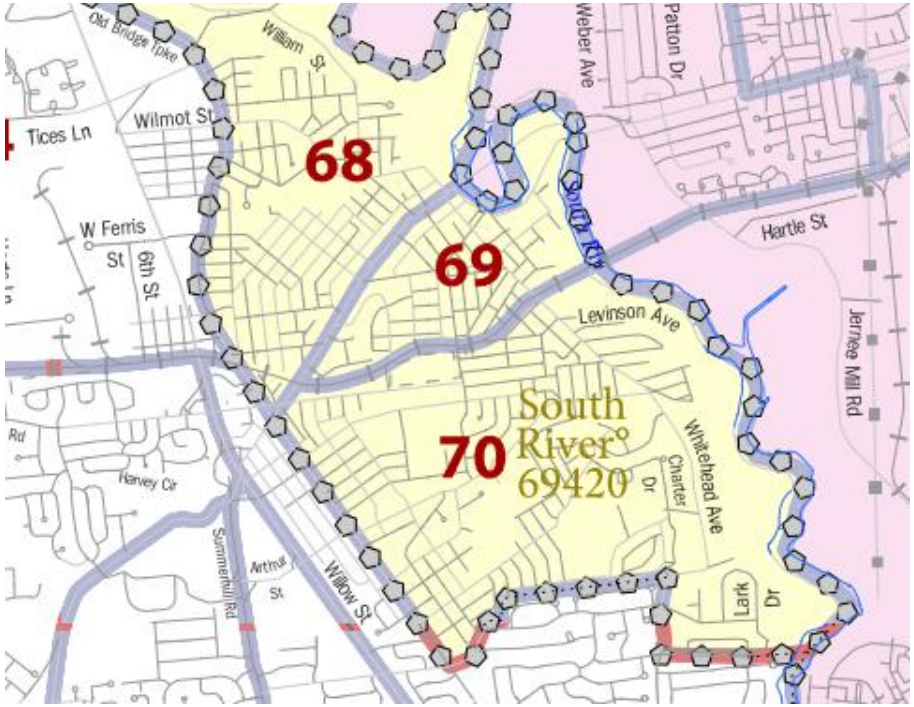
South River's location, cultural composition, and environmental concerns make it a unique scenario from the planning perspective. As Super Storm Sandy made clear, there is pressing need to take urgent steps to effectively mitigate issues pertaining to climate change, including flooding and stormwater management. Rising sea levels put South River at risk of future flooding and can potentially result in losses to life and property if adequate steps are not taken to manage the threat of flood inundation in the borough. Tools such as the United States Geological Survey's (USGS) Flood Inundation Mapping (FIM) program can be used by the borough to estimate their flood risks, develop and validate flood inundation map libraries, and make cost-effective mitigation, adaptation, and resiliency-building efforts based on this data. In addition, Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRM) along with FEMA's National Flood Insurance Program (NFIP) can be guiding tools for planners and policy makers to accurately assess the extent of at-risk lives and properties, and take concrete steps

towards achieving a socioeconomically equitable outcome aimed at increasing the borough's adaptive capacity.

Also significant is notable variation in life expectancy by Census block, which brings attention to a need to ensure an equitable outcome for the entire community, especially within the housing context. South River comprises three census tracts (as shown in **Figure 3**), all of which vary in terms of demographic attributes, such as life expectancy and mortality rates.

Figure 3:

Map of Census Tracts within South River



As was described in multiple interactions with municipal residents, another significant planning problem relates to development pressures at the intersection of water infrastructure, including drinking water, wastewater conveyance, and stormwater. Borough leaders and residents emphasized concern regarding failing water infrastructure and the need to intelligently plan for both water infrastructure extension and removal to accommodate development pressures and limitations on floodplain development.

Finally, the South River community is made up of residents belonging to several cultural backgrounds, in addition to existing disparities related to gender and income. Among the largest in the borough are the Portuguese and the Spanish communities. Russian and Polish are also commonly spoken languages in South River. This adds a layer of complexity to any measures taken towards effective communication of risks to the general population. A major part of the planning problem, in addition to the more straightforward issues of sea level rise, stormwater management, sewer service area extension, and management of buyout lots, is the need to decide on solutions which will take into consideration the needs of all residents, especially the most vulnerable. Particulars relating to issues of equity are further detailed in the 'Description of the Community Development' section below.

Overview of Blue lining

Amongst the planning and housing problems we feel are of interest to South River is the issue of blue lining. Blue lining is a new lending practice which may soon occur nationwide in flood and storm prone areas. It is the practice of lenders refusing to loan to buyers seeking to invest in areas deemed susceptible to flooding and storm-related damage. In October 2019, the Federal Reserve Bank of San Francisco published a series of 18 papers with specific warnings regarding

the potential practice of blue lining.[7] These papers examined community impacts of blue lining, and predict that home values could fall significantly due to the refusal of banks to lend mortgages to those seeking to repair properties damaged by floods, or potential buyers of flood prone communities.

While blue lining has the potential to limit future development in flood prone communities, lower home values could cause a loss of revenue for communities like South River through diminishing taxes, which could make them even more vulnerable to flooding due to lack of funding available to address the issue. With blue lining developers or lenders will be discouraged from financing and constructing new homes, apartments, and shopping centers, in areas which may flood and cause significant damage to structures. This lack of willingness to invest may decrease the desirability of a coastal community and make it less likely individuals will want to live, work, and find leisure in these communities. Blue lining may impact coastal communities on both the East and West coasts of the United States. Many Americans could soon see their net worth, which is often tied to their properties, fall significantly.

The consensus of researchers working with the Federal Reserve Bank is that certain aspects of blue lining may already be occurring despite lack of awareness by potentially affected communities. For example, researchers concluded that high-elevation properties in coastal

[7] Bernstein, Asaf, et al.,"Strategies to Address Climate Change Risk in Low- and Moderate-Income Communities," Community Development Innovation Review (Federal Reserve Bank of San Francisco, October 2019), https://www.frbsf.org/community-development/publications/community-development-investment-review/2019/october/strategies-to-address-climate-change-low-moderate-income-communities/)

communities tended to appreciate quicker over 47 years than low-elevation properties in the same area. This suggests homes closer to bodies of water and more vulnerable to flooding have historically sold for less. On average, low-elevation properties sold at a 7% discount, though researchers found it difficult to determine whether it was solely elevation which drove the price drop, or rather property characteristics and water damage[8]. Whatever the reason, it appears buyers are considering sea level rise, proximity to bodies of water, water damage, and the probability of flooding (whether every 100 or 700 years), when purchasing property. Now, banks will likely consider these same factors when determining whether to loan to potential buyers in coastal communities. Since many prospective buyers will be prevented from purchasing homes in coastal communities, it will also prevent homeowners from selling their properties. As a result, current homeowners will be subjected to a higher likelihood of experiencing future floods and subsequent damage to their properties with little recourse and solution.

It should be noted that blue lining is a legal discriminatory lending practice[9]. While at first glance it may seem the drop in property value due to sea level rise would be a problem for mostly wealthy people and communities, the opposite is true. Out of 175 communities that can expect chronic flooding by 2045, nearly 67 communities (40%) have poverty levels above the national average. To worsen the problem, it appears that the sea level rise discount is only sought by wealthier buyers, such as investors, while low to moderate income individuals are more likely

[8] Bernstein, Asaf, et al.,"Strategies to Address Climate Change Risk in Low- and Moderate-Income Communities," Community Development Innovation Review (Federal Reserve Bank of San Francisco, October 2019), https://www.frbsf.org/community-development/publications/community-development-investment-review/2019/october/strategies-to-address-climate-change-low-moderate-income-communities/)

[9] Christopher Flavelle, "Bank Regulators Present a Dire Warning of Financial Risks From Climate Change," The New York Times (The New York Times, October 17, 2019), https://www.nytimes.com/2019/10/17/climate/federal-reserve-climate-financial-risk.html)

to buy a property at full price, indicating they could eventually be shocked at the actual lessening value of their property. Blue lining will more directly affect the average American instead of the popular belief it will only affect those with expensive waterfront properties. In turn, this adverse effect will only serve to deplete low- and middle-income communities of their wealth and resources[10].

Landscape Design for Resilience

South River's design problem is multifaceted and includes several interlinked dimensions. In addition to the serious issues of flood risk related to sea level rise and stormwater flows, the issue of derelict buyout lots is a significant concern. Post Superstorm Sandy, 184 properties in the borough's floodplains were significantly damaged. Of these, 76 properties qualified for buyouts under the New Jersey Department of Environmental Protection's (NJDEP) Blue Acres Program. Properties bought under this program are often demolished and the lots are left vacant. This has left multiple vacant and untended lots scattered across South River.

To prevent further dilapidation of these properties, residents, architects, and environmentalists have proposed uses for them which would benefit the entire community. Proposals include the design of a rain garden or expansion of the community garden in Pacer's Field along the

[10] Bernstein, Asaf, et al.,"Strategies to Address Climate Change Risk in Low- and Moderate-Income Communities," Community Development Innovation Review (Federal Reserve Bank of San Francisco, October 2019), https://www.frbsf.org/community-development/publications/community-development-investment-review/2019/october/strategies-to-address-climate-change-low-moderate-income-communities/)

floodplain. Waterfront revitalization is also an issue of interest to community members, and one proposal is to design interconnected habitat along the South River as a community space and link this to the interventions undertaken at the buyout lots. Although the proposals are in place, the lag in execution is a direct consequence of the difficulty in obtaining required permits for these projects. Too often, decisions on these issues are made lot by lot without taking the larger landscape into consideration. Or decision making is bureaucratic, lacking input from a diversity of professions. There is great need for, and in fact a great opportunity for, collaboration and shared insights by experts from many fields.

With relation to the flood risk that the borough of South River faces, the problem of significant impervious cover along the town's waterfront further exacerbates the risk of rising sea levels and floodplain inundation. Impervious cover along the most vulnerable areas of the floodplain affects the natural vegetation in the area, thereby reducing the soil's natural defense against flooding. This also contributes significantly towards reducing South River's resiliency against future flood risks.

However, issues pertaining to floodplain and watershed management are on a scale which is bigger than the scope and reach of any individual municipality, South River included. Ecological restoration and habitat conservation policies and decisions need to be approached with a regional perspective and common guidelines will need to be applied to all the municipalities which are a part of the South River floodplain and larger watershed. A collaborative, regional approach to this issue will help ensure a uniform strategy towards the problems of impervious

cover, watershed management, and ecological restoration, and help improve the collective quality of the South River floodplain.[11]

Community Development for Resilience

The South River community has a rich mix of diverse ethnicities, the predominant ones being the Portuguese and the Spanish communities. Several smaller communities also reside in South River and form a part of the town's diverse population. While this provides a vibrant and

[11] United States Census Bureau, 2020.

multinational cultural context to the town, this also comes with the fact that different backgrounds may translate to different issues and needs to be addressed. All design, planning, and policy interventions in South River must consider the perspectives of all these communities to ensure that these interventions are, in fact, truly beneficial to South River. In addition, as mentioned earlier in the report, the existence of a diverse diaspora in the borough, presents the challenge of language barriers. It is crucial to engage in effective communication of risks and challenges to the different communities in a way which is easy to understand and engaging for all members. All design, planning and policy interventions will have to be tailored in a way which considers the varying needs of the different subsections of the larger community.

Furthermore, in recent years, there has been a growing trend of disinvestment by residents within town. Instances of vacant buyout lots, a lack of community spaces, lack of an active relationship with the river, and a lack of diverse employment opportunities, point towards a sense of detachment with the town. Issues of recurring floods and a slow response from government bodies may have catalyzed this reaction from the community.

The issue of equity, both cultural and financial, plays a significant role in such a situation. To ensure equal opportunity for all, and to impart a sense of balanced consideration for all communities and individuals, it is crucial to devise a system to be able to involve key members of all cultural communities, income levels, genders, and political inclinations, if not all members, in decisions which would have a borough-wide impact. Opening the platform for constructive discussions, and active consideration and implementation of suggestions from the community may go a long way in establishing a culture of equitable development in South River.

DEMOGRAPHICS AND HEALTH

Methods

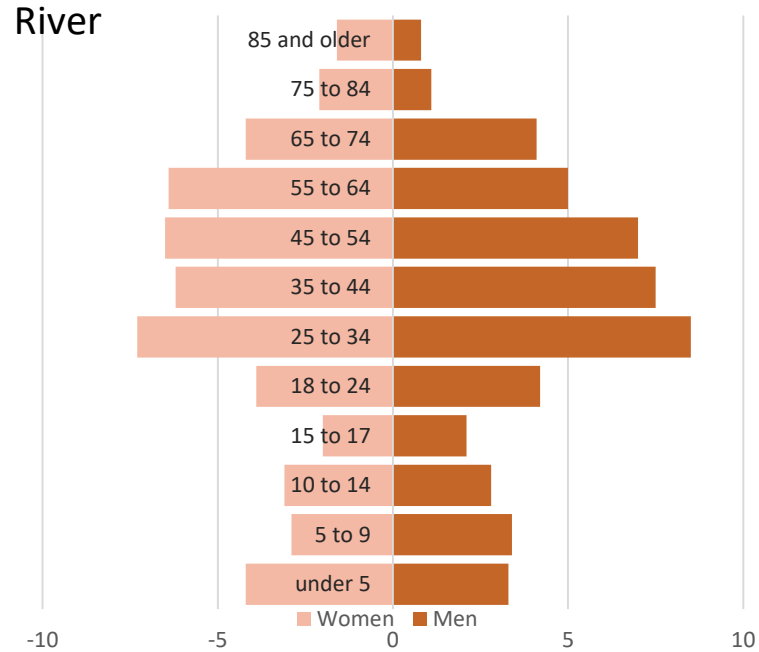
Our Demographics analysis engaged data from the 2018 American Community Survey's (ACS) 5-year estimates for South River and the New Jersey Department of Health. The 2018 ACS data was obtained from Social Explorer[12] which was more convenient to use because Social Explorer has more recent data than American Factfinder and allows one to choose what data to look at in one document. The studio chose to look at mortality rate to compare South River to Middlesex County and New Jersey in order to determine if it is cause for concern. The studio also chose to look at occupation, employment rate, and poverty status by gender in order to determine if there were any gender disparities as well as to get an idea of the makeup of the town. Health insurance information was only available by age demographic, but it was chosen to determine which groups are more likely to be covered. Generally, these variables were all chosen to determine how South River fares in terms of equity because occupation gives an idea of how people support themselves and is also related to one's ability to obtain quality healthcare.

[12] American Community Survey, 5-year estimates. Population data, 2018. Prepared by Social Explorer. (accessed 2020).

Data

For demographics and health, our team used data collected from the New Jersey Department of Health and the 2018 American Community Survey (5-year estimates) for South River, Census tracts 68-70, and Middlesex County. The demographics section used health and employment data to find if there may be equity issues in the town whether by gender or age. The total population of South River was 16,091 in 2018. The population pyramid (**Figure 4**) shows how dispersed gender is in South River. According to 2018 estimates, there are 7,977 males and 8,114 females with a median age of 37.5. The population pyramid shows that South River holds most of its population between the ages of 25-54.

Figure 4: Population Pyramid for South River



The graph below (**Figure 5**) compares the mortality rate between New Jersey, Middlesex County, and South River using data obtained from the New Jersey Department of Health. The graph shows that South River's mortality rate is quite erratic, but it generally displays that South River has lower life expectancy than the State, and significantly lower life expectancy than Middlesex County. Of note is South River's flood prone Census Tract 69, home to a low socio-economic status immigrant community. Census tract 69 has a four-year lower life expectancy than in neighboring tracts in South River, well lower than the national average and the lowest in Middlesex County. The average mortality rate for South River is 813.5 per 100,000 while it is 804.7 for New Jersey and 695.7 in Middlesex County. The mortality rate for South River does vary by year because of the town's relatively small population but the number of deaths per year ranges from 100 – 140.

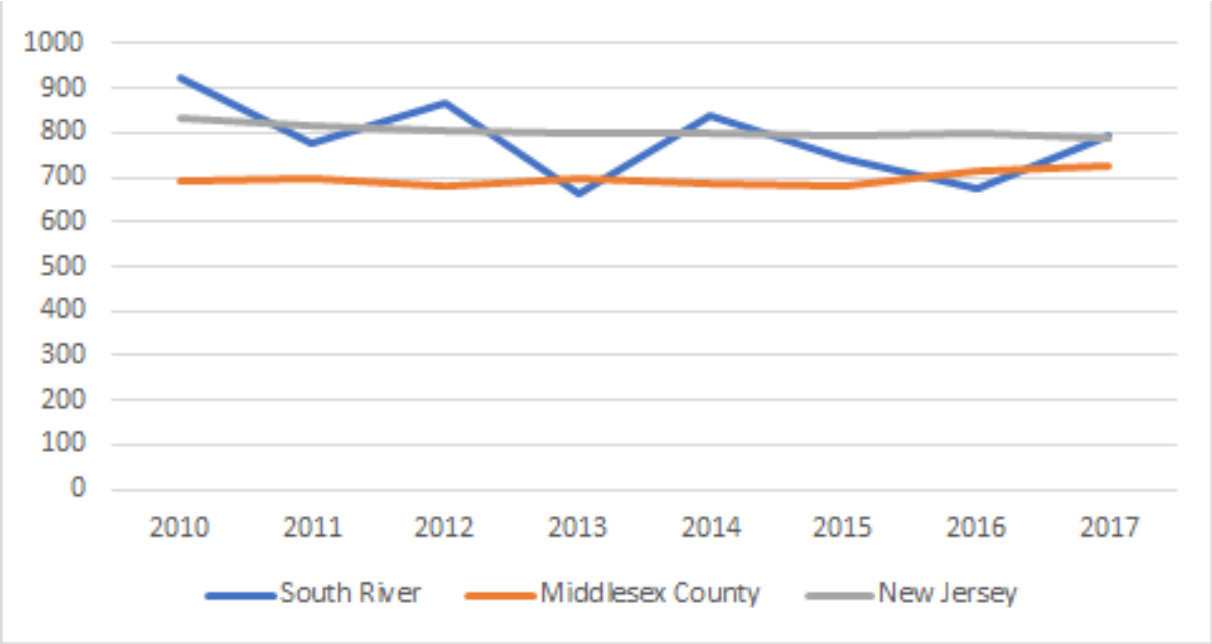
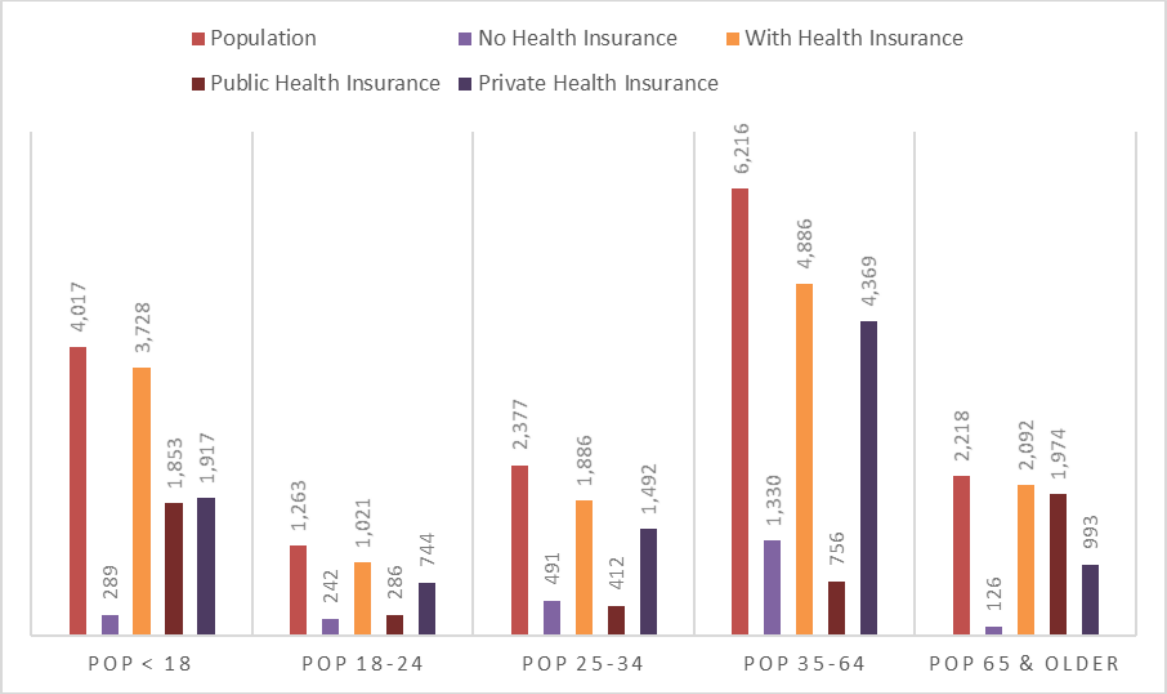


