MODULE 5, Lesson 2: Designing for the Future: Climate Change Challenge

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Disclaimer: Some of the content in this lesson may be sensitive to some student groups. Issues of poverty and environmental justice are approached within the realm of specific NYC neighborhoods. Students may or may not be affiliated with the featured neighborhoods. Teachers should be prepared to navigate potentially sensitive classroom discussions around this issue. Teachers needing assistance in this process should seek additional professional resources.

Grades: 6-12

Duration: 4 class periods: 2 (45-50 minutes) lessons and 1 (90-100 minutes)

Objectives:

- Students will be able to analyze various forms of data to make connections between poverty and environmental justice

- Students will be able to cite evidence demonstrating the profound impact the environment can have on local settings

- Utilizing Visionmaker, students will be able to design visions for impoverished neighborhoods using climate change adaptation strategies

- Students will be able to share their ideas on urban planning design, contributing to the betterment of, and involvement in their local communities

Materials: Activity 1- student notebooks, whiteboards, NYC neighborhood/district map, projector, *One New York: The Plan for a Strong and Just City* document, laptops for students; Activity 2- *One New York: The Plan for a Strong and Just City* document, laptops for students; Activity 3- laptops for students

Suggested Standards:

NYS Content Standards:
Grade 6-8 Science Standards:
Standard 1—Analysis, Inquiry, and Design
T1.1; T1.3
Standard 6—Interconnectedness: Common Themes
5.2; 6.1; 6.2
Standard 7—Interdisciplinary Problem Solving
1.1; 1.3; 2.1

6-8 Life Science Standards
Standard 4:
7.1e; 7.2c; 7.2d

Grades 9-12 Science Standards:
Standard 1:
1.1a; 1.1c; 1.2a
Engineering Design Key Idea 1
Standard 6—Interconnectedness: Common Themes
2.1
Standard 7—Interdisciplinary Problem Solving
1.1; 1.3

Grades 9-12 Living Environment Standards
Standard 4:
7.1c; 7.2c; 7.3a; 7.3b

Grades 6-8 Social Studies Practice & Content Standards
6.A2; 6.E6; 6.F6; 6.F1
7.A2; 7.B4; 7.C4;
8.A2; 8.B4; 8.C4; 8.2b

Grades 9-12 Social Studies Practice & Content Standards
A2; B3; B7; D1; D2; D3; F2; F6; F8

Grades 6-8 Technology Standards
Standard 5 – Technology
2,3,4,6

Grades 9-12 Technology Standards
Standard 5 – Technology
2,3,4,6

Next Generation Science Standards:
Grades 6-8 Earth and Space Science Standards

MS-ESS3-3; MS-ESS3-5

Grades 9-12 Earth and Space Science Standards
HS-ESS3-1; HS-ESS3-4

Grades 9-12 Engineering, Technology, and Applications of Science Standards
HS-ETS1-3; HS-ETS1-4

Common Core State Standards:
Grade 6-8
CCSS.ELA-LITERACY.RI.6.1
CCSS.ELA-LITERACY.RI.6.7
CCSS.ELA-LITERACY.RI.7.1
CCSS.ELA-LITERACY.RI.8.1

Grade 9-12
CCSS.ELA-LITERACY.RI.9-10.1
CCSS.ELA-LITERACY.RI.11-12.1

ACTIVITY 1: Climate Change through the Lens of Environmental Justice (90-100 mins)

In Lesson 1 we learned that due to climate change the New York City Panel on Climate Change (NPCC) has predicted that temperature increases and rising sea levels are extremely likely for New York, while annual precipitation is likely to also increase.[1] This may lead to flooding, water quality, and infrastructure problems.[2] What students may not know is that environmental justice issues that will disproportionately affect NYC's poorest residents. This lesson will be an exploration of environmental justice issues as they relate to rising sea level, income equality, and brownfields. This activity may take two class periods to complete.

Mayor Bill de Blasio's OneNYC document was created to highlight four main lenses: growth, equity, sustainability, and resiliency.[3] All four of these lenses have meaning for NYC's poorest neighborhoods. The teacher should begin by having students do a mental mapping activity. Teachers will ask students to individually write down their perceptions of New York on a piece of paper. The teacher will ask:

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[1] New York City Panel on Climate Change, "Climate Risk Information," City of New York, 3-4, http://www.nyc.gov/html/om/pdf/2009/NPCC_CRI.pdf.

[2] Ibid.

[3] The City of New York, *One New York: The Plan for a Strong and Just City*, The City of New York, 2015, http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf.

What do you associate with this place? What images or words come to mind when you think of New York (can be anything)? Students may name neighborhoods, products, or people, or they may share adjectives. Once they have finished the teacher should pose the following questions:

- *How do you think you've developed these perceptions?*

- *How many of you have images based on personal experiences or a family connection?*

- *How has popular culture influenced these ideas?*

- *How else do we develop perceptions of places?*

Have students share with their table groups their individual thoughts. Did anything they list have something to do with equity issues in the city? If so, what were they? Repeat the activity as a whole group to make students' lists more conscious of possible inequalities that exist in NYC. What were some of the new images/words that you came up with as a group?

The teacher should share with students that U.S. Census data from 2009-2013 tells us that 21.5% of New Yorkers are below the poverty level, and 45.1% are at or near the poverty level.[4] Students should be asked to informally share their thoughts and feelings about the fact that 66.6% of New Yorkers live in or near poverty. Are they surprised by how high/low that figure seems compared to their assumptions? Ask a few select students to extend their thinking by providing a rationale for their assumptions. According to the OneNYC document, "Despite its overall prosperity, New York City continues to struggle with high rates of poverty and growing income inequality…Over the past decade, income inequality has increased in the city, surpassing the national average- and in recent years, it has continued to rise."[5]

The teacher should transition by informing students that the Manhattan Institute has conducted a poverty and progress report in NYC and has identified the poorest neighborhoods of each borough. Those neighborhoods and their subsequent community districts are as follows:[6]

- Bronx #1- Mott Haven and Port Morris
- Bronx #2- Hunts Point
- Brooklyn #16- Brownsville and Ocean Hill
- Brooklyn #5- East New York
- Brooklyn #13- Coney Island

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[4]The City of New York, *One New York,* 33

[5] Ibid. p 32

[6] Stephen Eide, "Poverty and Progress in New York I: Conditions in New York City's Poorest Neighborhoods," *Manhattan Institute Civic Report*, no. 88 (2014). http://manhattan-institute.org/sites/default/files/cr_88.pdf.