Figure 5:

Mortality Rates for South River, Middlesex County, and New Jersey

Figure 6: South River Health Coverage by Age Groups



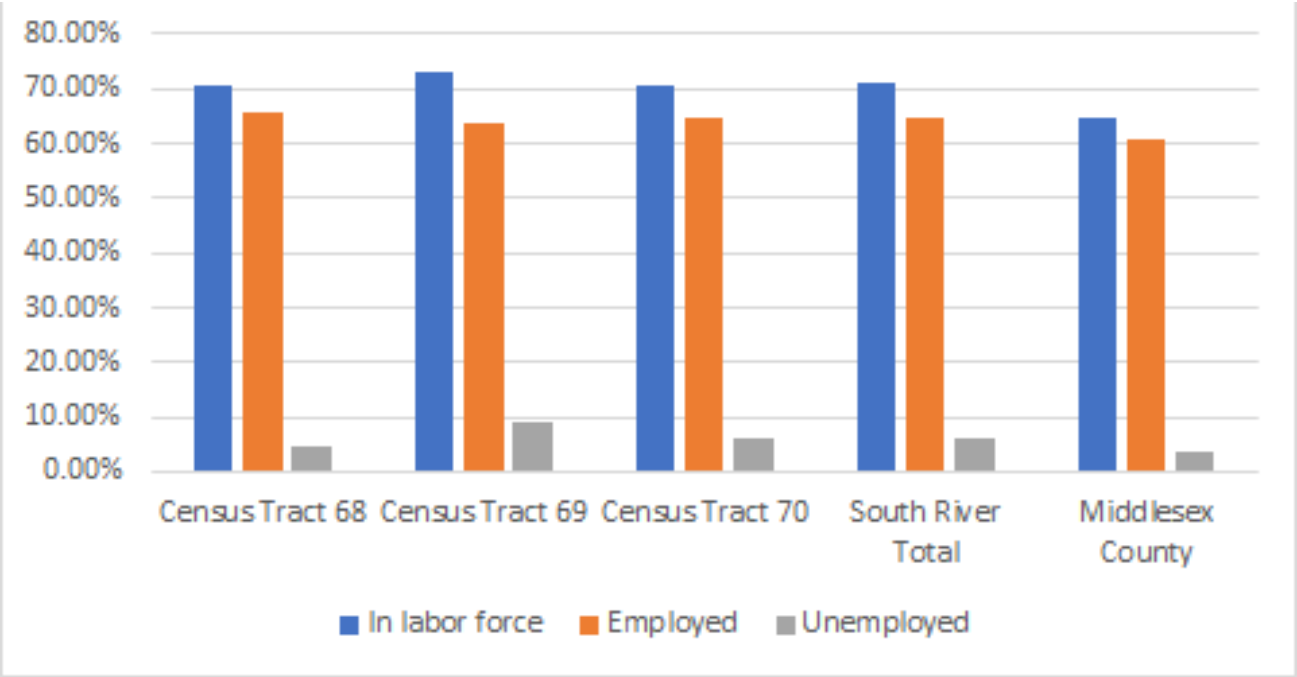
Moving into health coverage, 15.4% of the entire South River population is not covered by health insurance, according to the 2018 American Community Survey.

The largest demographic that is uncovered by health insurance are the 35-64-year-olds at 21.4% (**Figure 6**).

Most age groups in South River have coverage from private health insurance while about 89% of the 65 and older population is covered by public health insurance, most likely Medicare.

Figure 7 shows the percentage of employed and unemployed by each individual census tract in South River, Middlesex County, and South River as a whole. Unemployment is represented by the orange bar while employed is light blue and in the labor force is in dark blue. According to the 2018 American Community Survey, South River has an unemployment rate of 6% while Middlesex County has an unemployment rate of 4%. In terms of census tracts in South River, census tract 69 has the highest unemployment rate at 6%, while census tract 68 has the lowest unemployment rate at 5%.

Figure 7: Percentage of Employed, In Labor Force, and Unemployed by Area



The unemployment rate for men living in South River is 9.5% while the unemployment rate for women is 7.7%. In terms of census tracts, census tract 70 has the highest unemployment rate for men at 11.6% while census tract 69 has the highest unemployment rate for women at 16%.

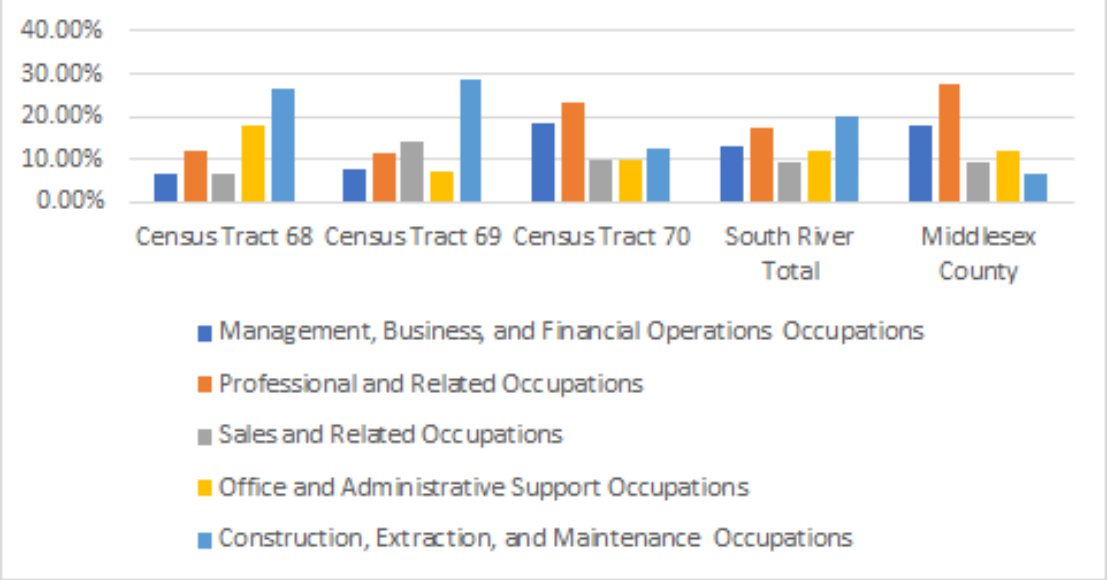
Table 1 below provides more details on unemployment in South River.

Table 1: Unemployment in South River and its Census Tracts

Employment status by sex	Census tract 68	Census tract 69	Census tract 70	South River
Males employed	1,366	903	2,085	4,354
Males unemployed	85	100	275	460
Females employed	1,171	639	2,067	3,877
Females unemployed	98	122	107	327

In South River, the top five occupations are construction/maintenance, management/finance, office or administrative work, professional, and sales (**Figure 8**). Census tract 68 and 69 have most people working in construction/maintenance. Census tract 70 is most similar to the industry makeup of Middlesex county as both have a high portion of people working in the professional field. When looking at the town of South River as a whole, the community is almost equally blue-collared and white-collared as 20% of the working population is in construction while 18% is in the professional field. The fact that South River has a large construction industry is a benefit because in the future this can be used to rebuild homes and businesses that have been affected by climate change.

Figure 8: Top Occupations by Percentage in South River and Middlesex County



In conclusion, the demographic with the largest record of no health insurance is 35-64-year-olds which is true in census tracts 68 and 69 but in census tract 70, 65 or older is the demographic that is most uncovered. A possibility as to why 35-64-year-olds are largely uncovered by health insurance in South River may be because of the contract-based nature of work in the construction industry.

Marketwatch[13] reports that construction workers are often not covered by insurance and in the United States, 42.8% of construction workers are uninsured. While most people are covered by private health insurance, this is not the case for the 65 and older demographic as 89% are covered by public health insurance. Census tract 69 has the most individuals with no health insurance and this population represents 37% of South River. Interestingly, census tract 69 is also the only tract where the 65 and older demographic is 100% covered by health insurance.

[13] Passy, J. (2018, March 22). Workers in this field are the least likely to have health insurance. https://www.marketwatch.com/story/workers-in-this-field-are-the-least-likely-to-have-health-insurance-2018-03-22

Health insurance coverage is related to life expectancy because different plans may affect the quality of healthcare a person receives, and a total lack of health insurance can have the same effect. As mentioned before, residents of census tract 69 are the least covered by any health insurance which means that there will by disparities in life expectancy in this tract. Census tracts 68 and 69 have many construction workers which may affect the life expectancy in these tracts as this industry is riskier. While occupation does seem to have correlations with health insurance, there are other factors to consider in the next steps.

Next Steps for demographic research

Next steps for demographic research should include a closer examination of health issues, insurance coverage, and other health differences in individual census tracts. For example, census tracts 68 and 69 have a large population of people working in construction, an often unsafe, contract-based and uninsured profession, which can affect life expectancy. Another step is to research the mortality rate and how it differs between census tracts and seek data for cause of death. It may also be worthwhile to study the difference in income between each census tract as this will also give insight into how people in each tract are living. An additional step will be to research race and ethnicity in South River and to analyze differences at the town and census tract level as this will help to identify equity issues that need to be addressed.

HOUSING

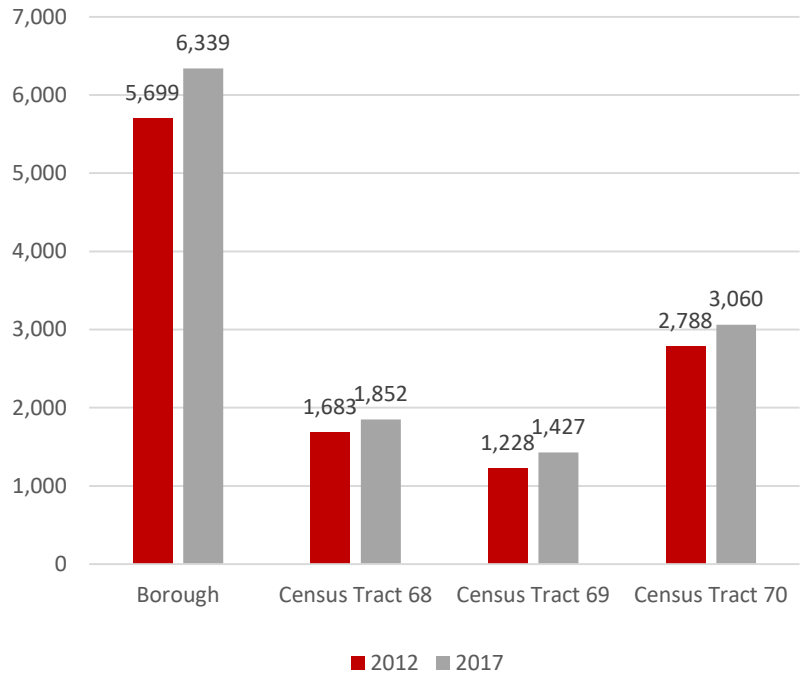
Housing is an essential part of understanding the issues and dynamics of a city and its people. In the case of South River, the city's housing bears the brunt of flooding-related issues which plague the city. To get a holistic understanding of the borough's housing market, especially in the context of the havoc that Super Storm Sandy wreaked in 2012, the studio looked at South River's housing market during two periods of time: 2007-2012 and 2012-2017. The housing market was analyzed through several parameters, such as overall housing stock, occupancy/vacancy rates, and the state of the borough's sales and rental markets. Using the data collected, we analyzed changes in South River's housing market during the 10-year period and looked at market trends and lending patterns, to gauge the effect of Super Storm Sandy, and other climate change-related threats, on the borough's housing market.

Housing stock

Despite the damage to property caused by Super Storm Sandy, the overall housing stock at the level of the borough, and the three census tracts that make it up, seem to have increased in number (**Figure 9**). This may be an outcome of fervent rebuilding efforts, which would result in an increase in construction activity in the borough

Along with great increase in construction, rebuilding efforts after a disaster usually involve changes in policies towards safe construction and disaster-proof buildings. South River follows a similar trend with guidelines requiring habitable parts of a building being lifted at least above ground level to reduce damage to property and loss of life in the event of flooding in the town.

Figure 9: Housing Stock in South River and Census Tracts



Source: 2012 and 2017 ACS 5-year estimates

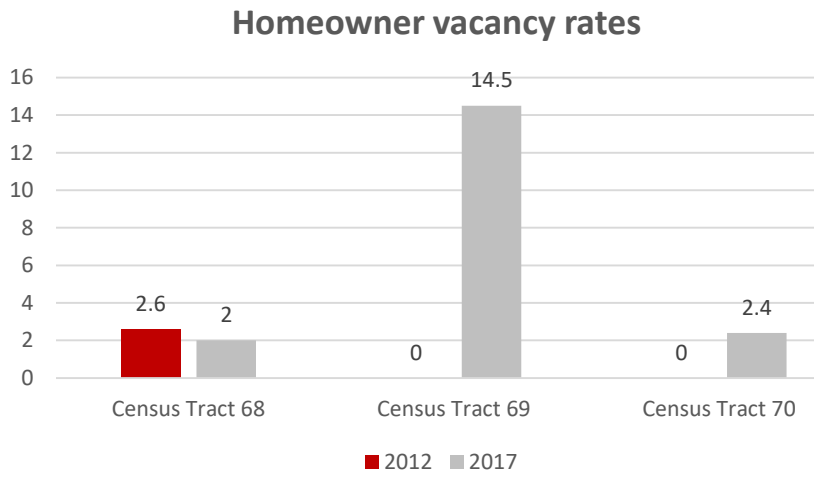
Occupancy/vacancy rates

From 2012 to 2017, South River's housing market seems to have turned to a rental-intensive market. In the immediate aftermath of a disaster at the scale of Sandy, several residents may have lost their home altogether, or their homes may have been rendered to an inhabitable situation. As a result, they may have had no option but to avail of rental options in the borough. This may have resulted in the reduction in rental vacancy rates across the borough. This is

especially true in the case of census tract 70, which shows a zero rental vacancy rate in 2017 (a drop of 12.3%) (**Figure 10**). Conversely, census tract 68 shows an increase in the rental vacancy rate and a drop in homeowner vacancy rates. This indicates a tendency towards homeownership in tract 68.

Overall, a rental-intensive housing market translates to a lower base of property taxes for the municipality. Property taxes form the bulk of tax revenues for a municipality and a fall in the number of homeowners may force the municipality to resort to increasing overall tax rates in the municipality. This will prove especially difficult for the low-income population in the borough. Such an issue will result in a downward spiral of further loss of homeowners and increase in tax rates as time goes on.