- Queens #4- Elmhurst and Corona
- Queens #3- Jackson Heights
- Manhattan #11- East Harlem
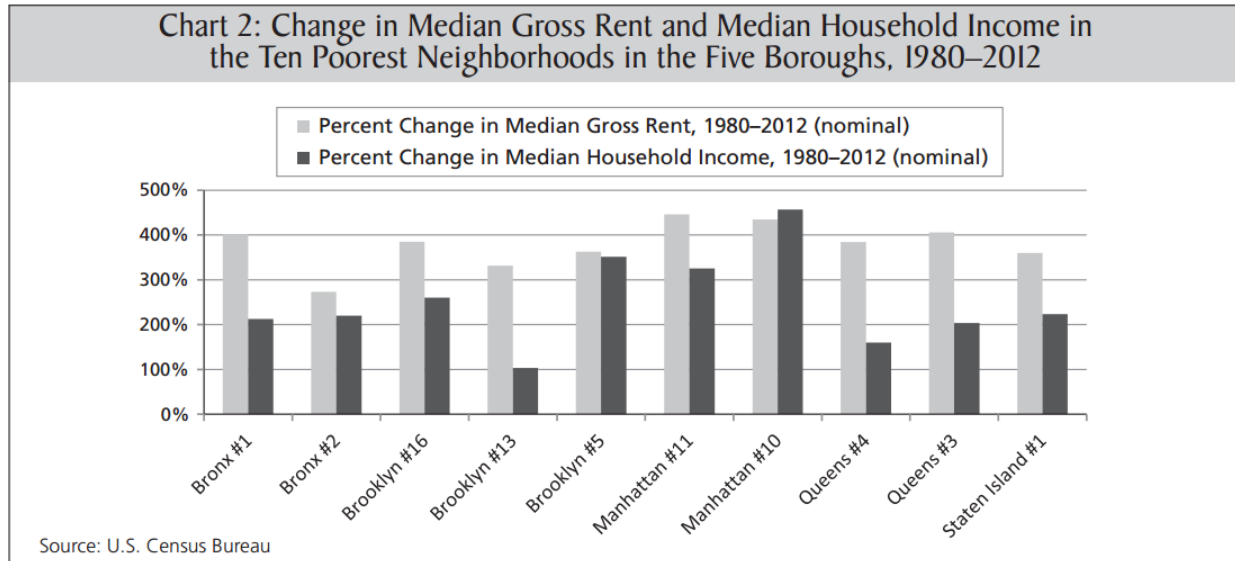- Manhattan #10- Central Harlem
- Staten Island #1- Stapleton

The teacher should provide students with a neighborhood district map of New York City so that students can explore the locations of the neighborhood identified above. An example of a map of this nature can be found at http://www.mappery.com/maps/New-York-A-City-of-Neighborhoods-Map.jpg.

Break up the class into 5 small working groups, one for each borough. Each group will explore on the computer WNYC's Median Income Across the US interactive map http://project.wnyc.org/median-income-nation/#13/40.5968/-73.9414.[7] They should zoom the map into the NYC area. Having found the general area of the poorest neighborhoods on the previous map, students should use that prior knowledge to explore those same general areas on the WNYC map. The group should take this opportunity to informally investigate differences in the median household income in their borough. Next, using the map legend, have students record the lowest median household income that they find in the vicinity of the poorest neighborhoods previously identified.

Once students have recorded their values, the teacher should show students the following graph from the Poverty and Progress in NYC report.[8] The teacher should ask students to share their observations from the graph. What is this graph telling us? What are the implications for residents in these poor neighborhoods?

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[7] John Keefe, Louise Ma, Chris Amico, and Steve Melendez, *Media Income Across the U.S.*, WNYC Data News Team, http://project.wnyc.org/median-income-nation/#13/40.5968/-73.9414.

[8] Ibid. p 8

Chart 2: Change in Median Gross Rent and Median Household Income in the Ten Poorest Neighborhoods in the Five Boroughs, 1980–2012

Legend:
- Percent Change in Median Gross Rent, 1980–2012 (nominal)
- Percent Change in Median Household Income, 1980–2012 (nominal)

Source: U.S. Census Bureau

The teacher should take a moment to summarize the graph once students have shared their observations. In essence, low-income areas have a difficult time matching their income to the demands of the housing market. In all but one case, they don't make enough money to be able to afford growing rent prices. The teacher should display the next chart which provides information on the percentage of NYC's population that lives in public and subsidized housing. According to the Poverty and Progress report, "When figures for subsidized housing are included, the median neighborhood among this cohort (i.e., the ten community districts studied) has one-third of its rental units dependent on public support."[9] If the New York City Housing Authority didn't provide residents of these neighborhoods the opportunity to pay a percentage of rent relative to their income, then many people would not be able to have stable housing

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[9] Ibid. p 7

situations.

Table 6: Percent Public and Subsidized Housing in New York City's Poorest Neighborhoods		
	Public rental units (% of rental units)	Subsidized rental housing units (% of rental units)	Total, public and subsidized housing
City	8.2%	8.4%	16.6%
Bronx	11.4%	13.4%	24.8%
Brooklyn	8.6%	6.7%	15.3%
Manhattan	9.0%	11.6%	20.6%
Queens	3.7%	2.3%	6.0%
Staten Island	8.6%	6.5%	15.1%
Bronx #1	35.0%	19.0%	54.0%
Bronx #2	3.1%	30.0%	33.1%
Brooklyn #16	23.5%	12.5%	36.0%
Brooklyn #13	17.7%	10.8%	28.5%
Brooklyn #5	18.0%	25.5%	43.5%
Manhattan #11	34.8%	21.1%	55.9%
Manhattan #10	18.8%	24.6%	43.4%
Queens #4	0.0%	2.4%	2.4%
Queens #3	0.0%	0.4%	0.4%
Staten Island #1	11.2%	11.8%	23.0%
Median	17.9%	15.8%	33.1%
Source: Furman Center		

Scott Winship, a Walter B. Wriston Fellow from the Manhattan Institute for Policy Research, quotes President Obama who states, "A dangerous and growing inequality and lack of upward mobility is the defining challenge of our time."[10] Similarly, Mayor de Blasio argues that New York City's inequality "fundamentally threatens our future."[11] Mayor de Blasio's OneNYC document highlights as one of its primary visions, making NYC a just and equitable city. For the sake of this lesson, the teacher should proceed moving forward with this notion through the lens of environmental justice.

New Yorkers have voiced education and housing to be some of the most important issues to them.[12] The environment came up as one of the lowest priorities at only 3%.[13] However, the environment is vitally important to all New Yorkers, whether they are aware of this or not.

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[10] Ibid. p 4

[11] Ibid. p 4

[12] The City of New York, *One New York*, 19.

[13] Ibid, p. 19

Environmental matters affect us all, but most times environmental issues disproportionally affect poorer residents and communities. This is known as an environmental justice issue. The OneNYC document states, "We recognize that equity and environmental conditions are inexorably linked. Environmental hazards translate into poor health, loss of wages, and diminished quality of life, particularly for residents of low-income communities that have historically been burdened with a disproportionate share of environmental risk."[14]