Figure 10: Homeowner and Vacancy Rates in South River Census Tracts



Source: 2012 and 2017 ACS 5-year estimates

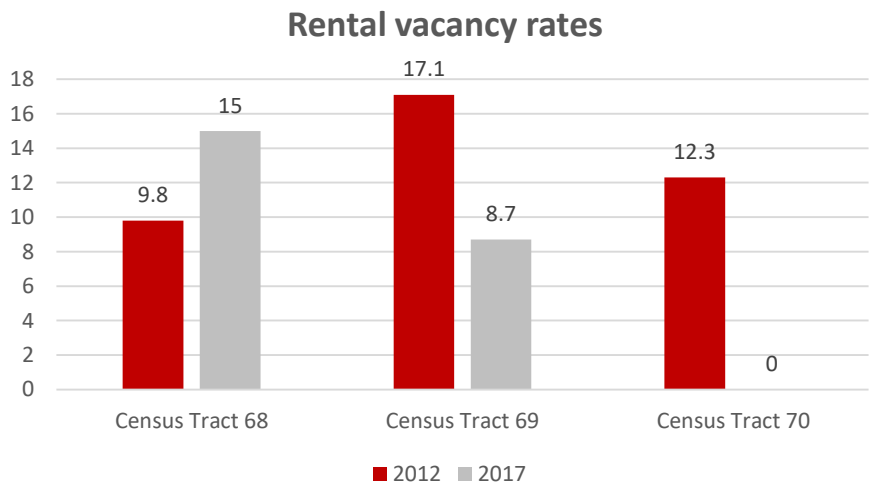
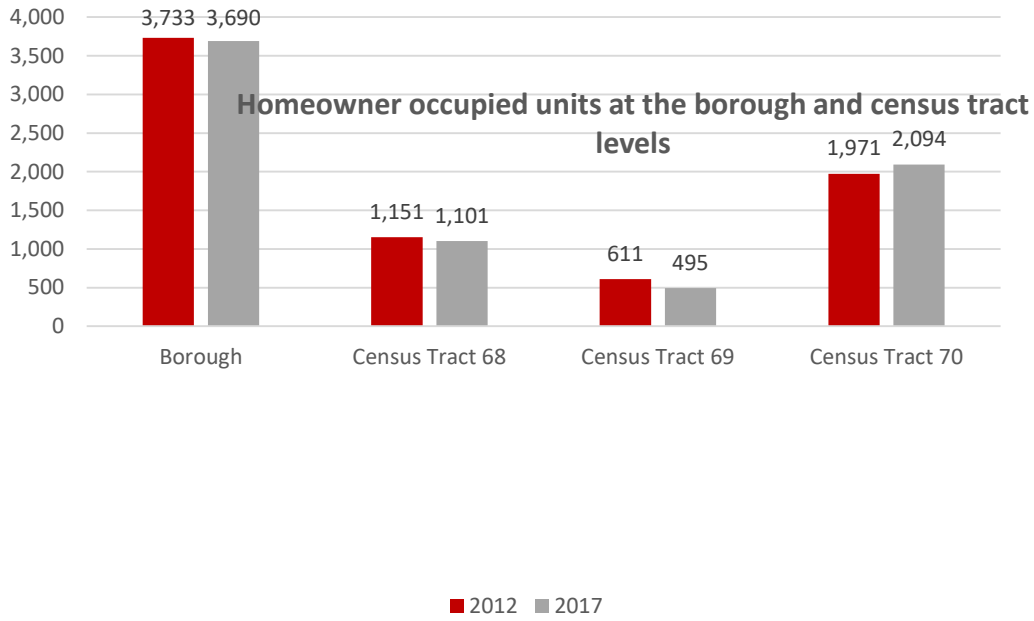
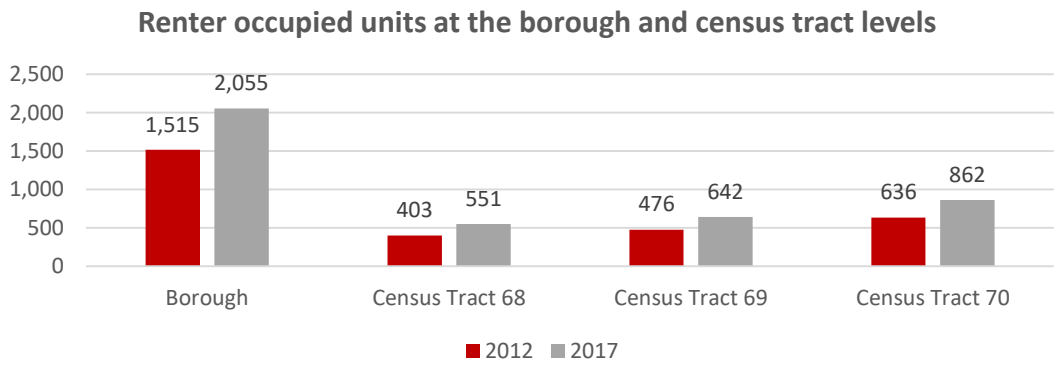


Figure 11: Homeowner and Renter Occupied Units in South River and Census Tracts





Source: 2012 and 2017 ACS 5-year estimates

Homeowner and rental markets

At the borough level, there has been an overall increase in inclination towards renting and a reduction in homeowner occupied units (**Figure 11**). This follows the narrative of the vacancy rates, which also indicates an increase in rental occupancy, as opposed to a reduction in homeowner occupancy rates. The only anomaly in these trends comes from census tract 70 which shows a slight increase in homeowner occupied units, even though homeowner vacancy rates have shown a rise in the tract.

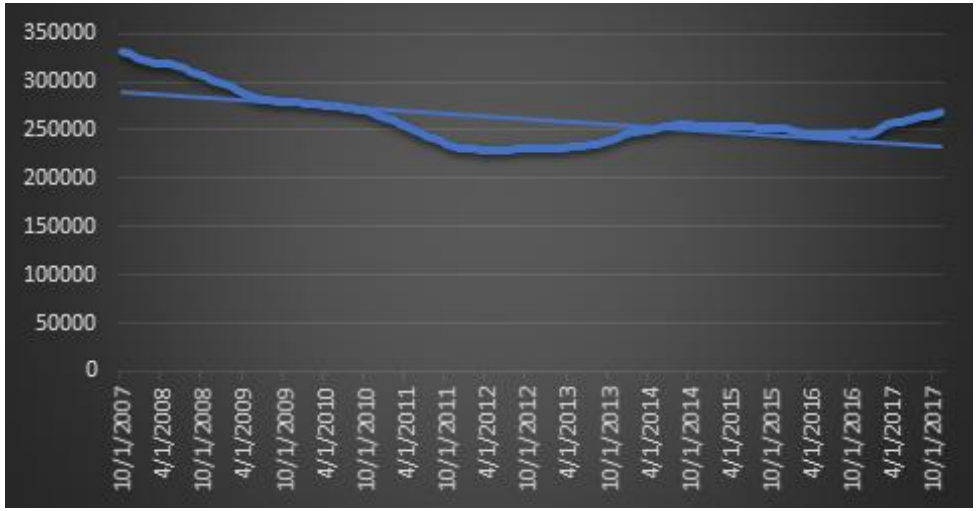
Housing Strategies to Consider

In relation to housing, possibly among the biggest problems that South River may be facing is a transition to a rental-intensive market. As mentioned above, a rental-intensive housing market may translate to a harmful spiral of rising property taxes and a further reduction in the number of homeowners. To combat this issue, South River may need to look at policy changes to incentivize homeownership in the borough. This may include steps like offering monetary subsidies for those looking to buy a house in the form of financial aid to cover mortgage payments, paying a part of the homeowner's flood insurance, or similar financial help. Further, a change that the borough may be facing is the continued high risk of flooding to houses on the floodplain. Although elevating habitable spaces is a recommendation to increase resiliency against flooding, not all homeowners may understand the need to take such a step or have the means to do so. In order to ensure a higher degree of compliance with this recommendation, the borough could choose to make elevation mandatory. Further, to assist those with difficulties in making structural changes, the municipality, County or other local aid groups may consider providing direct or other technical assistance to help in the process.

Housing market analysis

Because the borough of South River borders a tributary of the Raritan River also called South River, the areas which border the river have experienced significant flooding and flood related damages. Following Super Storm Sandy, 184 properties in the area were deemed "flood impacted properties" by FEMA, 40 were deemed "substantially damaged", and 75 were ultimately eligible for Blue Acre buyouts by the borough[14].

Figure 12: Estimated Property Values 2007-2017 in South River, according to Zillow.com

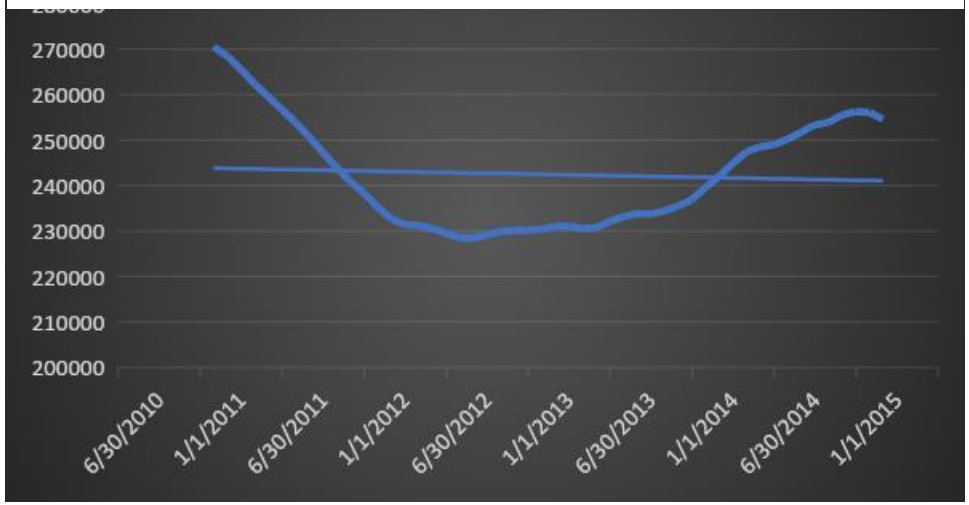


Research indicates that property values are adversely affected by repetitive flood risk and flood related damage, especially particularly post Superstorm Sandy. The storm caused severe flooding as high as 40 inches on Washington Street and was the cause of the evacuation of several multi-family apartment buildings, businesses, and single-family homes in the area[15]. A study of Zillow's home value index suggests property values were adversely affected (**Figure 12**).

[14] Thompson, Sean, "Floodplain Neighborhood Acquisition Plan". Bignell Planning Consultants, Inc., (April 21, 2015), http://southrivernj.org/notices/SouthRiver-Floodplain-Neighborhood-Plan-Adopted-04272015.pdf. (Accessed May 1, 2020)
[15] Thompson, Sean,"Strategic Recovery Planning Report". Bignell Planning Consultants, Inc., (March 1, 2014), https://www.nj.gov/dca/divisions/lps/SRPRs/South River SRPR.pdf. (Accessed May 1, 2020)

In the 5-year period preceding Superstorm Sandy from October 2007 until October 2012, the average property value estimate in South River was $273,724. In the 5-year period after the storm (November 2012-November 2017), the average property value estimate was $248,763. This reflects a drop in property value by $24,961. However, it is difficult to know if the drop in property value was solely due to Superstorm Sandy. Based on the trend line, property values remained high during 2007-2008 and then began decreasing during the great recession[16]. It is possible this 2-year period could have skewed the pre-2012 average property value to be higher. It is also possible post Sandy property values were worse partly due to the economic downturn.

Figure 13: Estimated Property Values 2010-2014 in South River, according to Zillow.com



A more specific 2-year period suggests property values did not change much post Sandy. From October 2010 until October 2012, property value estimates in South River averaged $242,228 and from November 2012 until November 2014, they averaged $242,626 (**Figure 13**). However, the trend line suggests property values did dip considerably around the time Superstorm Sandy made landfall and did not begin recovering until 2014[17].

[16]Zillow Research, "Housing Data", https://www.zillow.com/research/data/. (Accessed May 1, 2020)
[17] Zillow Research, "Housing Data", https://www.zillow.com/research/data/. (Accessed May 1, 2020)

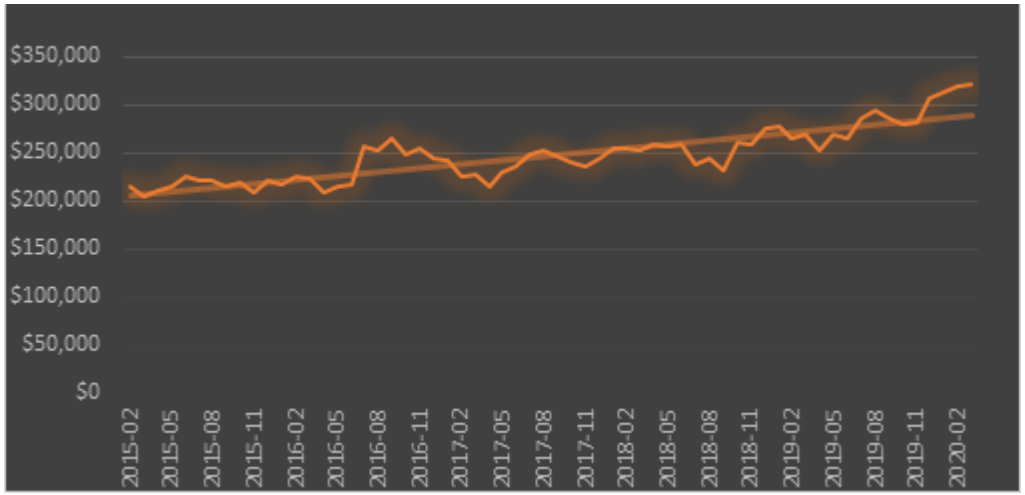
In comparison to South River, both the state of New Jersey and the County of Middlesex also experienced a similar downturn and upturn in property values pre and post Superstorm Sandy. The average estimated property value for all homes in Middlesex County during the 5-year period before Sandy (October 2007-October 2012) was $312,392. The average estimated property value county-wide during the preceding 5 years after Sandy (November 2012-November 2017) was $301, 467. There was a $10,925 drop in estimated value, which suggests Superstorm Sandy may have been the cause, but also indicates Middlesex County did not suffer as large a drop in estimated property value in comparison to South River. A more specific 2-year look into Middlesex County shows the average estimated property value was $324,807 in the 2-year interim before Sandy (October 2010-October 2012). In the 2-year interim after Sandy (November 2012-November 2014) estimated property values dropped steeply, to $290,492, a drop of $34,315. Middlesex County has many communities which border the Raritan River, as well as a few coastal communities, which could have been adversely affected by Superstorm Sandy in a similar fashion to South River.

The average estimated property value for all homes in the State of New Jersey in the 5-year period before Superstorm Sandy (October 2007-October 2012) was $325,306. In the 5-year period after Sandy (November 2012-November 2017), the average estimated property value in the state reduced to $302,628, a total reduction of $22,678. At first glance, it would appear that New Jersey property values may have fallen across the board as they had in Middlesex County, but a more specific 2-year analysis suggests the drop may not have been due to storm related damage. A look at 2-year pre and post Sandy averages shows that between October 2010 and October 2012, the average estimated property value was $296,222. In the 2-year

period after Sandy, property values remained nearly unchanged at $294,281. This suggests that overall New Jersey property values may not have been as adversely affected by Superstorm Sandy as they were in both South River and Middlesex County, but rather property values may have dropped due to the economic downturn.

Actual property sale prices cannot be fully compared to Zillow's property value estimates because they are not available for South River before 2015. However, from the information available, property prices appear to be recovering from both the great recession and the aftermath of Superstorm Sandy (**Figure 14**).

Figure 14: South River Sales Prices 2015-2020, according to Zillow.com



In February 2015, the average sale price of a home in South River was $213,900. By March 2020, the average sale price was $321,400, an increase of $107,500 over a 5-year period. Zillow's property value estimates paint a similar picture. In February 2015, the average property value estimate was $254,908 and by March 2020, property value estimates had risen to $302,291. Data in the interim between 2015 and 2020 shows a steady increase of both estimated property values and sale price[18].

FEMA's National Flood Insurance Program (NFIP), a program aimed at reducing the effects of flooding on private and public property, has responded to many homeowners in South River. Per the NFIP, in 2019 there were a total of 114 policies in force in South River alone worth a combined $28,681,300 in coverage[19].

In 2018, NFIP recognized 77 residential and 6 commercial properties in South River as "repetitive loss properties (RL)", although no properties were deemed "severe repetitive loss properties (SRL)[20]". In late 2015, there were a total of 50 "repetitive loss properties" in South River, which made a total of 146 claims (6.95 per year) for a total value of $5,555,225

[18] 1.Zillow Research, "Housing Data", https://www.zillow.com/research/data/. (Accessed May 1, 2020)
[19] FEMA, Policy information by State, "Policy & Claim Statistics for Flood Insurance" (Updated April 16, 2020), https://www.fema.gov/policy-claim-statistics-flood-insurance (Accessed May 1, 2020)
[20] FEMA, "Flood Risk Report," (March 26, 2018), https://map1.msc.fema.gov/data/FRP/FRR_02030105_20180326.pdf?LOC=99a01e65d811a718bf7609d5421c2957 (Accessed May 1, 2020)

$264,535) during a period of 21 years[21]. The data suggests RL properties may be on the rise, though the number of policies in force has decreased from 187 in 2014.

On the other hand, "severe repetitive loss" properties in South River have been substantially reduced. There were 6 SRL properties in 2014, suggesting many were removed from the market by 2018, potentially due to buyouts. NFIP estimated that these 6 SRL properties made a total of 28 claims (1.33 a year) for a total value of $867,541 ($41,311 a year) during a period of 21 years[22].

The large number of properties at risk of flooding and storm related damage has caused worry that South River may be susceptible to blue lining policies. Blue lining is a relatively new phenomenon occurring nationwide in flood and storm prone areas. It is the practice of lenders refusing to loan to buyers seeking to invest in areas deemed susceptible to flooding. The map in Figure 15 shows the continually devastated areas in South River bordering the Raritan River.

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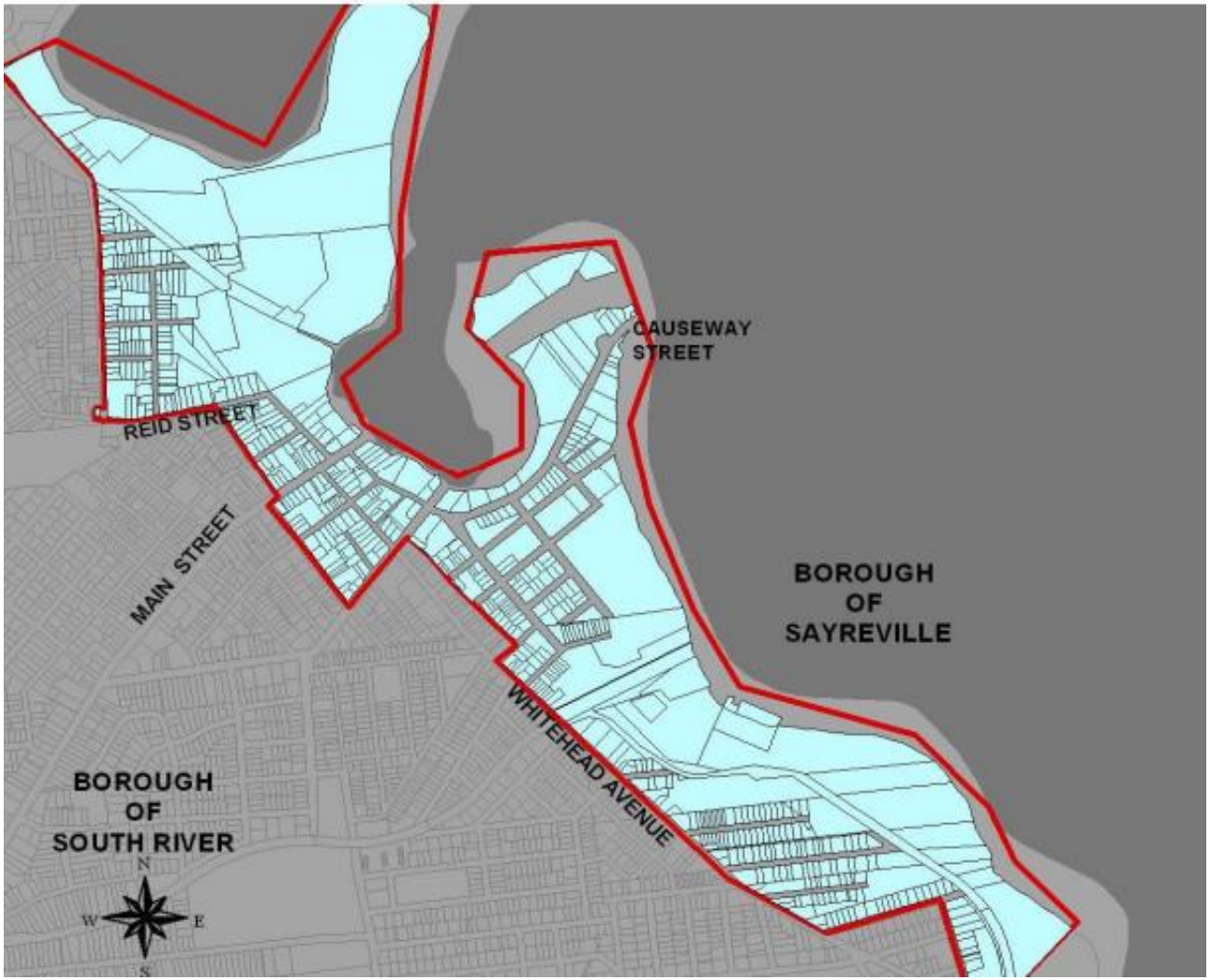
[21] Princeton Hydro, Middlesex County: 2015 Hazard Mitigation Plan Update, "Appendix 23: Borough of South River" (Published October 2015) http://www.middlesexcountynj.gov/Government/Departments/PSH/Documents/2015 Hazard Mitigation Plan/Middlesex_HMP_Appendix_23_SouthRiver.pdf. (Accessed May 1, 2020)

[22] Princeton Hydro, Middlesex County: 2015 Hazard Mitigation Plan Update, "Appendix 23: Borough of South River" (Published October 2015) http://www.middlesexcountynj.gov/Government/Departments/PSH/Documents/2015 Hazard Mitigation Plan/Middlesex_HMP_Appendix_23_SouthRiver.pdf. (Accessed May 1, 2020)

Figure 15: Repetitive Loss Area in South River, from National Flood Insurance Program[23]



[23] Thompson, Sean, "Floodplain Neighborhood Acquisition Plan". Bignell Planning Consultants, Inc., (April 21, 2015), http://southrivernj.org/notices/SouthRiver-Floodplain-Neighborhood-Plan-Adopted-04272015.pdf. (Accessed May 1, 2020)

While the number of loans denied to individuals in South River is not public information, the number of people coming into and leaving the town can be assessed, as well as the number of homeowners and renters. Available census data appears to suggest that South River is not losing residents, but in fact is slowly growing. In 2012, there were 5,248 occupied housing units, which rose to 5,745 in 2017. However, the data also suggests the rate of homeownership has decreased as there were 3,733 homeowner occupied units in 2012 in comparison to 3,690 in 2017. The total number of homes with a mortgage also declined from 69% in 2012 to 59% in 2017. Unlike the housing market, the rental market has seen an increase in renters. In 2012, there were 1,515 renter occupied units in comparison to 2,055 in 2017[24]. It is important that South River remain aware of a future potential blue lining issue due to its vulnerability to flooding and storm related damage.