One such risk is that of brownfields. Brownfields are areas of land that cannot be utilized for development purposes because of the presence of environmental contaminates and toxins. These lands are either totally vacant or used sparsely (*For more information on Brownfields, consult the OneNYC document from page 194-199*).[15] Brownfields are commonly found throughout NYC. Have students use the following maps to identify where these locations are (located on the next two pages).[16]
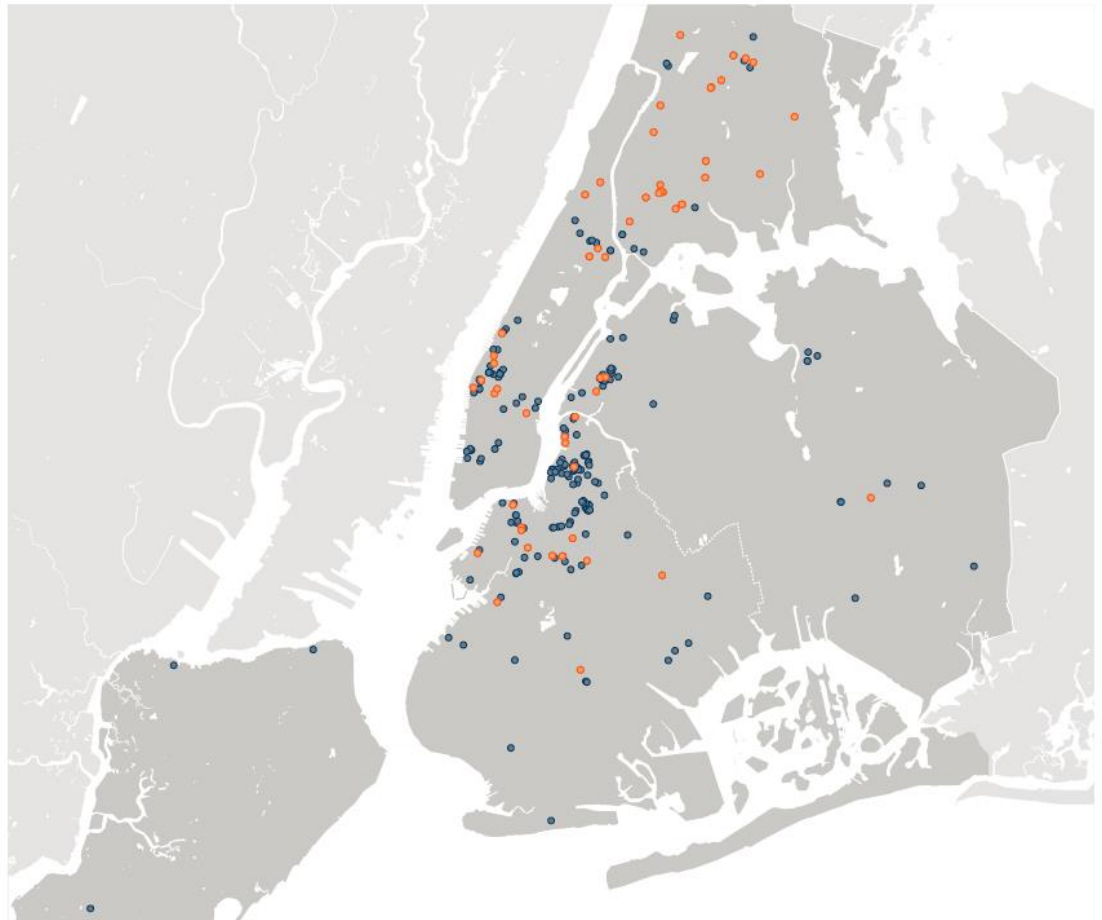
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[14] Ibid, p. 164
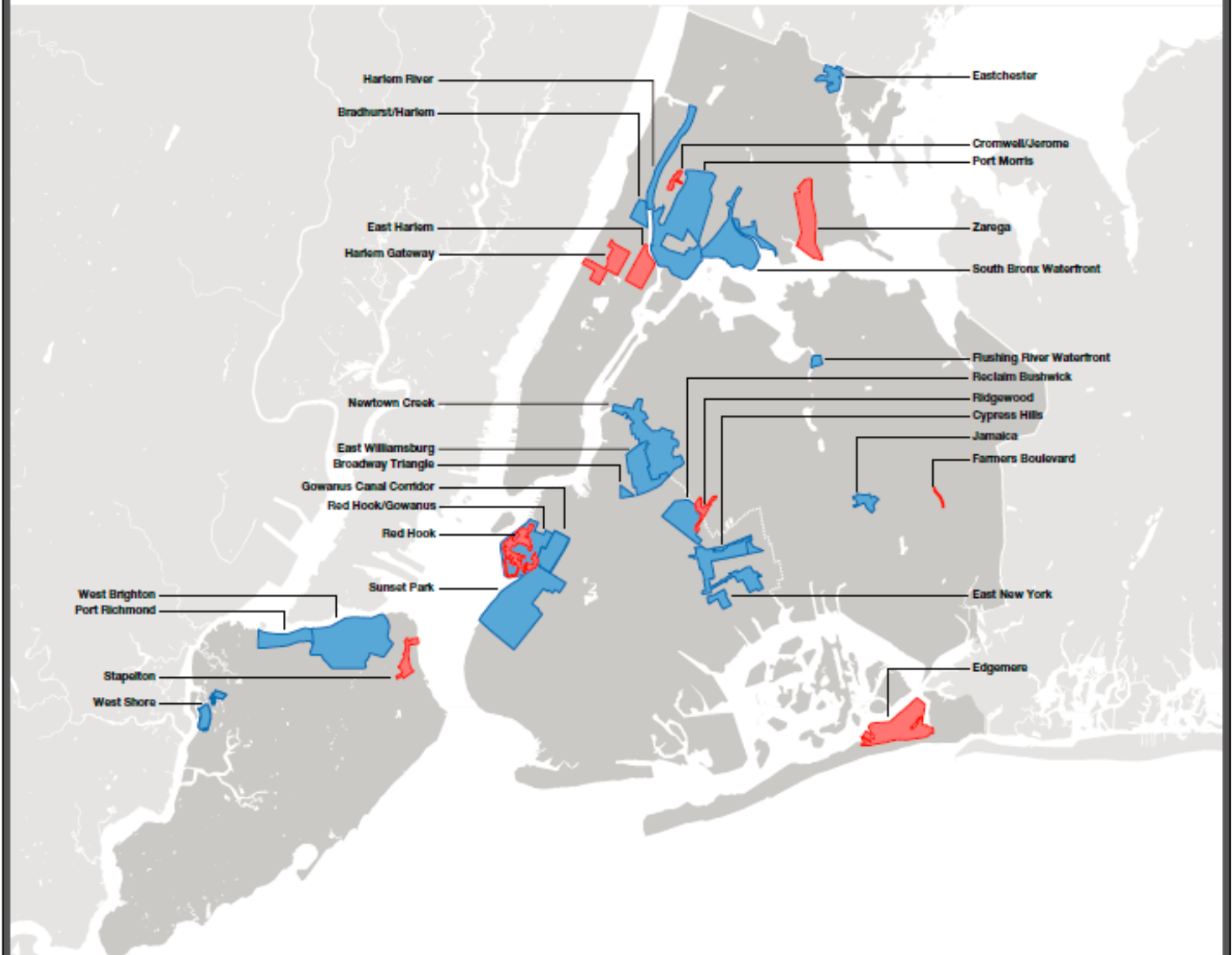
[15] Ibid, p. 194

[16] Ibid, p.196 & 198

Citywide Voluntary Cleanup Program (VCP) Sites

- Affordable Housing Projects Enrolled VCP: 60
- Sites Enrolled in VCP: 263

Place-Based Community Brownfield Planning Areas

Established Areas
New Areas

Harlem River
Bradhurst/Harlem
East Harlem
Harlem Gateway
Newtown Creek
East Williamsburg
Broadway Triangle
Gowanus Canal Corridor
Red Hook/Gowanus
Red Hook
Sunset Park
West Brighton
Port Richmond
Stapelton
West Shore

Eastchester
Cromwell/Jerome
Port Morris
Zarega
South Bronx Waterfront
Flushing River Waterfront
Reclaim Bushwick
Ridgewood
Cypress Hills
Jamaica
Farmers Boulevard
East New York
Edgemere

What are they noticing? Is there any location overlap between the areas that we have been discussing with the median income map and the poverty and progress report? Which ones? What does this tell us?