South River as a community has taken many steps to ensure the borough is prepared to tackle future flooding and blue lining issues. South River, shepherded by the Middlesex County Office of Planning, is part of FEMA's and NFIP's Community Rating System (CRS) program. South River also participates in Middlesex County's CRS Users Group, an organization consisting of municipal representatives working on floodplain management. Municipalities that are part of the CRS Users Group are rewarded with lower flood insurance premiums, which often results in more homeowners buying insurance. If more homes are insured, the community is better protected during floods or storms because FEMA can reinvest more in restoring damaged homes[25]. The Office of Planning in Middlesex County has assisted municipalities bordering the

[24] United States Census Bureau,"American Community Survey 2017," https://data.census.gov/cedsci/ (Accessed May 1, 2020)

[25] FEMA, NFIP/CRS Update, "Communities make good use of CRS Users Group", (April 2011), https://www.fema.gov/media-library-data/20130726-1758-25045-2579/april_crs_update_final2.pdf. (Accessed May 1, 2020)

Raritan River through watershed protection and restoration plans. Nicholas Tufaro, Principal Planner for the Middlesex County Office of Planning, is the coordinator for the Middlesex County CRS Users Group.

During our March mid-term discussion with Mr. Tufaro and other community members, Mr. Tufaro described ongoing work to mitigate South River's flooding issues, including the CRS Users group. He said, "We are not waiting until April to start the resiliency plan…Climate change analysts came and said that they want to give us access to climate change data. They want us to use it for resiliency analysis. This is important because the people who establish the ratings are looking at climate change and considering municipal capacity". Mr. Tufaro hopes to begin work on a resiliency plan which will address South River's flooding and storm related damage issues.

Mr. Tufaro also provided insight into how South River could mitigate flooding in the future using impervious cover and reduction, "In both cases, they need to look at spaces where it is easy to create green infrastructure, small interventions involving private properties". Impervious cover is any surface such as roads, driveways, and rooftops, which cannot effectively absorb rainfall. Replacing impervious cover with green infrastructure such as blue roofs, which gather and store storm water to then release it slowly, will help mitigate South River's flooding issues.

Other solutions Mr. Tufaro mentioned were the possibility of elevating homes near the Raritan River and preventing developers from constructing new homes or buildings near the river. Other groups, such as Princeton Hydro, an ecological and engineering consulting service, worked with the Lower Raritan Watershed Partnership and regional partners to develop a

proposal for ecological restoration of the South River floodplain. In November 2019 project partners were notified that they received a planning and engineering grant through National Fish and Wildlife Federation (NFWF). The grant will support development of an engineering plan which will reduce not just coastal inundation in multiple communities surrounding the Raritan River, but also help preserve and restore the watershed's ecosystem[26].

Methods

The estimated property values and sale prices of property in South River were obtained using Zillow data. Information regarding South River's flood insurance claims, policies, and repetitive loss designations was obtained through FEMA's policy and claims database and their Flood Risk Report as well as the 2015 Hazard Mitigation Plan Update and Floodplain Neighborhood Acquisition Plan. Demographic housing data (occupancy, renters, homeowners) was obtained from the American Community Survey (2017) found at the Census Bureau. Information on the CRS program was obtained through FEMA, "NFIP/CRS Update". Quotations by Nick Tufaro were shared during the studio mid-term presentation. Information regarding the Princeton Hydro NFWF grant was shared by guest speaker Johnny Quispe and obtained by review of the grant application.

[26] NFWF, "National Coastal Resilience 2019 Grant Slate," (November 2019) https://www,nfwf.org/sites/default/files/coastalresilience/Documents/2019grantslate.pdf. (Accessed May 1, 2020)

Additional Research Needs

Future graduate studios can tackle a more in-depth housing market analysis using what was analyzed this semester as a basis. While the current analysis suggests that Superstorm Sandy was most likely responsible for a drop in estimated property values after October 2012, it is difficult to understand the extent to which Sandy influenced the already falling property values due to other factors, such as the great recession. Future students can use the Zillow data (which goes back to 1996) and compare property values during other major storms and floods which directly affected South River, such as Tropical Storm Irene or other localized floods which may have caused property damage. Future students could connect insurance data, such as the number of claims during a specific year, to flooding and storm damage and falling property values. Once the effect of other storms or floods can be quantified, it will be easier to understand the full effect of Superstorm Sandy on property values. In addition, future students can flesh out the analysis of both state and county wide estimated property values. They can also consider similar factors, such as state and county wide claims which connect to devastating storms and floods. The same can be completed for the NY metro area. Students can also consider doing a similar analysis on nearby towns for comparison, or in towns which are known for not experiencing many storms or floods, to compare any differences in estimated property values. Lastly, students can adjust the data for inflation, which may indicate a greater decline in property values.

Next Steps

There are actions South River can take to address and take charge of potential current and future blue lining related issues. South River's next steps should be to engage their Planning, Engineering, and Policy experts, to conduct in-depth research in understanding the scope of the town's blue lining and housing related problems. The issue of blue lining is not well known to many. These experts can help set up town meetings to discuss blue lining issues and raise awareness. It is difficult to tackle an issue without knowing the scope of the current problem and understanding how the problem may evolve. The town and these experts can conduct town wide surveys which can seek to understand several issues. These issues can be as extensive as surveying the number of individuals who have had storm or flood related damage to their homes but no access to flood insurance, experiences from those who have sold their homes for less than expected, how many mortgages were denied or difficult to obtain due to close proximity to water or water damage, or even opinions from townsfolk regarding flood and storm related damage. Lastly, once the problem and future threat is understood, the town and experts can create a realistic plan based on available funding and the town's capabilities to address blue lining issues. Many planning projects are difficult to implement due to funding and lack of policy, but there is always something that can be done to better or prevent blue lining.

The South River; Photo courtesy of Malembe Dumont Copero

SOUTH RIVER'S WATER STORY

South River's Green Team has made it a goal to pursue the statewide non-profit, Sustainable Jersey's Gold Star Standard in Water, which requires the completion of a Municipal Water Story. "Water is a shared resource and essential to life", point out the authors of Sustainable Jersey's Water Story initiative, and each municipality has a unique relationship with its water[27]. The Water Story tool guides South River through the collection of data needed to create a borough-specific narrative of water. Understanding a municipality's water story is increasingly important in the context of extreme weather events related to climate change, which threatens utilities and other facilities that produce drinking water and treat wastewater. Consider that New Jersey experienced widespread outages of wastewater treatment plants following Super Storm Sandy in 2012, which resulted in billions of gallons of raw sewage dumped into waterways, including the Raritan River. Dozens of boil water advisories were issued after drinking water treatment facilities lost power. Information gathered as part of the Water Story will help South River integrate climate change considerations into future wastewater, drinking water, and stormwater management planning.

The Water Story we present here examines South River's relationship with its water, the way water shapes life in South River, and how water shapes the environment in South River. This tool is designed to build South River's understanding of its water infrastructure, governance, and resources, in addition to highlighting local water issues and actions to strengthen understanding of hydrologic flows and water infrastructure, and turn water into an asset for

[27] Sustainable Jersey. "Municipal Water Story draft", (2019).

South River. South River's Water Story is a document which has continuity over time and will be useful for years to come as South River's water issues evolve and as the municipality makes strategic decisions regarding resiliency in the face of flooding and climate change.

The importance of a Municipal Water Story lies in the complexity of water systems and in the complex geography of New Jersey. The state has 565 municipalities with streams, rivers, lakes, and ponds within them. Many of these water sources extend beyond municipal boundaries, requiring shared management and responsibility that can be difficult to coordinate. Furthermore, the separate narratives of water resources, drinking water, non-potable water, wastewater, and stormwater can make it difficult to understand the interactions and associated issues between all the different water systems at both the municipal and regional scales. Consider that water in New Jersey municipalities is supplied by 584 different Public Community Water Systems (PCWS) and that wastewater is treated by 260 different utility companies. The Water Story tool helps South River and other municipalities make sense of the connectivity of water sources, governances, and systems and thus simplifies the identification of challenges, the first steps towards defining the most effective actions to tackle water issues. Finally, good water quality and wastewater management are cornerstones of a healthy society, and a key marker of regional equity considerations.

Sustainable Jersey has underlined three steps as key for creating a successful Water Story.

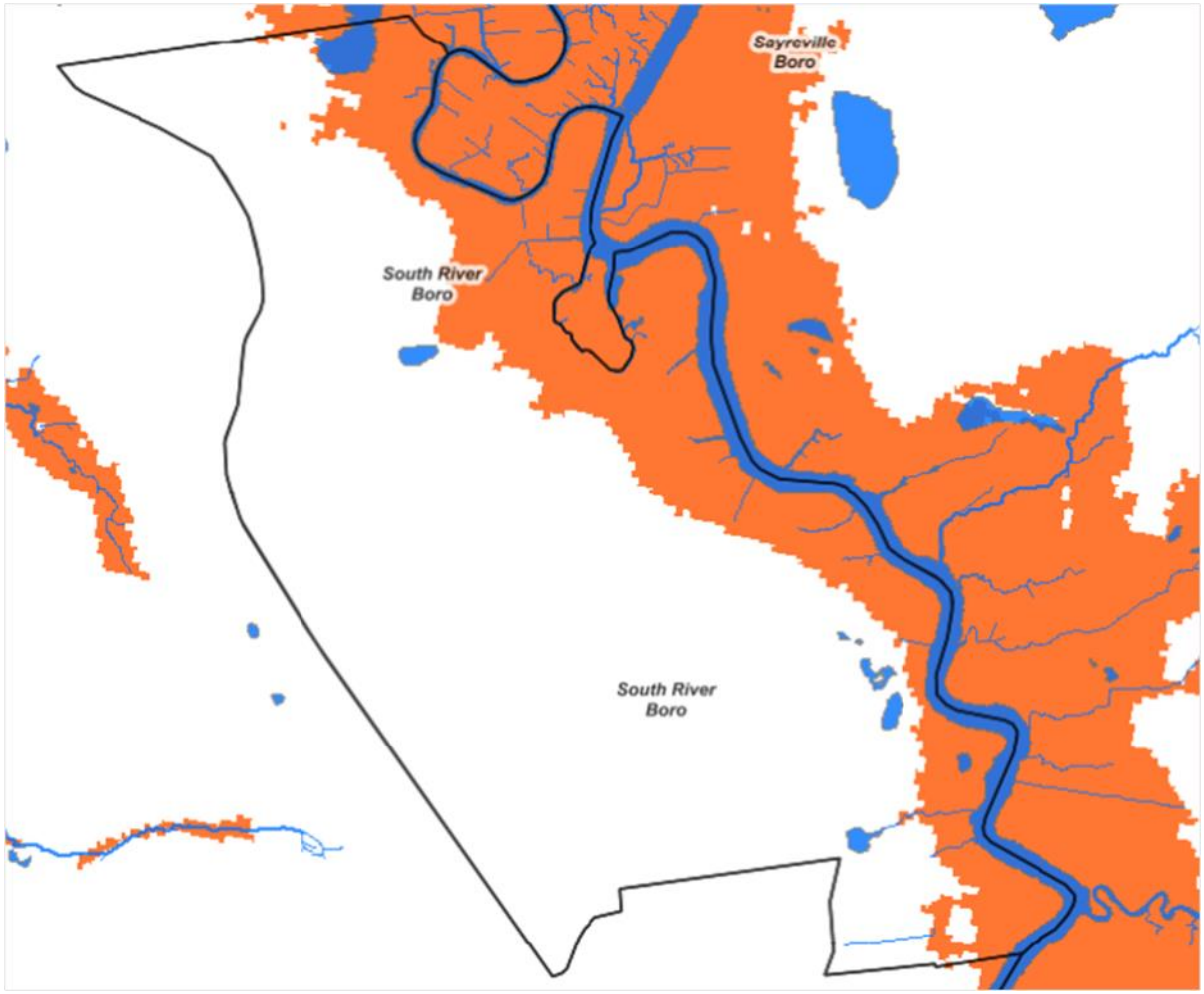
> "(1) develop a narrative that brings together and summarizes essential information characterizing municipal water resources, governance, issues and values,

(2) reach out to a wide segment of municipal residents in order to amplify, refine, validate and reconnect with water and the local water story, and

(3) use the watershed and municipal water information to develop a list of ranked issues.

This report will guide the reader through the studio team's work and results from the application of the three steps. Research was done to collect essential information on South River's hydrologic setting and water resources within its boundaries, its water supply, its wastewater management, and its stormwater management. These are the four sections below which come together to form a non-technical narrative explaining governance, issues, and values concerning South River's relationship with water. The process of data collection also involved community participation and outreach to South River residents in order to better understand and "amplify, refine, validate, and reconnect with water" via firsthand stories; information on community involvement can be found in Appendix i. Finally, this section's conclusion uses collected data and resident water stories to create a list of ranked water issues for the Borough of South River. In this way, the studio achieves its goal to aid the Green Team and South River in the development of a vault of water-related information which can be sustainable over time and aid in a future submission of the Water Story as a prerequisite for the Gold Water Standard in Water in addition to helping address local water issues and advance an understanding of water infrastructure in the face of climate change and resiliency considerations.

Figure 16: Hydrology of South River, with water features in blue and floodplains in orange[28]



[28] Rowan University. "Watershed Explorer", https://www.njmap2.com/watershed/all/. (Accessed May 3, 2020).

Water resources in South River – Hydrologic setting

South River is located in the center-west part of the "Lower Raritan Watershed, below Lawrence" HUC-11 watershed south of the Raritan River, with a very small northwestern tip of the municipality in the "Lawrence Brook" HUC-11 watershed to its west[29]. The HUC-14 sub-watershed South River belongs to is the "South River, below Duhernal Lake" region. South River also lies within the Lower Raritan Watershed Management Area (WMA), New Jersey's Watershed Management Area 9, along with nearby coastal municipalities including Sayreville, Old Bridge, Woodbridge, Perth Amboy, South Amboy, and more than forty other coastal and inland municipalities.

The most significant water resource in the municipality is its namesake, the South River, which borders the borough to the east (**Figure 16**). The River flows northward into the Raritan River and is the first major tributary of the Raritan. It is tidally controlled from its mouth upstream to Duhernal Lake Dam. Sayreville, Old Bridge, East Brunswick, Spotswood, Helmetta, Monroe Township, Millstone Township Marlboro Township, Englishtown, Manalapan Township, Freehold Township, and Jamesburg are upstream municipalities whose water activities affect the quality of the South River waters. Downstream (where the South River continues or feeds into the Washington Canal and the Raritan River), Sayreville, East Brunswick, Edison, Woodbridge Township, Perth Amboy, and South Amboy are communities which are affected by South River's water activities.

[29] Rowan University. "Watershed Explorer", https://www.njmap2.com/watershed/all/. (Accessed May 3, 2020).

There are a few minor streams which extend from the South River into eastern portions of the borough. These eastern portions of South River lie in floodplains, as seen in Figure 16. County and municipal open space including Pacers Field, Causeway Park, Grekoski Park, Veterans Drive Athletic Field, and uninhabited areas are within the floodplains, but so are residential, manufacturing, and commercial areas like the Causeway, Water Street, Reid Street, and Whitehead Avenue. The Federal Emergency Management Agency (FEMA) declared portions of South River a major federal disaster area, most recently following the devastating flooding associated with Superstorm Sandy in October 2012 and prior to that in August 2011 (Hurricane Irene). Tidal flooding along the South River is not limited to hurricanes or Super Storms – other storm events, nor-easters, and non-storm high tides regularly damage property and put lives at risk. It is important to note that the frequency of flooding events has increased in the past thirty years. Scientific research links these events to increased precipitation related to storm intensification. There is a general rising awareness and concern over these events within the municipality.

In terms of recreation, the water resources in South River are mostly enjoyed by residents through boating and fishing. The South River Boat Club is a popular attraction visible from many parts of South River's river boundary. Furthermore, much of the green space in South River is along the river in the form of Pacers Field and Grekoski Park, where there are athletic fields and wildlife for the enjoyment of residents. The consensus, however, is a general concern that the water in the South River is not safe for recreational uses such as swimming due to legacy and on-going pollution in New Jersey's waterways.

The federal Clean Water Act §303(d) requires the development of Total Maximum Daily Loads (TMDL) for all streams or rivers that do not meet surface water quality standards and/or that do not support their designated uses. TMDL is the "maximum amount of a pollutant that a waterbody can receive and still meet surface water quality standards."[30] According to the New Jersey Integrated Water Quality Assessment Report (2016) the South River does not meet surface water quality standards and does not support designated uses.[31] The report recommends that legacy impairments in the South River for cadmium, copper, lead, chromium, and mercury require new sampling to determine current water quality. The report makes no mention of the impacts of non-point source pollutants associated with stormwater runoff and, as is the case for all tidally-influenced waters of the Lower Raritan Watershed, there is no Total Maximum Daily Load (TMDL) approach available from NJDEP on addressing these pollutant issues for the South River. NJDEP has explained their failure to meet federal CWA requirements in the form of TMDLs for South River and the Lower Raritan as related to the difficulty of modeling the combination of tidally influenced and freshwater flows.

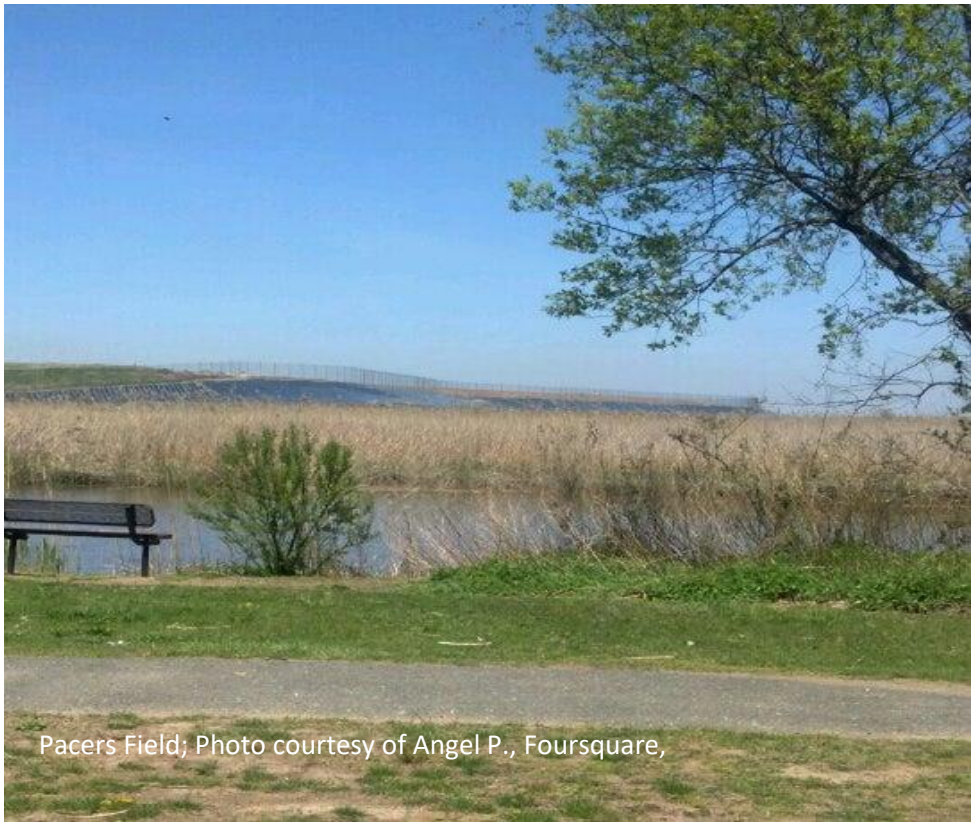
Within the South River sub-watershed however there are proximate benchmarks, including a Restoration Plan for the Manalapan Brook Watershed, which flows into the South River. The Manalapan Restoration Plan was created in 2011 in response to a total phosphorus TMDL

[30] New Jersey Department of Environmental Protection, Bureau of Nonpoint Pollution Control. "Total Maximum Daily Load (TMDL) Look-up Tool", https://www.nj.gov/dep/dwq/msrp-tmdl-rh.htm. (Accessed May 3, 2020).

[31] New Jersey Integrate Water Quality Assessment Report (2016): https://www.nj.gov/dep/wqmp/docs/202190916-int-wqa-report.pdf (Accessed May 6, 2020).

established by NJDEP and addressed total suspended solids in the watershed as well. These issues should be monitored closely.

In conclusion, South River has a significant relationship with its hydrological setting, as evidenced by the very name of the borough. Water resources like the South River impact residents' lives via increased flooding thanks to prominent floodplains in the eastern parts of the borough. There are also concerns about pollution. Despite this, South River residents enjoy fishing, boating, and using recreational green spaces along the river, keeping water an integral component to what makes South River South River.



Pacers Field; Photo courtesy of Angel P., Foursquare,

Water supply

This section of the report analyses the sources of potable water and water´s governability (treatment and distribution). It also discusses water quality and its implications for South River´s residents.

Sources of water

The source of a city water system may be either surface water or groundwater. Surface water is found in lakes, rivers, and reservoirs. Groundwater lies under the surface of the land, where it travels through and fills openings in rocks. The rocks that store and transmit groundwater are called aquifers. Groundwater must be pumped from an aquifer to the earth's surface for use[5]. The South River´s water sources are the Farrington Sands Aquifer and the East Brunswick Water Utility[32].

The Farrington Sands Aquifer is a deepwater source. South River draws the water of this aquifer from three wells and one infiltration gallery. The three wells source from the middle Potomac-Raritan-Magothy aquifer, and the infiltration gallery sources from the upper Potomac-Raritan-Magothy aquifer. South River Borough is the only municipality that receives water from these wells[33][34]. In other words, water collected directly by South River Water Department is neither distributed not bought by other municipalities.

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[32] Barker.H, E.McGreevey.J., M.Campbell.B, Hahn.E & M.Putnam.M. «Source Water Assessment Report for South River Water Utility». Trenton, New Jersey, October 2004.
[33] South River Water Treatment, «Annual Water Quality Report»., 2017.
[34] South River Water Treatment Annual Water Quality Report, 2018. http://southrivernj.org/dpw/2019/CCR%202018.pdf (Accessed May 6, 2020).

East Brunswick Water Utility is the second source of water. It provides about half of South River´s water supply[35]. East Brunswick has a contract with South River to supply up to 850,000 gallons of water per day[36]. East Brunswick receives its water from the New Jersey Water Supply Authority, which operates with two sources of water.

The first source is the Round Valley Spruce Run Reservoir System. This is a groundwater source which operates the Spruce Run/Round Valley Reservoir System in Hunterdon County[37]. The second source is purchased water from the Middlesex Water Company[38]. The water from Middlesex Water Company comes from the Delaware and Raritan Canal Systems. This is a surface water source. The headwaters for the Delaware and Raritan Canal System come from the Delaware River Basin. Much of its water supply is held in reservoir storage in conjunction with a daily flow through the Delaware Raritan Canal[39]. In addition to the water that comes directly from the South River Water Department, East Brunswick Water Utility also provides water to the populations of East Brunswick Township, Helmetta Boro, and Spotswood Boro[40].

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[35] Barker et al. «Source Water Assessment Report for South River Water Utility», 2004.
[36] South River Water Treatment, «Annual Water Quality Report»., 2017.
[37] NJ.com. «South River: Water Emergency Declared; Treatment Plant Operator Arrested», last accessed April 4th, 2020. Available on <https://yourhhrsnews.com/south-river-water-emergency-declared-department-operator-arrested/> .
[38] East Brunswick Water Utility, «Quality on Tap 2017: East Brunswick Consumer Confidence Report», 2017.
[39] South River Water Treatment, «Annual Water Quality Report»., 2017.
[40] Barker.H, E.McGreevey.J., M.Campbell.B, Hahn.E & M.Putnam.M. «Source Water Assessment Report for East Brunswick Water Utility». Trenton, New Jersey, October 2004.

Table 2: Drinking Water Sources for South River

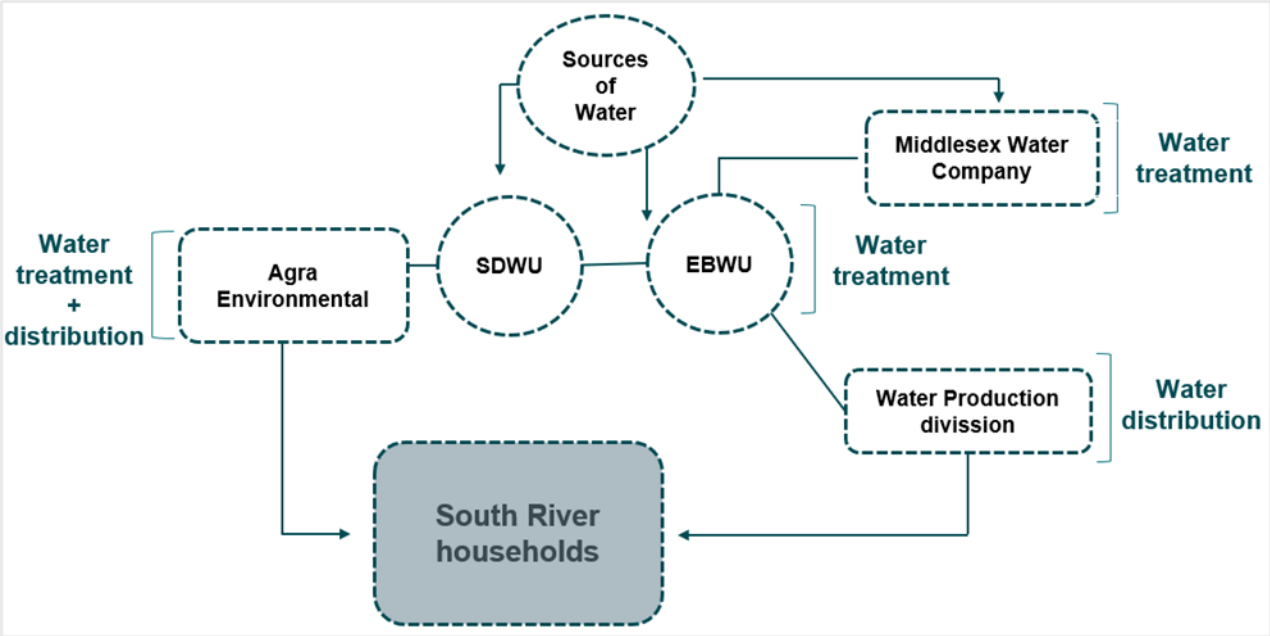
Source	Source Name	Water System Component	Source Status	Sources
South River	Whitehead Ave TWP	Treatment Plant	Permanent	
	Whitehead Ave Well 2	Ground Water	Permanent	middle Potomac-Raritan Magothy aquifer
	Whitehead Ave Well 5	Ground Water	Emergency	middle Potomac-Raritan Magothy aquifer
	Whitehead Ave Well 6	Ground Water	Permanent	middle Potomac-Raritan Magothy aquifer
	Whitehead Infiltration Gallery	Ground Water	Permanent	upper Potomac-Raritan Magothy aquifer
East Brunswick	Tices Lane Pump Station	Treatment Plant	Permanent	
	Middlesex Water Co.	Purchased Surface Water	Permanent	
	New Brunswick W.D	Purchased Ground Water	Emergency	

Source: data retrieved from Source Water Assessment Report for South River and East Brunswick (2004)

Water governance: Treatment and distribution

Water governance deals with how the water that comes from the sources mentioned above is treated and how it is delivered to consumers. Because South River draws water from two primary sources that have different actors involved, water governability is complex and needs special attention. Figure 17 explains water governability in South River.

Figure 17: Water governability in South River



Approximately 85 to 90 percent of New Jersey's population receive their drinking water from public water systems, which can be Community, Non-transient Non-community, and Transient Noncommunity. The remaining New Jersey population is served by private wells – i.e. serving individual homes, small businesses, etc. Both the South River Water Department and East Brunswick Water Utility are considered Public Community Water Systems (PCWS). These public water systems are highly regulated and perform routine monitoring for the presence of contaminants. The source of water is always treated prior to distribution to customers[41]. As

[41] Barker et al. «Source Water Assessment Report for South River Water Utility», 2004.

happens with the sources of water, there are two different paths for water treatment and distribution.

On the one hand, the water that comes directly from the Farrington Sands Aquifer goes through the wells to South River Water Utility and then is treated in the municipality's water treatment plant. These treatment processes can occur at different points within the system[42]. Traditionally, water treatment and distribution to customers in South River have been managed publicly. In 2019, following falsification of water quality reports resulting in criminal charges against the licensed operator, water has been treated and managed by a private company, Agra Environmental[43].

On the other hand, there is the water that comes from East Brunswick. East Brunswick's raw water supply is treated and delivered to East Brunswick under contract with Middlesex Water Company, which manages initial treatment. Once East Brunswick receives the water, it is again tested by a State certified laboratory and, if need be, treated prior to being delivered to the customer[44]. The Water Production Division is responsible for providing safe drinking water to the community and assuring that its quality meets the standards established by the New Jersey Department of Environmental Protection. System Operators are responsible for taking daily and periodic samples of drinking water in order to monitor water quality and fulfill State mandated reporting requirements. The Tices Lane Pumping Station not only delivers millions of gallons

[42] Ibid.
[43] NJ.com. «South River: Water Emergency Declared; Treatment Plant Operator Arrested».
[44] East Brunswick Water Utility, 2017.

per day of drinking water to customers in South River (and the other municipalities), but also monitors the New Jersey One-Call System to ensure that service remains uninterrupted[45].

While other voices should be heard, Rick Bern, member of the Green Team and of the South River Planning Board, has stated the community is happy with the new actor in charge. "The water plant is own by the people in South River, and as an employee, we have Agra doing the management and operation of the plant"[46]. The appearance of this new actor seems to represent an opportunity for the local authorities. During a meeting with the studio the major of South River, John Krenzel, stated:

> "The water utility has always been considered the second child. The electric department is the glory of South River, because by paying the electric utility bills the electric utility is giving money back to the town. Nobody [used to pay] attention to the water utility unless there [was] a problem with the water. The water utility was not equal to the electric utility. Now some actions have been taken to equalize the water department and the electric utility. [Residents] pay for their water bills, but all the infrastructure has been paid by way of property taxes. That would come to an end. We will put it under the water utility. This is what Agra is doing."[47]

[45] East Brunswick: The Center of New Jersey. Water Utility & Maintenance Overview, last accessed April 4th, 2020. Available on <https://www.eastbrunswick.org/239/Water-Utility-Maintenance-Overview>
[46] Midterm Report Studio 2020
[47] Midterm Report Studio 2020

In the last few years South River residents have complained about the quality of the South River Water Utility water, specifically due to significant sediment and an experience of brown water running out of the taps. The Borough invested significantly in the improvement of the water treatment plant to remedy this situation. During the infrastructure upgrades South River purchased water from East Brunswick. Mayor John Krenzel noted careful attention to ensuring that drawdowns from East Brunswick were minimized: "if consumption goes above a certain amount, East Brunswick Water Utility increases the cost that South River pays. There are certain exceptions for emergencies when they don't charge a higher price". According to the Mayor, the municipal preference is to reduce water sourced from East Brunswick. "Well water is much less expensive than purchasing water from East Brunswick. [We] are trying to keep water dependency low"[48].

Water quality

Water quality and health are intricately connected, and understanding the different aspects surrounding this relationship is important for communities to build resiliency around their water systems. The interim findings from the studio served as a mode of engagement with community members around water issues. Community members reported that the quality of water in South River has suffered due to several reasons, and water quality problems have been exacerbated by flood and storm events. The studio work focused on understanding the existing scenario, identifying the possible causes, examining the effects of climate change, and proposing possible pathways or approaches to resolving these issues.

[48] Midterm Report Studio 2020.

Existing scenario

Studying water quality indicators

Federal drinking water standards do not necessarily assure safe drinking water, as federal guidelines have not been updated in more than 20 years. Health guidelines promulgated by the non-profit Environmental Working Group (EWG) reflect recent and ongoing water quality studies and should be considered an alternative benchmark for water safety[49]. Compared to EWG guidelines, water samples from South River from quarterly assessment reports conducted by the U.S EPA (January 2019 to March 2019) show exceedance of 12 contaminants, and detection of 19 contaminants total[50]. Several of these contaminants are associated with health impacts, especially carcinogenic effects, with sustained exposure. For instance, the levels of Bromodichloromethane, a prominent carcinogen, is 102 times higher than the EWG health guideline. Other contaminants like the Halo Acetic Acids or the HAAs are formed as a by-product when water is treated with chlorine and are known to cause birth defects and cancer. The following table lists other reported contaminants and the potential threats to health that they pose.

[49] US EPA,OW, "Water Quality Standards: Regulations and Resources | US EPA," US EPA, April 23, 2014, https://www.epa.gov/wqs-tech.
[50] Environmental Working Group, "EWG's Tap Water Database: What's in Your Drinking Water?,"

Table 3: Reported Contaminants and Potential Threats to Health

Contaminant	Exceeding EWG's health guideline	Causes	Potential Effects
Bromodichloromethane	102x	Formed when chlorine or other disinfectants are used to treat drinking water	Cancer
Bromoform	2.6x	Formed when chlorine or other disinfectants are used to treat drinking water	Cancer
Chlorate	2.2x	Chlorate forms in drinking water as a byproduct of disinfection.	Harm to thyroid
Chloroform	51x	Formed when chlorine or other disinfectants are used to treat drinking water	Cancer
Chromium (hexavalent)	3.2x	Chromium (hexavalent) in drinking water may be due to industrial pollution or natural occurrences in mineral deposits and groundwater	Cancer
Dibromochloromethane	23x	Dibromochloromethane, one of the total trihalomethanes (TTHMs), is formed when chlorine or other disinfectants are used to treat drinking water.	Cancer and problems during pregnancy
Dichloroacetic acid	25x	Formed when chlorine or other disinfectants are used to treat drinking water. Haloacetic acids and other disinfection byproducts increase the risk of cancer	Cancer
Haloacetic acids (HAA5)	152x	Formed when disinfectants such as chlorine are added to tap water	Cancer
Radium, combined (-226 & -228)	30x	It can occur naturally in groundwater, and oil and gas extraction activities such as hydraulic fracturing	Cancer
Total trihalomethanes (TTHMs)	203x	Form during water treatment with chlorine and other disinfectants.	Cancer

Source: Environmental Working Group, "EWG's Tap Water Database: What's in Your Drinking Water?," https://www.ewg.org/tapwater/system.php?pws=VA2015575.

In addition to testing for known contaminants, unreported contaminants are also a significant cause for concern. An example of this would be the PFAs or Per- and polyfluoroalkyl substances that are known to affect the body's hormonal balance causing reproductive problems and affecting the immune system. PFAs represent a family of substances that are endocrine disruptors affecting the functioning of the endocrine glands and fertility. Despite significant known risks posed by these contaminants, current laws do not regulate PFAs, and on-going reporting or monitoring is not required.