We are finding that brownfields exist in many of the poorest neighborhoods that we have been discussing. This tells us that residents in these areas are disproportionately exposed to environmental contaminates that could affect their health, and it also impacts purposeful development from happening in their area. "Brownfields result in lost opportunities to create small businesses, new jobs, affordable housing, and healthy open space in areas where these opportunities are needed most. Oftentimes, their presence leads to a cycle of financial disinvestment and a downward economic and social spiral."[17]

The teacher should pose the following question to students, "*Let's take a step back. How does this all relate to climate change?*" Let students share a few hypotheses before moving forward. Next show them the following map of flood inundation from Hurricane Sandy (located on the next page). [18]

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[17] Ibid., p. 194

[18] FEMA, *Sandy Inundation,* In *PlaNYC: A Stronger More Resilient New York*, The City of New York, 2013, 14, http://www.nyc.gov/html/sirr/downloads/pdf/final_report/Ch_1_SandyImpacts_FINAL_singles.pdf.
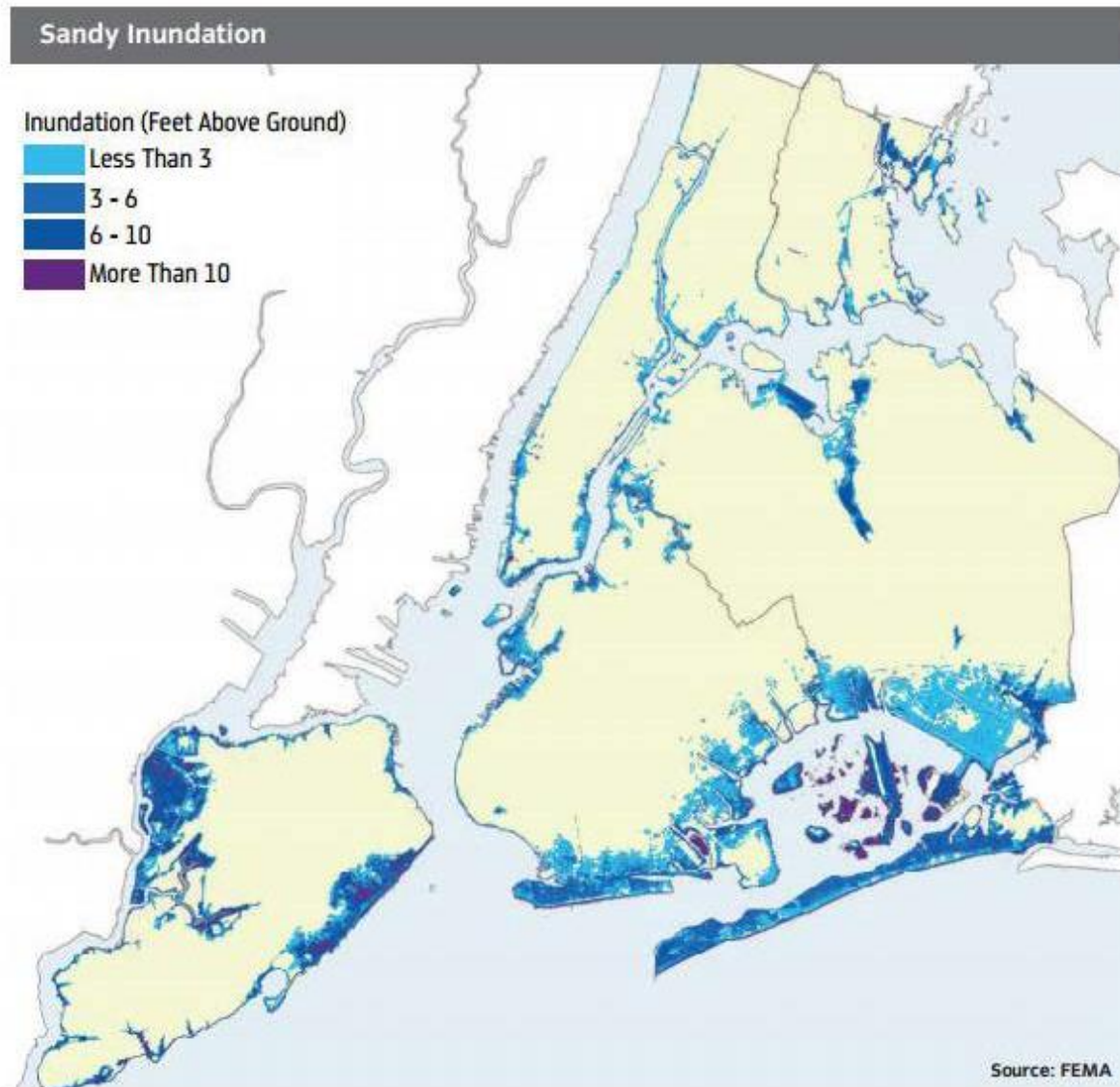
Have the students compare the two brownfield maps and the Hurricane Sandy inundation map side by side. Pose the following questions:

- Are any of the general areas we have been discussing in this activity, affected by Sandy flooding?

- What do they think some ramifications are of having brownfields in flood-prone areas? What risks does that pose? (*teachers for discussion prep refer to page 199 of the OneNYC document*)

- Climate change projections anticipate increases in temperature and sea level rise to be extremely likely, and increases in annual precipitation to be more likely than not.[19] What

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[19] New York City Panel on Climate Change, "Climate Risk Information,"3-4.

impact will this have on some of our coastal neighborhoods in NYC? What is likely to be the impact on some of NYC's poorest neighborhoods?

  o Take into consideration the facts that we have learned earlier: the majority of the residents in the poorest neighborhoods make less income than current rent trends; a good percentage of those residents rely on public or subsidized housing. Also take into consider that Hurricane Sandy damaged 305,000 housing units in NYC. There are 67,000 at-risk buildings in flood-prone areas, and 398,000 at-risk residents living in flood prone areas.[20]

Students should walk away from this activity knowing that NYC's poorest residents will suffer disproportionate amounts of harm compared to residents who live in more affluent neighborhoods when it comes to the effects of climate change. Not only are the physical locations of many of the neighborhoods in flood-prone zones, but they are also in areas where brownfields exist. Flooded brownfields can spread environmental contaminates throughout neighborhoods and put residents in harm's way and expose them to additional health risks associated with such contaminates. Low-income neighborhoods already suffer from higher incidences of asthma, cardiovascular disease, exposure to mold in their homes, and limited economic opportunity and neighborhood stability due to environmental related obstacles.[21] How are you going to help give a voice to these disenfranchised communities? Create a vision for a greener NYC that's how!

ACTIVITY 2: Climate Change Adaptations Strategies for NYC's Most Disenfranchised
                Neighborhoods (45-50 mins)

In Activity 1 we learned about just a few of the environmental justice issues that some of NYC's poorest residents face. Now it is time for students to use this information to create a "greener" NYC for these particular neighborhoods. The class should be divided into 10 small groups, 1 for each of the neighborhoods discussed in Activity 1 (Mott Haven/Port Morris; Hunts Point; Brownsville/Ocean Hill; East New York; Coney Island; Elmhurst/Corona; Jackson Heights; East Harlem; Central Harlem; and Stapleton). Depending on the size of your class, this may result in students working in pairs. However, it is up to the teacher's discretion to create small groups of appropriate sizes to best meet the needs of their specific demographic of students. That may require selection of fewer neighborhoods with which you work.

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[20] Huffington Post, "Hurricane Sandy's Impact, By the Numbers (Infographic)," *Huffington Post Green*, October 29, 2013, http://www.huffingtonpost.com/2013/10/29/hurricane-sandy-impact-infographic_n_4171243.html.

[21] The City of New York, *One New York*, 164.

Each small group should create a vision in one the specific neighborhoods listed above. Students should use the brownfield maps, the Hurricane Sandy inundation map, and the WNYC's Median Income across the US interactive map http://project.wnyc.org/median-income-nation/#13/40.5968/-73.9414 to create vision areas they feel are representative of those neighborhoods (sample suggestions can be found in appendix A). Students should have the independence to decide what alterations they are going to make to their vision in attempt to create a more sustainable and just neighborhood for low-income residents. If students need assistance generating ideas or steps to be taken, the appendices of the OneNYC document are great resources (Indicators, Summary of Initiatives, and 2011 Sustainability Initiatives sections).

Students should utilize Visionmaker to come up with different climate change adaptation strategies (i.e. limiting different building types at water edges, restoring natural ecosystems such as estuaries, reducing CO_2 emissions by installing bikes lanes, building green infrastructure, minimizing the effects of the urban heat island by planting more trees, etc.) for communities that are most at risk for environmental justice disparities. Some of these neighborhoods may be in flood-prone areas, while others may not. Students should be creative about how they are going to improve these neighborhoods for its residents with an environmental focus in mind. With the changes that they make, students should record the impact their changes have towards the various Environmental Performance Indicators. Ultimately they will be looking to reduce storm and/or floodwater, reduce greenhouse gases or solid waste production, increase or maintain biodiversity, and either maintain or increase resident and/or worker populations. Their goal is not to displace residents but to improve their overall quality of life, while becoming more sustainable.

If teachers believe student groups need more support or initial structure to this activity, they can issue a challenge for each group. In this case, the teacher would have to create the vision, in order to monitor the progress of the student groups (refer to the "Creating and Joining Groups" and "Creating a Challenge" documents in appendices B & C for additional assistance on how to accomplish this task). Provided are a few examples of challenges that a teacher could issue:

- Example 1: Vision- Mott Haven/Port Morris in the Bronx
    - Reduce floodwaters by 70%
    - Maintain resident population
    - Increase worker population by 20%
- Example 2: Vision-Brownsville in Brooklyn
    - Reduce non-biodegradable garbage by (x)%
    - Maintain resident population
    - Reduce fuel combustion (CO_2 output) by (x)%

- Example 3: Vision- East Harlem in Manhattan

    o Reduce impervious runoff from hardtops by (x)%

    o Increase trips by mode (various modes of transportations) by (x)%

    o Increase worker population by (x)%

ACTIVITY 3: Visionmaker-Giving Students a Voice (45-50 mins)

Excerpt from the OneNYC document:

> New York City works best when New Yorkers are involved with their city and have a say in their government, and when government listens to their voices to make better decisions. We need to create new processes for communication and dialogue. The result will be more informed policymaking and better-designed programs, and New Yorkers with tools and resources to help shape the future of their city. Engaged New Yorkers are empowered residents who interact with their government, and can effectively help set priorities and shape policy.[22]

Research has shown that children do not often take action or become involved in the dialogue about environmental problems because they feel they do not have a voice through which to be heard.[23] Visionmaker is the vehicle through which students can have a voice, not only about environmental issues, but also socio-political matters. It is a tool which allows students to feel like they can make a different in their own lives and the lives of others.

Activity 3 is all about students sharing out their visions with the rest of their classmates. They should have written talking points to highlight and discuss the alterations that they made and provide a rationale for those alterations.
- Student must make sure to discuss the outcomes of their modification as well as the larger implications for communities and the environment.
- What aspects of the OneNYC document did they draw inspiration from?
- Which EPIs were they most focused on improving and why?
- How will their visions help protect residents/the physical neighborhood from the effects of climate change?

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[22] The City of New York, *One New York*, 35.

[23] Irida Tsevreni, "Towards an Environmental Education without Scientific Knowledge: An Attempt to Create an Action Model Based on Children's Experiences, Emotions, and Perceptions About Their Environment," *Environmental Education Research* 17, no. 1 (2011).

Once all student groups have had the opportunity to present their visions, the teacher should discuss with students the possibility of promoting their newfound voices to a larger audience. Visionmaker allows students to share their visions publicly. If you selected to make your vision public, other users will be able to search for, copy, and comment on your vision. Clicking the "i" icon next to a public vision's name in the vision control toolbar or navigating to the Vision Information tab in the Dashboard shows basic information about a vision, and allows users to comment on the vision or share it via Google+, Facebook, or via a unique URL.

Teachers within the same or different schools could require their students to comment and provide critical feedback to other students' visions. This will allow students to see multiple viewpoints and could serve as an extension activity to make additional modifications to their original vision. Students could also share their visions on social media for friends and family outside of their immediate classroom community.

In reviewing students visions, if the teacher thinks there are high caliber visions that exemplify student understanding of the impacts of climate change on NYC and the concept of environmental justice, they could consider sharing the students' vision with the Office of the Mayor. On the OneNYC website (http://www1.nyc.gov/html/onenyc/index.html) there is a "Speak Up" tab which allows you to contact City of New York representatives. This page prompts New Yorkers to share their ideas on how to better New York City. On behalf of the students the teachers could share the unique URL address in the appropriate box in addition to answering the following prompt: **COMPLETE THIS SENTENCE: "ONE WAY TO CREATE A BETTER NEW YORK CITY IS TO _____" .**

NYC students desire to have their voices heard. They too should have a say in the betterment and shaping of their home communities. Visionmaker is a tool to give them that voice!