Contamination at the source

According to the New Jersey Water Supply Plan (2017-2022), South River receives 23% of its Water from groundwater sources which are at risk of chemical contamination[51] due to decades of industrial activity in the area and including on-going concerns of leaching from landfills and Superfund sites. There is a high correlation seen between the presence of Superfund sites and the incidents of cancer[52]. Surface water sources also are subject to contamination by nutrients, fertilizers and other pollutants which are typically addressed at treatment plants. A more extensive water quality study conducted at the scale of the watershed is required to better understand impacts of these historic source and ongoing non-point sources of pollution on source water.

[51] Pye and R Patrick, "Ground Water Contamination in the United States," Science 221, no. 4612 (August 19, 1983): 713–18, https://doi.org/10.1126/science.6879171.
[52] Raid Amin, Arlene Nelson, and Shannon McDougall, "A Spatial Study of the Location of Superfund Sites and Associated Cancer Risk," Statistics and Public Policy 5, no. 1 (November 29, 2017): 1–9, https://doi.org/10.1080/2330443x.2017.1408439.

Contamination at the treatment level

The risk of contamination at treatment plants due to poor compliance with standards also requires consideration in planning for water quality resiliency. Several contaminants are often a by-product of chemical processes used to purify water[53]. This requires technical research into the process of treatment and the possible procedural upgrades needed to address health concerns. This issue intersects multiple municipalities and requires coordinated efforts to hold authorities responsible and improve standards of water treatment.

Our water institutions

Water Quality in South River Borough is periodically audited by the South River Water Department, with samples collected from different locations. However, recent convictions related to fraudulent data entries[54] raise concern not only of the water quality but the institutional systems that monitor them.

Though the list of contaminants can be alarming there are pathways to solutions, and this requires community involvement. Focusing on the short-term actions, purifying systems and filters at a home level can be employed to address minor water contamination issues. However, it may be prudent to consider how larger systemic changes in governance and water quality monitoring might benefit water quality improvements. Mayor Krenzel confirmed that the Borough's Water department has suffered from less in the way of municipal attention and

[53] R D Morris, "Drinking Water and Cancer.," Environmental Health Perspectives 103, no. suppl 8 (November 1995): 225–31, https://doi.org/10.1289/ehp.95103s8225.
[54] Carly Baldwin, "2nd Middlesex County Water Inspector Arrested, Now in South River," East Brunswick, NJ Patch, June 13, 2019, https://patch.com/new-jersey/eastbrunswick/2nd-middlesex-county-water-inspector-arrested-now-south-river.

resources as compared to other utilities, and noted concerted effort to prioritize water issues now and in the future. Building up the capacity and functioning of entities like borough Water Departments that overlook water supply, its maintenance and monitoring will play a major role in creating climate resiliency at the local level. Moreover, it is essential that these institutions prepare for eventualities like storms and floods.

Impact of climate change on the existing scenario

- Water availability

As seen in the previous section, South River receives the bulk of its water from the Farrington Sands aquifer. Aquifers are groundwater sources that cannot indiscriminately maintain consistent water levels, especially given poor recharge rates in urban areas and the concomitant extraction rates. It is well established that climate change impacts the natural water cycle[55]. The Lower Raritan region will experience this primarily in terms of uncertain precipitation. This along with current patterns of extraction from water sources, especially aquifers, is going to impact the availability of water. Low rates of recharge reduce water levels in the aquifers, potentially concentrating source contaminants and substances that could impact community health.

[55] Water and climate change, "Water and Climate Change," IUCN, December 5, 2018, https://www.iucn.org/resources/issues-briefs/water-and-climate-change.

- Vulnerability of water infrastructure systems

South River has first-hand experience with serious disruption from floods and storms, events that have compromised the water infrastructure and impacted the ability of the community to adapt to these events. Climate change predictions suggest that much of the Eastern Seaboard, including New Jersey's Lower Raritan region and South River, will experience increased extreme weather events, including intensification of precipitation in single storm events. Considering this, water infrastructure systems are pivotal in creating a resilient South River community. Water infrastructure is not simply the physical network of pipes and filters and culverts, it includes institutional infrastructure as well. Our governance mechanisms and authorities must incorporate disaster preparedness and draw out plans at the local level to address climate change, pandemics, and natural and other hazards.

- Local land use impacts on water quality and health

A porous or "pervious" terrain allows for stormwater to filter into the aquifers slowly and plays a vital role in maintaining the quality of groundwater and surface water sources. Impervious surfaces and stormwater conduits concentrate the run-off, which gathers pollutants into surface water systems. Even 5% of impervious surface in the watershed causes degradation of streams. [56]

[56] US-EPA, "Managing Urban Runoff," February 2003, https://www3.epa.gov/npdes/pubs/nps_urban-facts_final.pdf.

- Landfills and superfund sites

A recent federal Government Accountability Office (GAO) report conveys how 60% of toxic superfund sites are vulnerable to climate events, potentially increasing risks of exposure for nearby communities. Multiple superfund and landfill sites near South River are of potential concern. This might further impact health especially due to deteriorating water quality.

Pathways to community resiliency

- Accountability at a local level

Holding the relevant authorities accountable and contacting local representatives to address water quality and infrastructural issues are key in this process. Exercising 'Community Power' [57] which largely demands political action impacts the resiliency outcomes of a community.

- Planning and management at a watershed level

Resilient water systems and municipalities must take into consideration upstream-downstream, and watershed level information. Watershed level analyses can reveal larger factors that impact water quality, including hydrologic flows, monitoring aquifer levels and water extraction, and serve as a point of coordination for various municipal water departments.

[57] Rosa Gonzalez, "community-driven climate resilience planning: a framework National Association of Climate Resilience Planners NACRP," ed. Taj James and Jovida Ross, May2017. https://kresge.org/sites/default/files/library/community_drive_resilience_planning_from_movement_strategy_center.pdf.

- <u>Ecosystem services solutions at local level</u>

  An evolving understanding of ecological functions opens the door to employment of ecosystem services to purify water and address the issues of many contaminants. For example, natural, or" green," infrastructure projects rely on services produced by ecosystems, often utilizing natural landscapes to minimize flood damages, purify and store water, and reduce urban stormwater runoff.

Next Steps

Next steps for future studios or for South River regarding water quality and health include dissemination of the technical information in reports and databases to community members. South River community members already have a detailed understanding of the various factors that affects their water; however, visualizing data regarding water quality and its impacts on health would bolster grant-seeking for infrastructure upgrades, repair and retrofits. This could take the form of maps that employ and overlap different datasets: Water Quality, Location of Superfund sites, Watershed analysis, socio-economic and health data, to name a few. However, permissions may be required to obtain some of this data, especially health at Census tract level. This challenge can be overcome with small sample surveys and qualitative interviews that focus on health and socio-economic factors of a household.

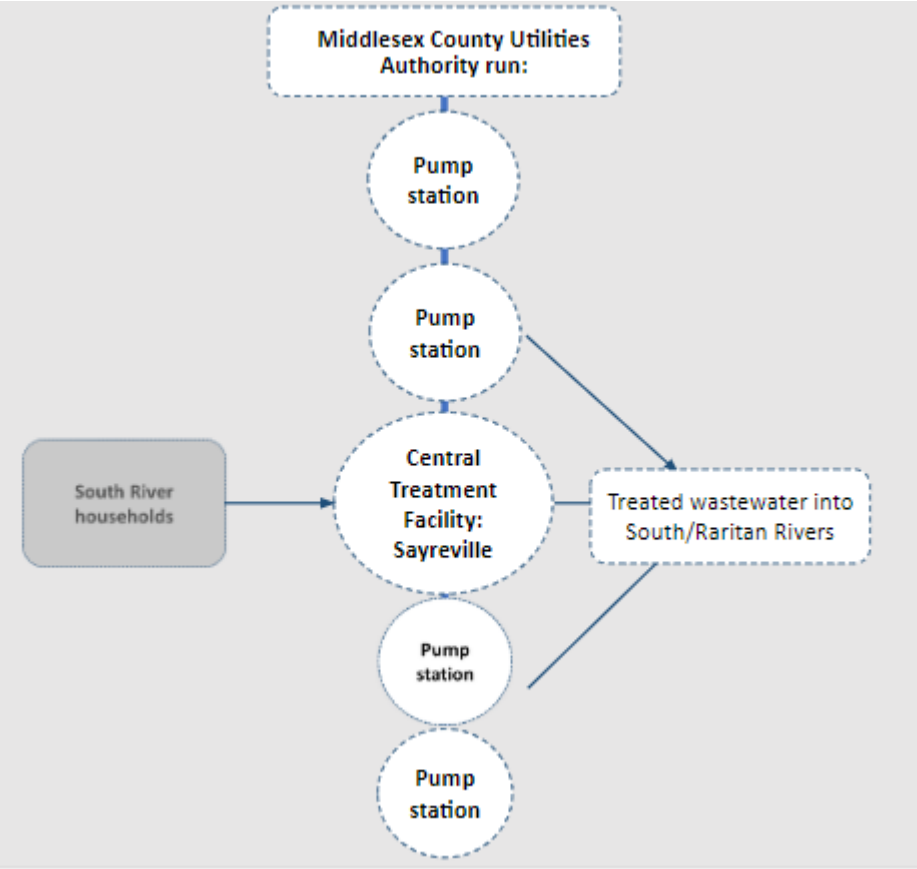
Wastewater

Pacers Field in South River; Photo courtesy of Malembe Dumont Copero

Wastewater is "used" water. In the home, it comes from sources including sinks, dishwashers, bathtubs, toilets and washing machines. Wastewater is also generated by commercial and industrial users where human waste may be mixed with a wide variety of wastes from cleaning, processing, or manufacturing. When wastewater is improperly discharged into a surface waterbody it can deplete oxygen, stimulate undesirable plants like algae, and introduce disease-producing organisms and toxic chemicals into the water.

Wastewater in South River is treated by the Middlesex County Utilities Authority (MCUA). MCUA serves 797,000 customers in Middlesex, Somerset, and Union counties. MCUA's treatment plant is fully operational with five pump stations, which normally handle 110 million gallons of wastewater daily. MCUA's main pump station, the Sayreville station (Edward

Figure 18: Wastewater Processes and Infrastructure for South River



J. Patten Reclamation Center), sits immediately across the river from the Borough of South River, and normally processes 75 million gallons daily. Currently, the MCUA sewage treatment plant wastewater discharge is 105.61 million gallons a day. Some of this is surface water discharge. It should also be noted that there is no combined sewer overflow (CSOs) in South River, however tidally-influenced upriver effluent flows from the Perth Amboy CSOs downstream may pose risks for local surface waters[58]. A diagram of wastewater processes employed in South River and by MCUA can be seen in Figure 18.

MCUA facilities have felt the effects of increased storms and flooding in the past decade. During Superstorm Sandy in 2012, MCUA lost two key pump stations in Sayreville and Edison, leading to weeks of uncontrolled discharge of untreated wastewater into the Raritan Bay. Sayreville spilled 1.1 billion gallons

[58] Middesex County Utilities Authority, mcua.com. (Accessed May 3, 2020).

over a three-month period due to electrical and other infrastructure failure that resulted from storm surge and flooding[59]. This was the largest spill of untreated sewage in all Sandy-affected states in the U.S., and the fourth largest overall spill in New Jersey history. The overall cost of storm-proofing the Sayreville station is approximately $88 million. Upgrades are ongoing, with a target of completion in winter 2020. FEMA is providing $78 million of required funds for improvements which will include a 1,700-foot flood wall, cast-in-place concrete, steel sheets, a stormwater collection and pump-out system, stormwater overflow basin, three diesel generators, and one natural-gas generator.

Another important aspect of wastewater management is the municipal Wastewater Management Plan (WMP)[60]. WMPs assess the cumulative water resource impact of future development and are a component of the areawide, more comprehensive Water Quality Management plans (WQMP) required by NJDEP. South River lies within the Lower Raritan/Middlesex County water quality management (WQM) planning area, whose WMP development is led by the Middlesex County Planning Department[61]. South River's sewer service area has a current flow (in MGD, millions of gallons a day) of 1.37 as of December 2017. Additional flow capacity is .10 MGD. There is no expected capacity deficiency in South River to 2037[62].

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[59] Kenward, A., Yawitz, D., and Raja, U. "Sewage Overflows From Hurricane Sandy". April 2013. https://www.climatecentral.org/pdfs/Sewage.pdf. (Accessed March 1, 2020).
[60] New jersey Department of Environmental Protection, Division of Water Monitoring and Standards. "Water Quality Management Planning Program." March 4, 2020. https://www.nj.gov/dep/wqmp/wqmps.html. (Accessed May 3, 2020).
[61] Middlesex County Office of Planning. "Wastewater Management Plan draft". 2019.
[62] Ibid.

Also notable in the WMP is that portions of South River are non-sewer service areas which exceed the nitrate dilution standard. Nitrate in water can cause "blue baby disease" and can indicate the presence of agricultural runoff.[63] There are 72 municipal zoning[64] permitted units in parts of South River which exceed the nitrate dilution standard, mostly in pits and muck, while the New Jersey Geological Survey suggests no more than two units in a municipality this size. While this isn't an issue now, it is important to be aware of these suggestions when considering further development in South River.

As of right now, the full Middlesex County WMP is not available. Anticipated release is late 2020. For South River's Water Story to be complete, and to have a total understanding of wastewater management and potential issues in the Borough, will require taking a closer look at the full WMP when it is available. Finally, South River has a mandatory review of its master plan due next year, and it will be critical to use the WMP and the non-sewer area boundaries to understand updates and future development plans.

View of South River from Causeway Park; Photo courtesy of Malembe Dumont Copero

[63] Middlesex County Office of Planning. "Wastewater Management Plan draft". 2019.
[64] Ibid.

Stormwater

The New Jersey Administrative Code defines stormwater as any type of precipitation that runs over the land's surface, is transmitted to the subsurface, or is captured by separate storm sewers or other sewage or drainage facilities[65]. Runoff is the water that runs along the ground or through sewer pipes, not the water that is transmitted into the ground. Stormwater is inevitable, as every storm or heavy rainfall will result in some level of increased water in the area. What is problematic however, is when there is excessive runoff because stormwater is unable to seep into the ground. Stormwater runoff picks up large pollutants like plastics, Styrofoam, and cigarette butts as well as particulate matter that is much smaller, including toxins such as gas, oil, fertilizer, and pesticides as well as pathogens[66].

In addition to runoff carrying harmful pollutants, another problem caused by excessive levels of runoff is riverbank erosion (including "under banking"), which is the gradual deterioration of riverbanks through increased flooding and extra meandering water in streams[67]. Our studio saw several photos of under banking, shared by guest presenter Johnny Quispe in the context of his research into ecological restoration of South River's riparian areas.

Per the National Pollutant Discharge Elimination System (NPDES) permit program, created in 1972 by the Clean Water Act, municipalities perform many of the permitting, administrative, and enforcement aspects of stormwater management. In New Jersey, each municipality is

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[65] NJDEP. "New Jersey Environmental Rules: New Jersey Administrative Code Title 7 Section 8" Accessed May 2, 2020. https://www.nj.gov/dep/rules/nj_env_law.html

[66] NJDEP. "Clean Water NJ". Last updated August 8, 2018. https://www.cleanwaternj.org/

[67] GEI Works. "Riverbank Erosion: Erosion Control Products to Prevent Riverbank Erosion" Accessed May 2, 2020. https://www.erosionpollution.com/river-bank-erosion.html

responsible for creating and implementing their own stormwater management plan. These plans are shared with the Middlesex County planning department. The County office of public works manages the storm drainage system for all roadways within the county. The Office of Public Works is responsible for ensuring that outflow from storm drains do not pollute any of the county's water bodies, including lakes, streams, and rivers[68].

In March 2019, New Jersey enacted the Clean Stormwater and Flood Reduction Act, which gives local and regional government and other entities the ability to create stormwater utilities and establish fees. A stormwater utility is a mechanism by which to raise funds for stormwater management, allocate its costs more fairly, and help ensure that less polluted runoff reaches our streams and rivers. This is an important new tool for municipalities, and an important new way to leverage funding to pay for the high costs of stormwater management. Prior to the Clean Stormwater and Flood Reduction Act, the costs of managing storm-related flooding and runoff could only be captured through other local government costs — typically either property taxes or water or sewer fees. This resulted in under-investment in managing stormwater, as well as inequities in who pays for stormwater management. It is now the case that properties that generate runoff can be directly charged for the service of the stormwater they displace.

At the state level, New Jersey's Department of Environmental Protection (NJDEP) is responsible for enforcing each municipality's Total Maximum Daily Loads (TMDLs), which is a regulatory measure under the Clean Water Act that limits the total amount of pollutants that

[68] Middlesex County New Jersey. "Stormwater Management". Accessed May 2, 2020 http://www.middlesexcountynj.gov/Government/Departments/IM/Pages/Storm-Water-Management.aspx

can be discharged surrounding rivers. Due to challenges posed by modeling tidal and overland flow, South River does not have a stormwater TMDL. (See issues regarding TMDLs in section "Water resources in South River – Hydrologic setting" above).

Boaters on the South River; Photo courtesy of the South River Boat Club, http://www.southriverboatclub.com/gallery.html

In addition to regulating TMDLs, NJDEP is responsible for managing the Municipal Separate Storm Sewer Systems (MS4) permitting process, under the Municipal Stormwater Regulation Program. The program was created in response to federal Environmental Protection Agency (EPA) guidelines set in 1999. The permitting process is a form of non-point pollution control that occurs due to stormwater runoff. There are two main tiers of permits in the program. Tier A Municipalities are generally located within the more densely populated regions of the state or along or near the coast[69], whereas Tier B communities tend to be more

[69] NJDEP. "Bureau of Nonpoint Pollution Control: Tier A Municipal Stormwater Permit". Last Updated January 23, 2020. https://www.nj.gov/dep/dwq/tier_a.htm

inland and rural. All the Municipalities in Middlesex County, including South River, are considered Tier A.

Aside from state-enforced regulations like TMDLs and Tier A MS4 general permits, there are actionable ways that a municipality can take to lessen the negative effects of stormwater runoff. The most notable would be investment in green infrastructure to absorb rainfall and decrease the total volume of surface runoff. In 2015, the Rutgers Cooperative Extension Water Resources Program released an impervious surface reduction plan for South River that laid out 24 proposals for implementing green infrastructure[70]. The proposals were stated in economic and environmental terms, quantifying the ecological benefits to the borough while also noting the total cost of each project. However, without the political will to support these projects, issues surrounding stormwater runoff will persist.

Currently, the municipal stormwater management plan for South River is simply unavailable. Without a complete and working copy of the plan, South River's Water Story is incomplete by Sustainable Jersey's criteria.