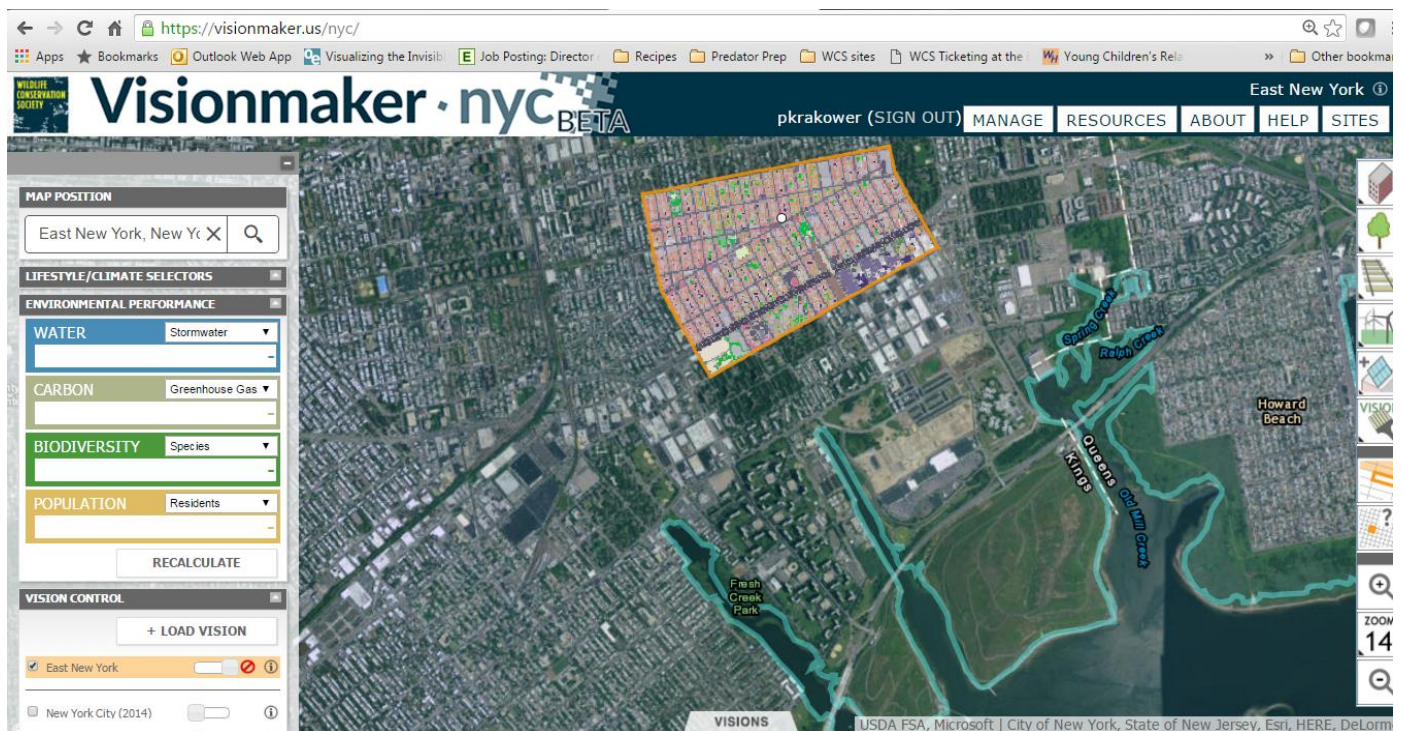## Appendix A: 10 Poorest NYC Neighborhood Vision Examples
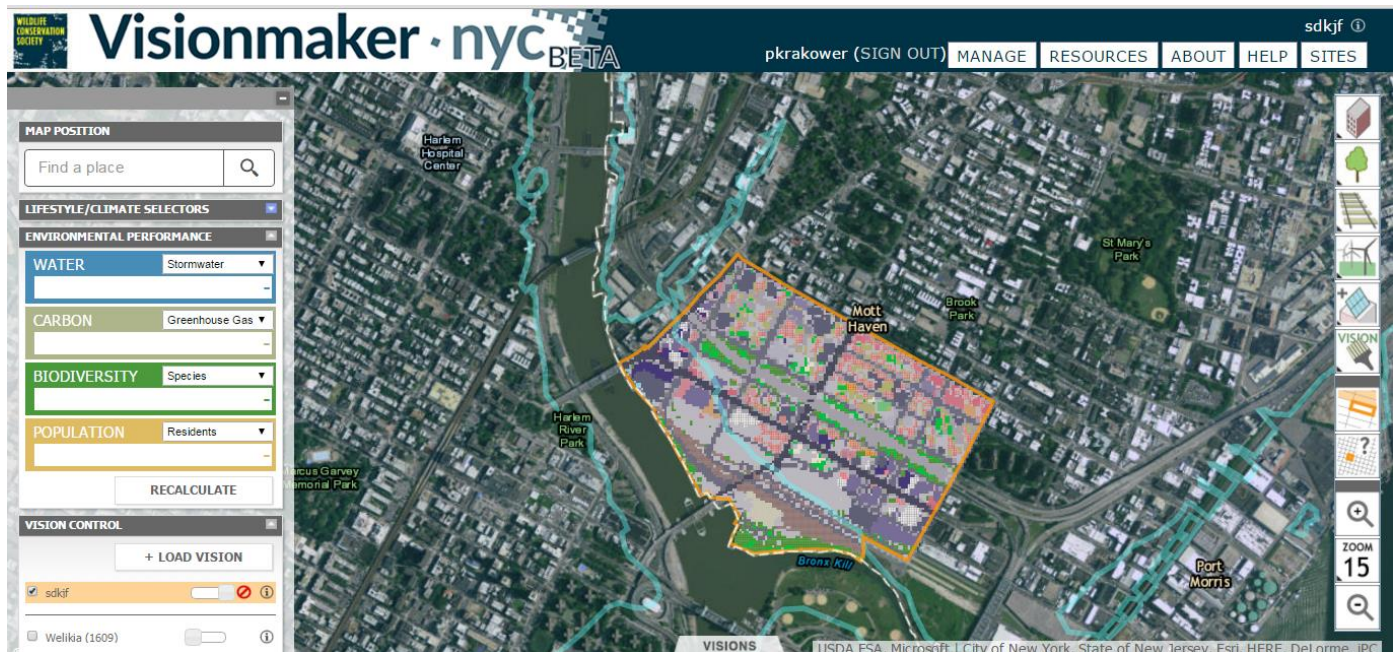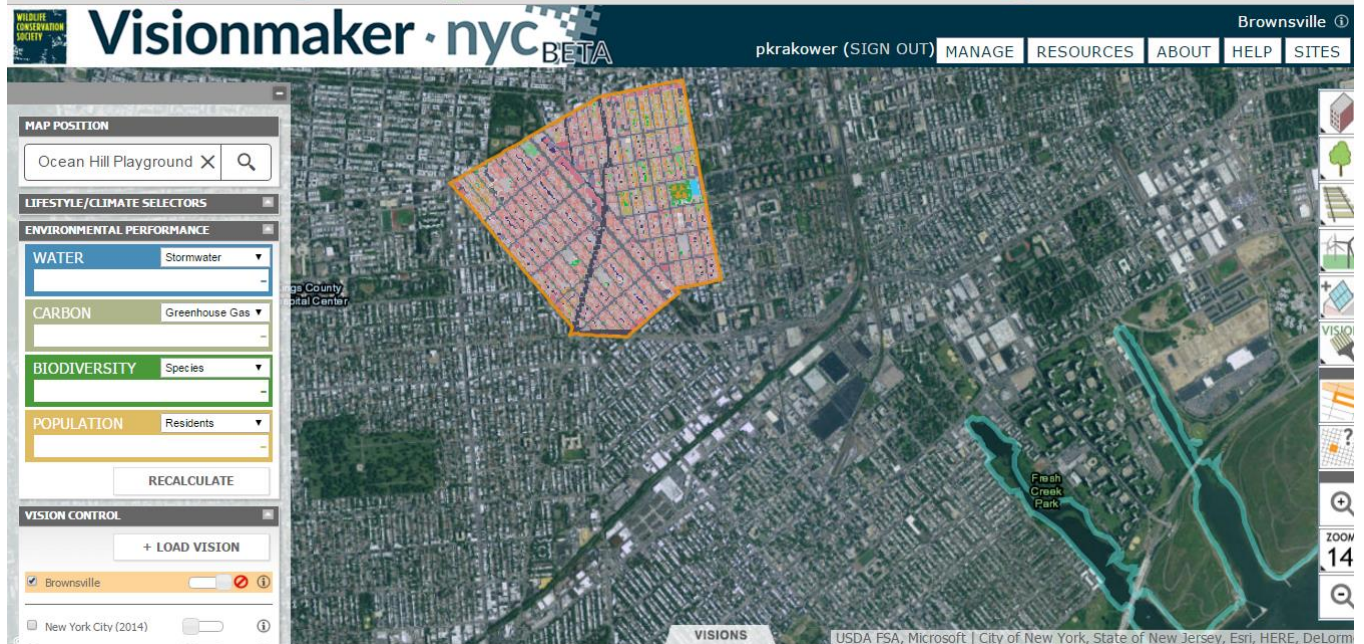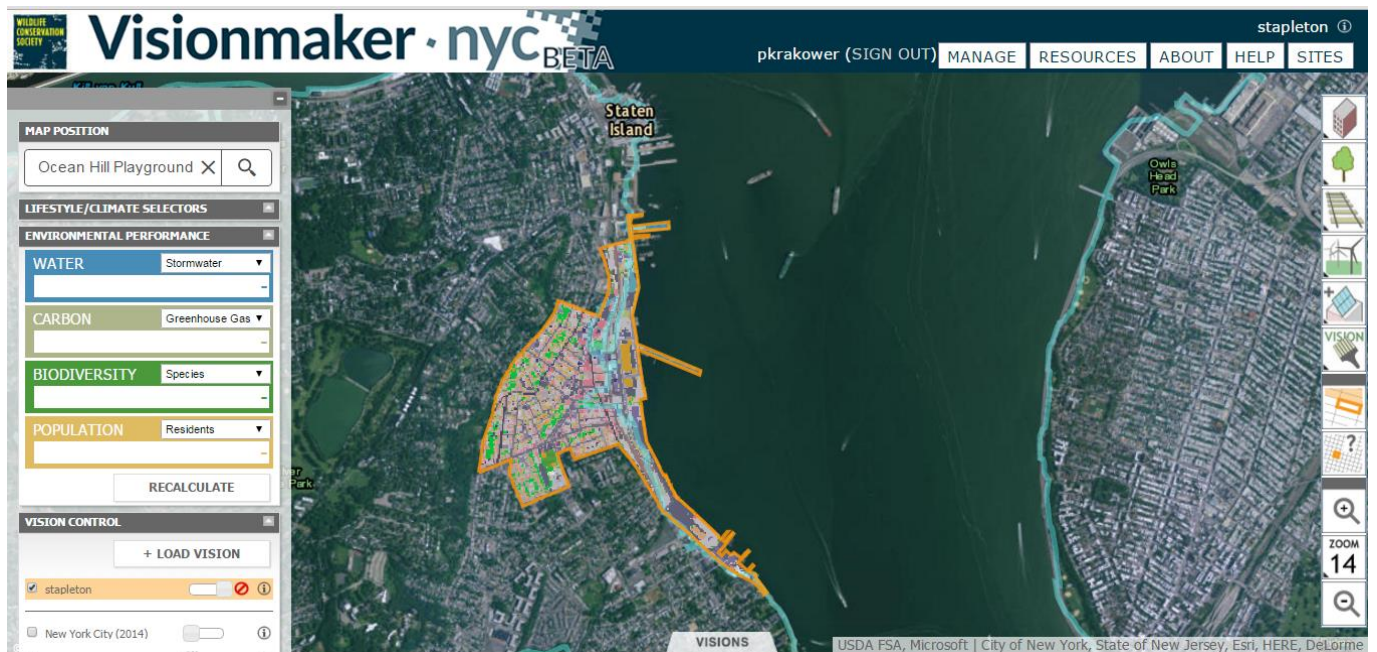