[70] Rutgers Cooperative Extension Water Resources Program. "Impervious Cover Reduction Action Plan for South River Borough, Middlesex County, New Jersey". 2015. http://water.rutgers.edu/Projects/NFWF/RAP/RAP_South%20River.pdf

Overview summary of issues

The Water Story shows how South River is a community that has a special and specific relationship with water. Clearly many aspects of life in the Borough, and Borough management, revolve around this valuable resource. Water infrastructure is a significant and driving element of what constitutes the built environment of a community. Over the years, water has shaped and impacted South River residents' life in this way. Super Storm Sandy and other past flood events, and anticipated future flooding related to climate change impacts, are just some of many examples.

However, it is also undeniable that the community's relationship with water is the result of human intervention and, in some cases, the lack of action by those responsible. South River´s water story shows that many of the issues the community faces today are related to aspects of water infrastructure and governance. Water is a fundamental human right. Individuals use it for different daily day tasks (drink, wash, cook etc.). In this sense, how the water is stored, treated, and location of storage (for example, whether the storage is affected by contaminants or environmental issues), make clear that water management processes are relevant for a healthy life.

While it is true that more recently South River´s local government has taken some steps towards tackling some of these problems (improving infrastructure, solving brown water issues, addressing water quality reporting, etc.), there is still a lot of work to do. Some of this work is related to the need to pay more attention to contaminants and other factors that might affect water, even when local potable water fulfills the NJDEP legal requirements. We have

learned that legal does not mean safe, and this is something that should also be integrated into future efforts.

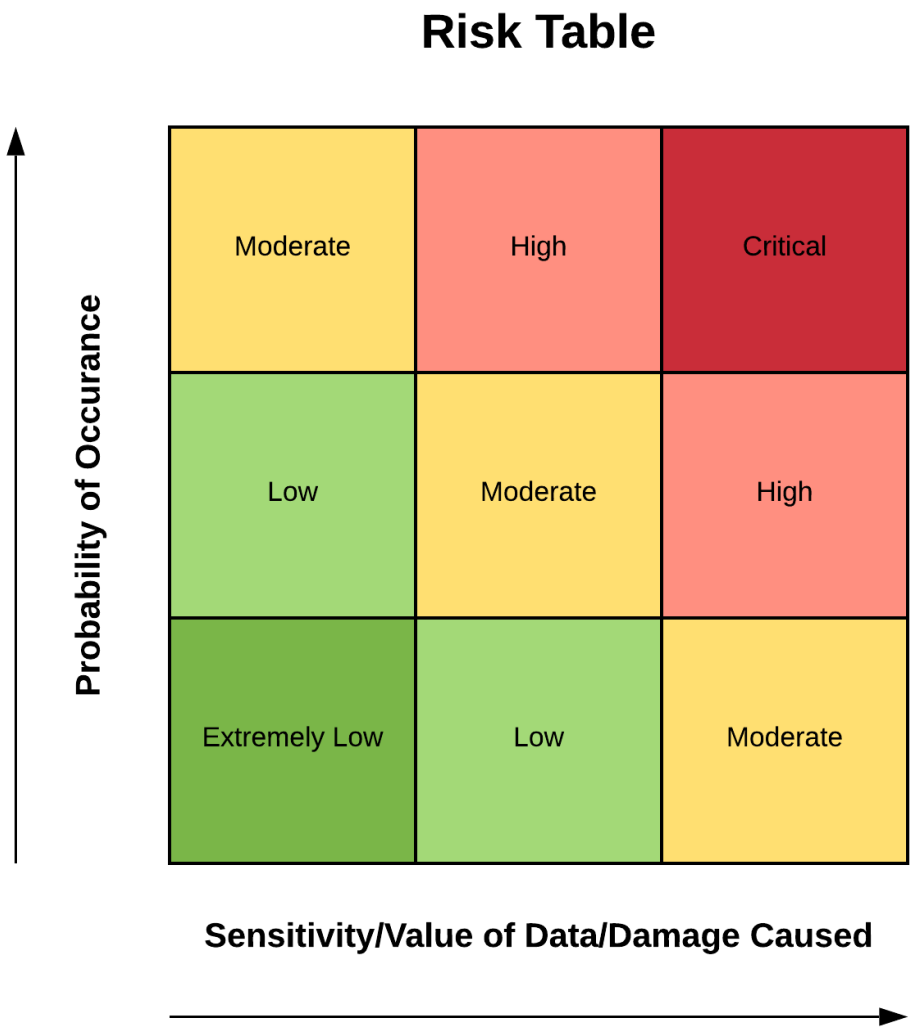
Other work is related to the lack of updated legislation. This is something very important when it comes to sound water governance. South River should already have an updated Wastewater Management Plan (WMP). The lack of it has not only been affecting water governance in the Borough, but also affected the studio´s work when trying to display South River´s water story in relation to wastewater and stormwater.

However, not all the relationships with water are negative for the residents of South River. The fortune of being defined by a River by name and proximity gives the community an opportunity for direct experience with nature, specifically around water (i.e. all the green spaces surrounded by water, etc.). Thus, future community efforts should not only be oriented towards introducing mechanisms for community resilience when dealing with natural hazards and improving water governance, but also to positively transform the community´s water experience. In other words, the community should start a process of reconciliation with water.

Ranking

As we have seen in the Water Story, water affects South River in many ways. Thus, it is crucial to get an idea of how relevant each of these water issues is so that effective interventions can be implemented. The following is a brief summary of the water issues the studio considers of primary relevance for South River along with a suggested ranking. The method and classification used should be reviewed (and changed if necessary) by the community members

Figure 19: Risk table methodology to evaluate water issues



as the Sustainable Jersey Water Story requires. The risk table displayed in Figure 19 was used to assess the following water issues and their levels of probability of occurrence and damage caused.

1. **Flooding:** Tidal flooding along the South River has been caused by storm events, hurricanes, nor-easters, and non-storm high tide. Scientific research points to storm intensification as a likely culprit. See Hydrologic Setting section.

2. **Flooding stormwater runs off**: Stormwater runoff is particularly problematic in areas with impervious surfaces, and leads to flooding. See Housing Market Analysis section.

3. **Water is not safe for recreation:** Water in the South River is not safe for recreational, primary contact uses such as swimming due to pollution in much of New Jersey's waterways. Safety of secondary contact for activities like kayaking and canoeing, which regularly occur on the South River, is also in question. See Hydrologic Setting section.

4. **Contamination of water by wastewater:** MCUA wastewater treatment facilities have felt the effects of increased storms and flooding in the past decade. During Superstorm Sandy in 2012, MCUA lost two key pump stations leading to weeks of uncontrolled discharge of untreated wastewater into the Raritan Bay. Although the spill did not cause contamination of drinking water in South River, it could happen in the future. See Wastewater section.

5. **Presence of nitrate in water:** Portions of South River are non-sewer service areas which exceed the nitrate dilution standard. Nitrate in water can cause "blue baby disease" and can indicate the presence of more serious agricultural pollutants. There are 72 municipal zoning permitted units in parts of South River which exceed the nitrate dilution standard. While this is not an issue now, it is important to be aware of these suggestions when considering further development in South River. See Wastewater section.

6. **Possible environmental impacts on location treatment plants**: Municipalities must be aware of the effects of climate change and decision-making regarding the location of treatment plants. See Wastewater section.

7. **Treatment problems**: South River's plant has problems with the treatment system and its chlorination system that might affect water quality (i.e brown water). Some interventions by the local government have been taken, and there is a need to evaluate whether it could happen in the future. See Water Supply and Water Quality sections.

8. **Legal does not mean safe**: Drinking water standards do not assure safe drinking water as legal limits have not been upgraded in over 20 years. When it comes to water samples, the quarterly assessment reports from the U.S EPA show that over 19 contaminants were detected. This has health impacts, especially carcinogenic effects, over a longer period. There is also the existence of unreported contaminants. Some of these contaminants can affect the body's hormonal balance causing reproductive problems and affecting the immune system. See Water Quality section.

9. **Water quality reports compromised**: Water quality in South River Borough is to be periodically audited by the South River Water Department by collecting samples from different locations. However, recent reports of fraudulent data being reported raises concern not only of the water quality but the institutional systems that monitor them. No

new water confidence reports have been published after this incident. See Water Quality section.

10. **Contamination at source (water intake)**: South River receives most of its water from groundwater sources which have chances of being contaminated with chemicals due to decades of industrial activity including the leaching from landfills and Superfund sites. There is a high correlation between the presence of Superfund sites and the incidents of cancer. Surface water sources also are subject to contamination of animal feces. Although no specific data has been collected for South River, it is something to consider. See Water Supply and Water Quality sections.

11. **Contamination at treatment plant**: The risk of contamination at treatment plants due to poor compliance with standards. Several contaminants are often a by-product of chemical processes used to purify water. See Water Supply and Water Quality sections.

12. **Treatment plant infrastructure**: The community also has problems with infrastructure being old and requiring updates. This is something that has been implicit in conversations with the community during our interactions with them. South River's Mayor Krenzel mentioned recent doing improvements in the South River treatment plant. See Water Quality section.

13. **Wastewater Management Plan:** South River and its area should have a plan. Although municipal representatives stated during our interim presentation that a new report is coming out, there are limitations regarding the study of water quality link to the plan. Legally, South River should have updated it years ago. See Wastewater and Stormwater sections.

14. **Watershed considerations:** Water quality for the sake of the environment and local ecosystems must also be taken into consideration. Related to this is the idea of food security, as many in South River and other municipalities within the watershed fish for consumption in rivers and streams. See Hydrologic Setting section.

Rutgers studio team meeting with South River Green Team in South River; Photo courtesy of Malembe Dumont Copero

INCLUSIVE COMMUNITY INVOLVEMENT

Moving forward, this report can be complemented by research driven by stakeholder engagement. With the semester interrupted by the COVID-19 pandemic, community outreach stalled and was not as inclusive as under normal circumstances. In future studios more community engagement across all segments of society is encouraged, including outreach to traditionally underrepresented groups. Reaching out to faith communities, cultural centers, and even schools are potential options for gaining more input from residents regarding community development and resiliency planning efforts.

Description of deliverables shared

The Rutgers Studio has prepared the following materials for the Borough of South River to use in their water-related community development and resiliency planning processes:

- Report "South River: Flooding, Neighborhood Change, Resilience, and Health": This document was developed for the governing officials of South River and interested stakeholders to better understand the water quality issues present within the Borough. It provides a detailed analysis of issues pertaining to the interconnectedness of health, housing, and community resilience work.

- Slide Deck: This presentation was developed by the Rutgers Studio students as a resource for community members to use in order to communicate water quality issues to government agencies, collaborating partners, and potential funders. Slides contain information regarding health insurance coverage, mortality rates, housing tenure, and the municipal water story required.

- Newsletter: A forthcoming eNewsletter that summarizes the information contained in this presentation will be located both on the LRWP website and on the South River Municipal website. It is intended for members of the general public to become more informed both about the work the Rutgers Studio has done over the course of the semester and about water quality issues within the Borough.

Data storage considerations for materials shared

Throughout the course of this semester, the students have been uploading materials to a shared Google Drive folder. Ownership of this folder will be given to Dr. Heather Fenyk at the conclusion of this course, and content will be shared with interested community stakeholders. If you would like access to this folder, please contact: hfenyk@lowerraritanwatershed.org

Communication strategies for materials shared

The deliverables outlined above were intended to serve a variety of audiences. For communicating key information to county officials or the general public, the slide deck, or some variation thereof, is most recommended.

INTERVENTIONS AND STUDENT PROPOSALS

Throughout the semester our studio was joined by guest lecturers who presented overviews of their work on different aspects of coastal resilience for the South River and larger watershed community. Presentations included consideration of how deconstruction of flood damaged homes could be used as a tool in community engagement and "community building," how restoration of the salt marsh in South River and Sayreville might serve as flood protection for the low socioeconomic communities in the floodplains of those communities, balancing redevelopment with flood hazard planning, and more.

Inspired by our guest lecturers and by our readings and research throughout the semester, studio team members developed their own draft proposals to address a planning, design, community development, or policy problem facing South River.

In what follows we provide an overview of lectures delivered by our guest lecturers and present the student intervention proposals. Each of the student presentations reflects on the guiding perspectives for the course: discussion of scale for planning and design, as well as equity considerations.

OVERVIEW OF GUEST PRESENTATIONS

Community Development Solutions: Deconstruction and Rebuilding

Tobiah Horton, Assistant Professor, Sr. Research Project Manager, Dept. of Environmental Sciences, Rutgers University

Professor Horton's presentation offered us alternative perspectives on design and its power to transform spaces that work for communities. The presentation traced the work of Professor Horton's Spring 2018 landscape architecture studio at Rutgers University as they deconstructed one of the buy-out properties, salvaging the materials and even reusing some in landscaping community gardens. This offered a completely different perspective of the idea of re-development of Blue Acre properties. Usually after Blue Acres purchases a flood-affected property, they clear the site and install a turf lawn.

Traditional practices of demolition are typically not conducted with sustainability in mind and reduce the entire property to scrap. Deconstruction allows for a process that is more sensitive to the economy of waste, working to reuse or recycle the various materials. It is also attentive to the social- value of the property, homeowners who choose to buy-out, prefer the care that goes into meticulously dismantling a home that was dear to them as opposed to the disregard that the act of demolition brings.

The post-demolition phase also posed key design challenges, the earthworks involved in creating a turf, renders the site less pervious and is maintenance intensive. These spaces are also bare and seem removed from the community. Professor Horton's studio designed a community rain garden space with paths and seating, offering a solution to both the ecological and social issues of the lawn. The design was a collaborative process with different students designing elements like benches, fencing, elevated paths and signage using the salvaged materials from the deconstruction exercise. With Deconstruction and Reuse, the home comes full circle and adds value to the community's spatial fabric.

Ecological Solutions: Living Shorelines

Johnny J. Quispe, Princeton Hydro

Coastal resilience is a central aspect to the work the studio has been doing with South River. Thus, this presentation was essential to amplify the spectrum of our conversations. Mr. Quispe started by defining resilience as the "ability of a community or region to adapt to and respond to disruptions and events of various sorts, including natural disasters". According to him, resilience is an interactive and reinforcing process that interrelates with sustainability (protecting natural assets and reducing damage) and hazard mitigation (reducing exposure to vulnerability to natural disasters). This intersection is very relevant when it comes to coastal flooding and rising seas. These hazards negatively impact not only human infrastructure but also generate changes and disruptions in natural ecosystems. Lateral migration, a landward migration of tidal wetlands that sometimes can lead to the reduction of canals, is one good example of this. Mr. Quispe argued that these processes of disruption could be tackled by using ecological solutions. He explained how living shorelines that utilize natural habitat elements for erosion control can help to restore ecological function and reduce the impact of tidal inundation. This can also generate a process of connecting and reconnecting communities with their ecosystems, especially in low-income inner cities where communities might not have access to waterfronts and the opportunity to interact with the surrounding waterways. The "South River Ecosystem Restoration and Flood Resiliency Enhancement Project (NJ)", a project led by Quispe and his partners, uses this vision.

Thinking Regionally for Equitable Outcomes

Nicholas Tufaro, Middlesex County Office of Planning

In early February, Mr. Nicholas Tufaro, Principal Planner for the Middlesex County Office of Planning spoke to us regarding equity in planning through his presentation titled, "Thinking Regionally for Equitable Outcomes". Mr. Tufaro is very involved in watershed protection and restoration in Middlesex County towns bordering the Raritan River, including South River. As described in our housing analysis section, he is also very involved in mitigating Middlesex County's and South River's flooding issues through programs such as the CRS Users Group, which he coordinates. In 2018, The Middlesex County Office of Planning along with Mr. Tufaro applied for the 2018 NJDEP National Disaster Resilience Grant. The grant was requested for the Raritan River and Bay Regional Resiliency Project. The project calls for a Regional Resiliency Team and Consultant team to work together to address "long term protection, resilience and stability from natural disasters within five contiguous Middlesex County towns"64. The grant will allow for a team up of regional and consulting teams to assess future flooding vulnerabilities, identify actions to reduce risk, evaluate solutions, and develop action plans based on the data66.

Equity in Resilience Planning

Sabrina Pereira, NOAA Coastal Management Fellow at New Jersey Department of Environmental Protection

Sabrina Pereira gave a presentation on the importance of social equity and how to implement it in resiliency planning. She introduced the concepts of environmental justice and social

vulnerability as well as how both are important when discussing vulnerable communities. Environmental Justice came out of the civil rights movement and looks at how people of color are often more affected by environmental problems like pollution than other communities. Similarly, social vulnerability focuses on vulnerable groups such as the elderly, the disabled, or children, and how they may find it difficult to recover from a disaster. Ms. Pereira went on to discuss the importance of equity which is providing people resources based on their situation. Sabrina talked about Resilient NJ, which is a part of the National Disaster Resilience Competition and was awarded a grant to produce regional planning projects in nine New Jersey counties that were most affected by Hurricane Sandy. The goals of Resilient NJ are to recognize and address any flaws in flood resilience planning as well as to make sure that socially vulnerable communities are represented to speak about their requests and the risks they face. Lastly, Sabrina presented the "Equitable Climate Resilience Planning Framework" which featured many important elements for helping the community including empowerment, data collection, community engagement, and co-development. Overall, Ms. Pereira's presentation was very helpful to the class and equipped our studio with understanding of the importance of an equity approach when studying the town of South River.

(Re)development Plans for South River

Joe Hyland, South River resident, architect, and Green Team member

South River resident, Joe Hyland, has played an integral role in shaping the direction and discussions of this studio. Both an architect and landscape architect by profession, and a member of South River's Green Team, Joe Hyland spoke to us about the challenges that the borough faces with regards to key design and planning issues, such as the redevelopment of

vacant buyout lots, revitalization of the town's waterfront, planning for community public spaces, and new and upcoming projects in the town.

In particular, he spoke with us about redevelopment of Laffin, an automobile repair store proposed to be redeveloped as a Portuguese Supermarket for South River. He touched upon the guidelines that all new construction activity in the town's vulnerable floodplains are expected to follow as part of the efforts taken to increase the town's resiliency against future flood risks. These include ensuring that all habitable spaces in a structure are elevated above ground to ensure that they are not in the direct line of risk in the event of a flood. They also include balancing dry and wet construction methods which can be implemented in high flood risk zones to better secure built structures against floods and other disasters.

Mr. Hyland provided additional details of ideas for the potential revitalization of vacant buyout lots and the borough's waterfront. These ideas will provide much needed community spaces in South River, but due to a lack of coordination between government bodies and specialists in other fields, the permits for the same have been difficult to secure thus far. Nonetheless, the discussions with Joe Hyland planted the seeds for creative thinking regarding the borough's potential redevelopment in our minds and helped us take our discussions and work forward with a new level of enthusiasm.

STUDENT PROPOSALS

Community gardens – Malembe Dumont Copero

There is an opportunity for generating new paths for environmental justice using community gardens. Environmental justice is normally seen as related to the distribution of bad goods (i.e. natural hazards, concentration pollutants, etc.). Contrary to this tendency, the proposal sees environmental justice as the mechanism for increasing and extending green and open spaces in the low-income communities. In other words, as the distribution of positive goods. The location we chose for this purpose was the Causeway Park.

Building upon the idea that environmental justice is not only about distribution but also about recognition of community capabilities and self-empowerment, the proposal encourages use of existing spaces and networks. In the end, helping communities to become more resilient should not mean replicating already existing efforts. First, we proposed opening the community garden to minorities groups and low-income members of the community that might need access to food for survival. Secondly, we also proposed the opening of a children garden school where kids could learn about gardening and experience nature. This could be done by using a network of volunteers of Friends of the Community Garden and by contacting the local schools.

A third dimension of the proposal was related to the organization of a farmer market. The idea is that the community could sell some of the food that is not being consumed and generate some economic resources. This could be done by contacting other local farmers. The New York Times highlighted how farmer markets have become a key resource during the COVID-19

crisis. They are spaces of interaction while social distancing and an opportunity for low-income people to access healthy food. South River does not have a farmer's market, and it has food deserts, so having access to fresh food whether in normal times or during the current public health crisis is also a question of equity and social justice. The location of the farmer market in the Causeway Park is also an opportunity for residents to reconcile with water and nature.

Research into healthcare accessibility, including at community organizations – Carolina Guzman

During our research, the studio team noted that South River has a higher mortality rate than Middlesex County and New Jersey overall. Further research is required to understand and address the town's high mortality rate. To better understand the issue, the town and community organizations can work alongside the New Jersey Department of Health to conduct a study into healthcare accessibility for residents of South River. This would include researching the number of hospitals, urgent care clinics, and doctor's offices, as well as type and specialist, within the town or in nearby areas. The town can further research whether healthcare clinics are easily accessible through mass transit or other means to the residents of South River.

Community organizations are important and should not be forgotten. They can also be included in the assessment because many provide health care services, as well as transportation, to South River residents including the elderly. Lastly, to further our understanding of South River's mortality rate issue, the town should consider reviewing mortality data amassed by the New Jersey Department of Health, such as reasons of death. Understanding why South River residents pass away and comparing it to nearby towns, the

county, or the state will provide further clarity of the mortality issue. The town should then consider whether the mortality rate is related to issues of education, sex, race, age, language, or household income unique to South River.

Using vacant lots to revitalize and protect South River – Ananya Kashyap

This design proposal revolves around the integration of three key aspects in the narrative around South River – the vacant buyout lots, revitalization of the town's riverfront, and protection of the town's floodplains by putting a halt on new construction along the riverbanks. The proposal aims to link the three issues together to come up with creative and necessary ideas for the vacant lots and for the new public spaces along the South River. The objective of the proposal is to be a grassroots initiative with a focus on collaboration with experts in relevant fields, such as landscape architects, planners, policy makers, and environmentalists. By opening a channel for dialogue with the community at the center, South River residents can truly be made to feel like an active and central part of the initiative.

A facility gap analysis can accurately portray the existing scenario of amenities and services in the borough and offer possible suggestions regarding uses for the new community spaces. The final ideas regarding these uses will be decided upon after extensive discussions with community members. While these ideas will help revitalize the vacant lots and the waterfront, the third issue of construction on the floodplain is equally important to ensure that South River is able to build resiliency against the adverse effects of climate change. Building on the floodplain increases the impervious cover on the waterfront, reduces natural vegetation, and

leaves the land more susceptible to threats of flooding. Creating a growth boundary and limiting the expansion of construction activities on the floodplain will allow the area's natural vegetation to flourish, reduce impervious cover, and increase resistance against flooding. Buyout lots could be used to accommodate projects which would have otherwise been constructed on the waterfront. In the case of necessary construction on the floodplain, alternate construction techniques can be utilized. Although a community-centered approach, the collaboration of key actors, such as government bodies, planners, policy makers, environmentalists, and architects, is indispensable to ensure the success of this proposal.

Artists in the planning process – Magdalena Mysliwiec

Oftentimes, at-risk communities like South River are approached with technical language or "doom and gloom" narratives which do not resonate. Using the American Planning Association (APA)'s equity lens on community engagement and public spaces, my proposal's goal is thus to reconnect the Borough of South River's community to its waterway and change perceptions to view the river as an asset rather than a liability. South River has done a positive job creating space between the river and inhabited areas using parks like Pacers Field and state-sponsored programs like Blue Acres, but water infrastructure can often leave barren and unusable spaces which are unappealing. This proposal will bring artists into a participatory, creative planning process to help re-imagine the spaces in South River which currently are underutilized from a social and aesthetic standpoint.

The South River project would engage the community at a town-wide scale in the planning for these spaces through various creative techniques ranging from storytelling to physical movement to food sharing. Such a planning process shows deference for local knowledge. Meanwhile, it is up to the artist to "bring a different type of imagination in" as well as encourage the collaborative problem solving recommended in APA's environmental justice equity policies. Arts allow for expression which goes beyond words. This creates a space which overcomes cultural barriers and that is welcoming and communal for all, even those who feel uncomfortable communicating in English, and encourages equity in planning. As such, my proposal centers on PROCESS rather than OUTCOME. South River residents themselves will determine the outcome. The hope is that if a public space is resident-designed it is more likely to be regularly used and reinvigorate the waterfront.

Mobile health clinics – Nathan Satish

This design proposal advocates for utilizing mobile health clinics in census tract 69 to offset the lower mortality rate in that census tract. It suggests that by partnering with NJ health clinics and other non-profits, South River could alleviate the health disparities within their population. Currently, roughly 1 in 5 South River residents is uninsured. By improving access to healthcare using mobile clinics, those without insurance can still get some of the healthcare they need.

Investing in health is not only beneficial from an equity standpoint, but it can also be an economic driver. Nathan was inspired by his hometown in Burrillville, Rhode Island, where every summer the RI Blood Bank parked their truck in a shopping plaza. After donating blood,

volunteers were given a voucher for a pound of free coffee at the neighboring Dunkin Donuts. A similar system could work in South River. He advises starting the project with a blood donation truck first as they are politically bipartisan and timely given the COVID pandemic. A consistent blood donation truck presence over time could help foment the idea of mobile clinics into institutional memory.

If this project were to move forward, there would need to be more research done in establishing partnerships with surrounding health advocates, as well as outreach into the community itself to make residents aware of where and when mobile clinics are and how they operate. The project could also be collocated with some of the other student design proposals, like the Community Garden.

Sponge city – Alena Siddiqui

Alena's design proposal focuses on possible stormwater management methods in South River. There is the possibility of turning South River into a sponge city which is something that a lot of cities in Asia have adopted. There are two ways to turn South River into a sponge city, one with green roofs and the other via creating more open green spaces. Open green spaces are important for a town or city, not only from an environmental standpoint but from a health perspective as well. Health equity plays a role in my proposal as the plan is to convert Blue Acre lands into green spaces, and it will be beneficial to have these spaces dispersed throughout the town so that all townspeople have access to green spaces. There are many health benefits to open green spaces such as reduction in stress, spread of disease, and pollution.

The adoption of green roofs and green spaces will also provide more areas for the community to meet. The idea is for green roofs to be on public buildings where all townspeople have access to such as the library. Green roofs and green space will create more public spaces which will foster a sense of community. These areas can be used for community gardens, cultural festivals, art installations, and more to provide the community with safe spaces to congregate. My proposal would involve more research into what areas can become green spaces as well as who will be willing to create a green roof. It will be best to market the proposal to the community of South River and discuss the positives of adopting such a proposal to make citizens excited about the idea.

Designing learning modules in deconstruction - Nirupama Vidyarthi

This proposal builds on Tobiah Horton's work in Deconstruction and Rebuilding and on Heather Fenyk's idea of creating circular economies through the deconstruction and rebuilding process. This is an effective solution that addresses the economic development concerns at the same time providing an avenue for the existing labor force in South River engaged in construction work. As this is a broader idea that already existed, the proposal focuses on a workshop template that would bring in interested community members and work with them in creating a learning module.

This proposal would require the studio team to work with community members who are interested in this endeavor. It is a community effort in running the workshop, developing modules and communication strategies, and creating a network of those interested in the skill development program with technical assistance from key stakeholders like architects, LRWP,

and Green Team members. Identifying the barriers to participation by community members would be crucial. There could be several factors affecting this, such as time restrictions, work schedules, and the reach of such programs. Some key questions that require discussion with interested community members would be: How would we organize this effort? Would this take the form of an organization? Would it be a cooperative? Or would this be a job training program conducted by the municipality? Tobiah Horton's presentation opened possibilities where we see these efforts scaled up across different municipalities, creating a larger environment where alternative development pathways can function.

OTHER RECOMMENDATIONS

The COVID-19 pandemic put into relief the importance of adopting a cross-disciplinary approach to address inequitable health outcomes. With respect to integrating health considerations in land use and land management considerations it is clear from our research that South River must treat housing policy as environmental policy, and likewise treat habitat connectivity and ecological restoration as health policy.

We recommend South River incorporate climate vulnerability assessments and resilience measures in their master planning processes, with specific focus on the following:

I. Advance Health Equity and Equitable Health Outcomes
   - Consider health equity as part of planning the built environment, taking into consideration disparities at the census block level
   - Improve access to health care and health insurance
   - Adopt a cross-disciplinary approach to address inequitable health outcomes
   - Establish clear, accessible and equitable targets for risk reduction (e.g. number of people at risk of flooding, number of people with low adaptive capacity living in the floodplain, amount of public infrastructure addressed)

II. Raise Awareness of the Relationship Between Flood Risk, Insurance Costs, Trends in Lending Practices (Blue lining) and Gentrification

- Advise community members of potential flood risks and impacts of proposed developments
- Prevent new development in high flood risk areas
- Provide pathways, incentives and options to relocate from risky areas in a way that is equitable and just
- Partner with other municipalities, the County and local NGOs to exchange information regarding community risks
- Embed social equity into cost-benefit analysis of (re)development
- Consider how sea level rise will affect settlement patterns over time with and without zoning interventions

III. Support Transparent and Empowering Community Engagement

- Build community capacity through development of community-owned narratives around environmental assets and healthy communities
- Establish structures so that South River and its residents work together to decide resilience strategies going forward
- Support the community in their understanding of planning and local land use issues related to health outcomes
- Support the community in their understanding of the potential for climate change to negatively impact health outcomes
- Develop a communications system for virtual outreach and meetings
- Implement principles of participatory planning

APPENDICES

i. Community outreach

This section describes the community outreach our studio team engaged in to inform our research and final products.

Kick-off meeting / tour of South River

A kick-off meeting was held on 2/01/2020 at First Reformed Church in South River and hosted by Heather Fenyk representing LRWP and the Rutgers Studio as well as Melanie McDermott representing Sustainable Jersey. The meeting offered a chance for studio students to meet and interact with some of the residents of South River and other key community stakeholders. Some of the community leaders in attendance represented South River's Green Team, various faith groups, and members of the shade tree commission.

After brief introductions, participants discussed the environmental issues facing the community, like how to best utilize vacant lots after the Blue Acres buyout program, the digging up of trees, and the political struggle to get a community garden approved. Dr. Melanie McDermott then gave her presentation introducing Sustainable Jersey and its certification program to the students and many of the community members. For a municipality to be registered under the certification program, it must assemble a "Green Team" comprised of residents, business owners, sustainability experts and others, and secure a resolution from the local government acknowledging support for the work of the Green Team. Green Team

members then choose from Sustainable Jersey's menu of 150 actions with corresponding points designed to incentivize registered municipalities to improve local sustainability practices by earning "bronze", "silver", and "gold" certification. Dr. McDermott encouraged the South River community to collaborate with studio students to develop the "Water Story", which is a narrative tool that summarizes essential information surrounding water resources and governance and is one of the requirements of earning "gold" certification.

Community members then led students on a tour of South River by Deacon Bobby Brown with South River's Union Baptist Church. The tour started at Pacer's Field and tudents were able to see just how close the river was to major developments in the town, notably the Laffin building, which is slated to be converted into a grocery store as part of an economic revitalization initiative. Students were surprised to see that Blue Acre properties were a patchwork across the borough rather than entire blocks. This would make design proposals more difficult to plan. The interactive tour ended at Causeway Park which sits just across the river from Sayreville, another Middlesex municipality that was ravaged by Superstorm Sandy.

New Jersey Council for the Humanities "Water Story" workshop

Community outreach also included a public "Water Story" workshop co-hosted by the Lower Raritan Watershed Partnership and South River Green Team. This two-hour session, held at the South River Public Library and sponsored by the New Jersey Council for the Humanities and Smithsonian, created the space for South River residents to talk about meaningful local water sites and sources. Participants shared stories about the South River, town history related to settlement and industry along the South River, and more. Stories captured from this event will become part of a public archive and digital exhibition that creatively visualizes,

interprets, and maps New Jersey's local water stories and the waterways that inspired them. The digital exhibition will return to the South River library in 2020 in the form of a computer kiosk and web interface.

Studio sharing session

After weeks of collecting and analyzing demographic data about South River on topics like housing tenure, health coverage, and other social vulnerability factors, students compiled a series of overview slides to share with members of the South River community. In addition to presenting demographic indicators of vulnerability, students used this as an opportunity to present their research on the Water Story project for South River. The purpose of this event was twofold. Students not only wanted to share their findings with community members, but also gather stories from community members in order to complement the data, especially stories that could be used in the final Water Story product.

The mid-term presentation took place the evening before Rutgers University closed its campuses and New Jersey Governor Phil Murphy issued a "stay at home" order in the attempt to stem the spread of Covid-19. The Covid-19 crisis limited participation, however the Mayor, three members of the Green Team, a representative from Middlesex County Office of Planning, and LRWP Board Members joined in an excellent exchange that benefited all parties. Community members got a clearer understanding of neighborhood inequalities at the census tract level and gained new insights into stormwater and wastewater management issues, and students got firsthand accounts of what residents believe to be the most pressing issues surrounding water resources in their town.

Phone Interviews

There were numerous stakeholders that wanted to attend the Studio Sharing Session event but were unable to do so because of the advent of Covid-19 restrictions. To try to engage with as many community stakeholders as possible, studio students learned about qualitative interviewing techniques, designed interview questions, and arranged phone interviews with members that were available to provide input. The following stakeholders were contacted and offered their advice for the studio's final report.

- Melanie McDermott, PhD, Senior Researcher, The College of New Jersey/Sustainable Jersey:

Melanie McDermott spoke with a studio representative to answer questions students had about the Water Story Project. She emphasized the importance of pulling together publicly available data from documents like the water management plan, stormwater plan, and other municipal documents in order to tell a clear and coherent story about residents and their relationship to their water sources. There was a clear emphasis on equity and making sure that as many voices as possible were represented, including historically marginalized communities.

- Jack Alai, South River resident and Former Chair of South River Town Council:

Jack's stories were especially helpful in understanding some of the issues regarding health, as the mortality rate was highest in his census tract. He believed that this was due to the large percentage of elderly residents in the area and speculated that alcoholism might be another

explanation. In addition to commenting on health demographics, he provided personal anecdotes that could bolster the water story project, because he noted the changing flora around the river and the decreasing number of cattails in the area. To address equity concerns, he suggested translating the document into Spanish and Portuguese.

- Shari Garretson, South River resident and member of Green Faith Network:

Shari Garretson looked over the slide deck presented at the sharing session and offered multiple suggestions for how the final slide deck could be improved for final delivery. She also suggested that in order to make the final products more accessible, they be translated into Spanish, Portuguese and Polish. She strongly urged students to consider presenting the final products remotely, despite the relatively little interest by community members due to more pressing matters surrounding COVID-19. To that end, she provided the contact details for the lead operator of TV35, which is South River's programming channel. She also encouraged students to get involved with the Citizen's Campaign, which is an organization that specializes in presenting ideas to governing bodies.

- Sabrina Pereira, NOAA Fellow at NJDEP:

Sabrina Pereira was helpful guiding students with respect to their proposals, sharing resources, and giving feedback on the slide deck. She appreciated the analysis and urged students to think of synergies between their various proposals. Her discussion primarily centered around questions of equity in climate resiliency. She also addressed challenges involved in meaningful community engagement especially as the state deals with the COVID-19 crisis. She noted that it is important to think of the ways in which the current situation has

impacted the community, and suggested students think about ways to use online platforms to communicate with community members and in order to share their final analysis.

Perspectives on Community Outreach

Community Outreach was difficult this semester given social distancing guidelines in response to the COVID-19 pandemic. Nonetheless, students actively reached out to stakeholders throughout the semester to gather stories and conduct structured interviews. Many students were successful in their effort, but there were still stakeholders that were non-responsive.

Students raised concerns over equity in their community outreach because only community leaders attended the Sharing Session and were present at the kick-off meeting. There were numerous discussions on how to effectively reach out to marginalized communities for their input, including reaching out on the town Facebook page, which was not done. Future studios will have to do a better job of getting stories from voices that are routinely overlooked, like immigrant and low-income community residents.

ii. Final Equity Considerations - Participatory Processes

The following section describes equity concerns related to our interaction with South River as we worked to advance community resilience.

South River's active community groups, including the Green Team, Environmental Commission, Shade Tree Commission, Community Garden, and faith-based agencies, represent residents in front of the planning department and local authorities. We met with representatives of several of these groups during our studio. However, there were some obvious limitations to achieve the third dimensions of equity, integral participation. Some of these limitations are related to where and when we met – some community members were not able to attend, and we ended up speaking mostly with local authorities and external actors related to the community rather than with residents themselves. Others are associated with the COVID-19-related public health crisis, and others to the lack of adequate tools and existing infrastructure for equitable community involvement in South River.

For the community to be able to realize equity in their resilience work, there should always be a consideration on how to facilitate community involvement in terms of place and time. The location and time where these discussions take place are very relevant aspects of achieving equity. How to sustain active engagement in decision making during periods of crisis is also something that should be considered. It is a fact during the time of crisis decisions that could negatively affect the community can take place. This is what Naomi Klein calls the "shock

doctrine”71. By reinforcing community networks and incorporating tools that would maintain- the community active in times of crisis, South River is securing equity.

Power Relations

This led us to another limitation to achieve equity. There is a tendency to reinforce power relations under the idea of resilience and sustainability. Even inside a community, hazards and water quality issues impact differently on different residents. They negatively impact the low-income or vulnerable more in general, and, in a particular way, minority groups and immigrants. South River is not an exception to this respect. The borough is a diverse community composed by populations from different ethnicities and origins. However, there is not a visible effort to mobilize and open paths for participation and involvement of these groups in community organizations and decision making.

Diversity

As the community tries to move toward resilience, it is essential to consider how to open paths for increasing diversity in the discussions and in the types of interventions the community does. It is impossible to speak about equity without paying attention to the different realities that exist in South River, which include questions of ethnicity, origin, culture and language. By considering these dimensions, the borough would be closer to achieving equity community resilience.

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