Mott Haven
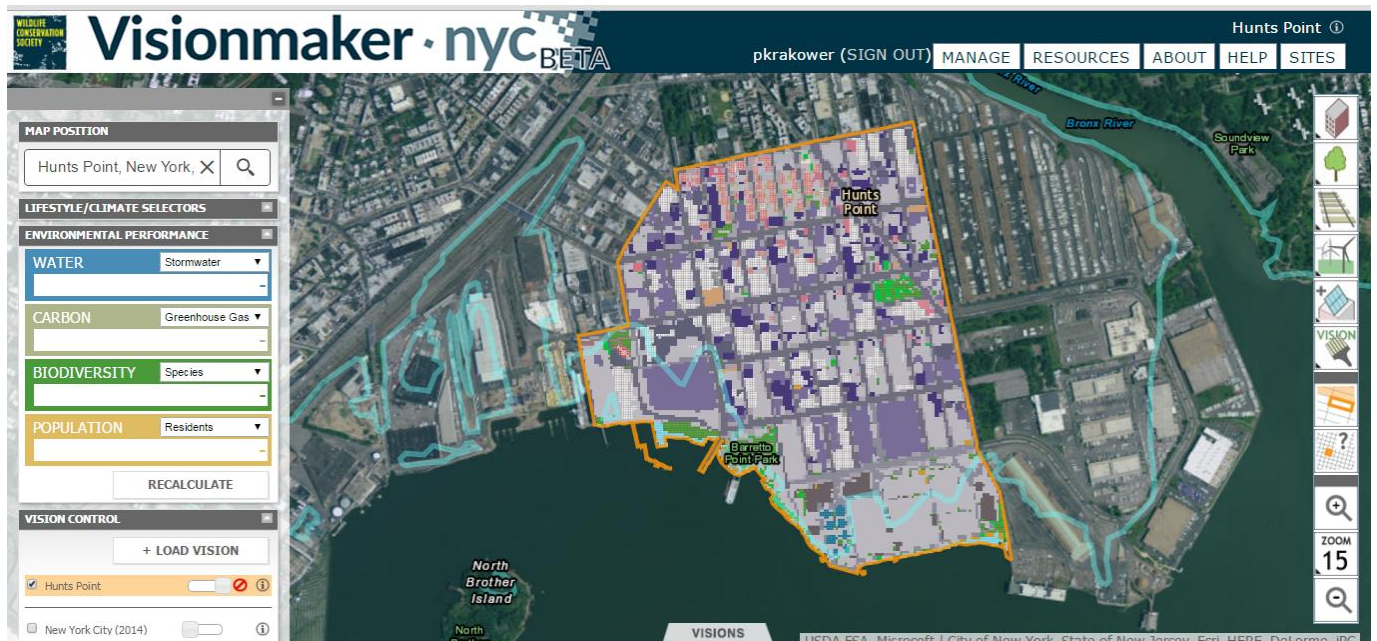
Hunts Point

East Harlem

Central Harlem

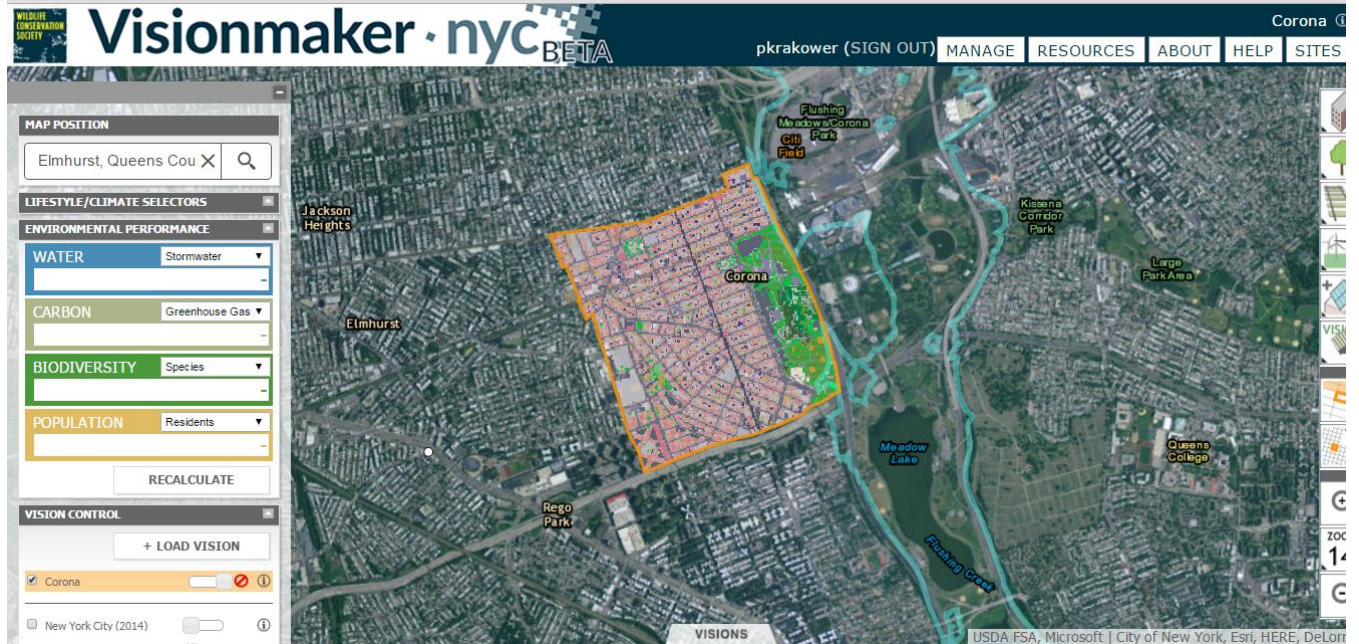**Coney Island**

East New York
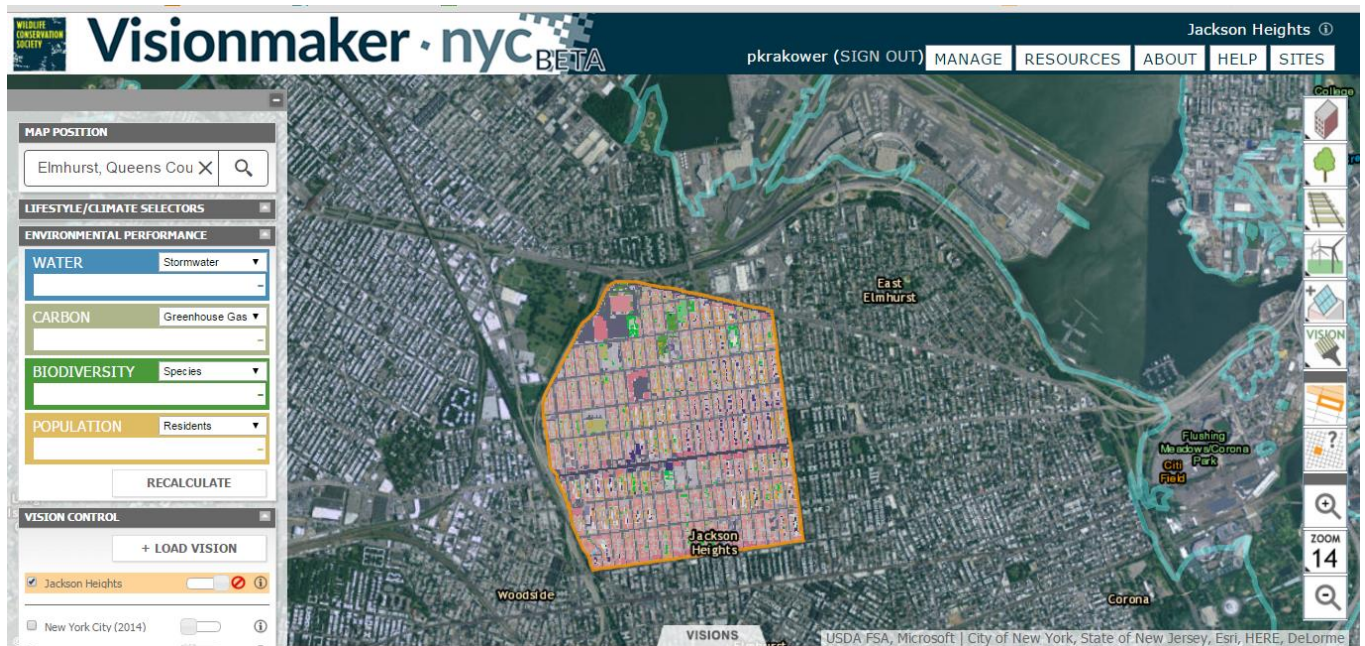
Brownsville

Stapleton

Corona

Jackson Heights

Appendix B- Creating and Joining Groups on Visionmaker NYC

Creating a Group:

- Go to Visionmaker.nyc

- Sign in with your account information

- Click on "Manage" in the top right

- Select "Groups"

- In the bottom right of the window, click on "+Create New Group"

- Give your group a name in the "Group Name:" box

- If you know the usernames of the members you would like to be in your group you can enter them into the "Group Members:" box.

  o If not, you will be given a group code upon creation of your group, which you can give to anyone to join your group (instructions on this below)

- Decide if you would like members to receive an email when they are added or removed and either check or uncheck the box

  o If you created the usernames using your own email address, this check box will mean that you will receive an email whenever you add or remove a user from the group

- Click "Save Group" in the bottom right corner

To access your group code:

- In the groups tab of your "Manage" menu, find the group you are interested in.

- Click on the pencil icon at the right to edit

- At the bottom left you will see the Group Code

To Join a group:

- Go to Visionmaker.nyc

- Sign in with your account information

- Click on "Manage" in the top right

- Select "Groups"

- In the bottom left enter the code for the group you wish to join into the box and click "Join"

Appendix C- Creating a Challenge on Visionmaker NYC

Creating a challenge:

- Go to Visionmaker.nyc

- Sign in with your account information

- Click on "Manage" in the top right

- Select "Challenges"

- In the bottom right of the window, click on "+Create New Challenge"

- Fill in ALL the fields (if you don't your challenge will not be created), giving your challenge a name, and description

- Select a group to issue your challenge to – this can be a group you've already created, or you can create a new group if you don't already have one.

- Click "Next"

- Choose a vision to base your challenge on

  o If you see the name of the challenge you would like to use in the list that shows in the window, click the circle on the right to select that vision

  o If you do not see the challenge listed, click on "<<Search" in the top right and search for the vision you would like to use (you can search by vision name or author username, but remember that the search is sensitive to case and spaces). Then select it from the list by clicking the circle on the right

- Click "Next"

- Select the metric on which to focus your challenge. You can choose up to three parameters total from the list.

  o Be sure when you choose a metric, to also select, maintain, increase by, or decrease by, and the percentage change you are aiming for.

- o Remember that the "(i)" will give you information about what each metric is and how it is calculated.

- Click "Next"

- Review your challenge, and if you are satisfied, click "Save Challenge"

  - o Now anyone in the group you issued it to, can view the challenge and create a response, and you can monitor their progress

To create a Response to a Challenge:

- Go to Visionmaker.nyc

- Sign in with your account information

- Click on "Manage" in the top right

- Select "Challenges"

- Find the challenge you are interested in responding

- Click "View Responses"

- Click "+Create New Response"

- In the window that pops up, you may make changes to the name, year, and description of your challenge response vision, but you do not need to

- When you are ready, click "save changes"

- Now you can zoom into your vision

  - o on the far right of the screen find the zoom buttons

  - o Click on the "Zoom #" in the middle and then select "Zoom to fit vision"

- Make any changes you want to try to meet the challenge.

- To check your status, go back to the challenge

  - o Click on "View Responses"

  - o Now you can see all the responses to this challenge and you can see the progress you are making toward meeting the challenge