GREATER GROVE HALL

MAIN STREETS

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Creating a Green Zone in Boston

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- The nature of this project is the exploration of the creation of a Green Zone in an urban section(s) of Boston's neighborhoods of color.
- The purpose of the Green "Innovation" zone is to foster green design interventions, including green businesses, practices, and technologies.
- Zones and zoning have been used to achieve a range of desired objectives e.g. Opportunity Zones, and biotech parks.
- The goal is the Green Innovation Districts would become an important contributor to the self-sufficiency and resiliency of both the neighborhood and region, by providing a place to pilot ideas and devising a methodology that could be replicated elsewhere.

What is a Green Zone?

- **Green Zone –** Is a community transformed from a highly polluted, economically depressed neighborhood into a vibrant area with *green business practices, a healthier environment and a stronger economic future.*

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Green Zone is not to be confused with:

- **Eco-District –** An eco-district is a defined urban area in which collaborative economic, community, and infrastructure redevelopment is explicitly designated to reduce negative and create positive environmental impacts. It links energy transportation, water, and land use in an integrated, efficient resource system.
- A **Resilience Zone** is a special improvement district, precinct, neighborhood, or corridor designated in official planning documents for comprehensive risk management and upgrading so that it performs with **resilience** in the face of a variety of predictable and unpredictable extremes.
- **Sustainability Zones -** Certified Sustainability Zones (CSZs), a reference to municipalities or other political domains whose inhabitants (1) strive to live within their ecological means, (2) ensure the social and economic means to live, and (3) use **state-of-the-art accounting tools** to measure, manage and report their Triple Bottom Line performance.

Creating a Green Zone would help pilot ideas for . . .

- The Greater Boston area
- Addressing near term environmental justice issues
- Laying the infrastructure for migration to the “highlands” as a result of rising sea levels.
- Urban seacoast cities such as New York, Miami, Philadelphia

We reviewed 11 Green Zone/Eco-District from around the world and we concluded . . .

- Among the 11 cases, there are three in New York, two in Pennsylvania, one in Connecticut, Maryland, Michigan, Missouri, New Hampshire, Colorado, and Massachusetts. (Green and eco programs reviewed are not included here)
- There’s strong interest in seeing more green districts in Massachusetts.
- There is a lot of energy, initiatives, and willingness to collaborate.

Massachusetts ranks low on “Eco-friendly” behaviors

- According a data study from WalletHub, Massachusetts only ranks 17th on “Eco-friendly behaviors”

- “Eco-Friendly Behaviors” metrics include “Green Buildings per Capita”, “Total Capacity of Solar PV Systems Installed per Household”, “Share of Renewable Energy Consumption”, “Green Transportation” and more.

https://wallethub.com/edu/greenest-states/11987/

State	‘Eco-Friendly Behaviors’ Rank
Oregon	1
California	2
Vermont	3
Minnesota	4
Maryland	5
Maine	6
Washington	7
New York	8
Connecticut	9
Colorado	10
New Jersey	11
Pennsylvania	12
Hawaii	13
Wisconsin	14
Nevada	15
Delaware	16
Massachusetts	17

GREATER GROVE HALL MAIN STREETS

Our goal is one planet living

One planet living is more than trying to mitigate climate change and the resulting impacts such as rising sea levels.

One planet living means we do not consume the planet's resources at a rate faster than the plant can produce them.

Achieving one planet living

- By 2050, **89%** of the U.S. population and **68%** of the world population is projected to live in urban areas.

- Since most of the planet will be living in urban areas, we have to figure out how to make our urban areas more sustainable.

- Given the size and scale of the problem, it can't just be left to the few who have the luxury to think about problems 50 years from now, it has to include everyone.

The need to move with a sense of urgency

- “The best time to plant a tree was 20 years ago. The second-best time is now.”

  – Chinese Proverb

- “The great French Marshall Lyautey once asked his gardener to plant a tree. The gardner objected that the tree was slow growing and would not reach maturity for 100 years. Then Marshall replied: in that case, there is no time to lose, plant it this afternoon.”

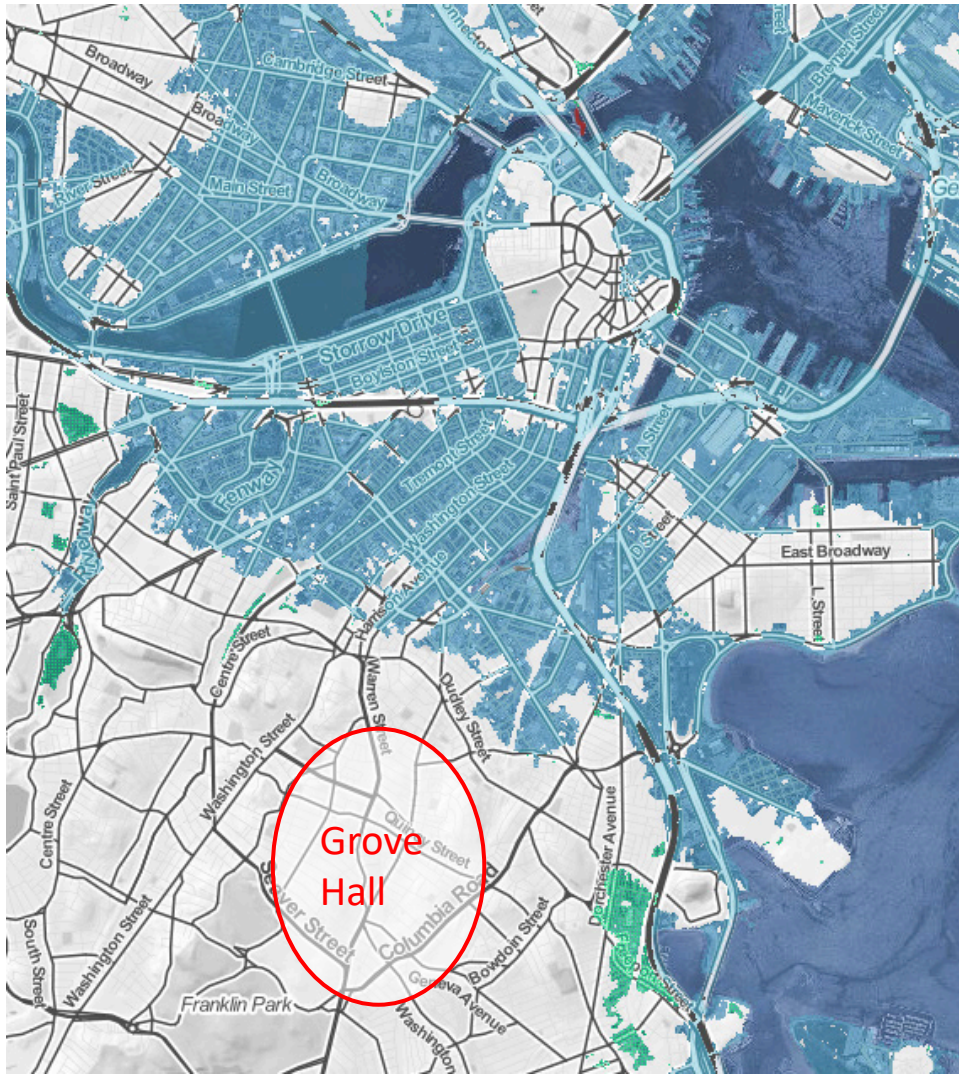
  – John Kennedy

Boston will be heavily affected by rising sea levels

- According to NOAA sea level viewer, at 6ft, Boston stands the risk of having 60% of its area flooded and residences and business displaced.
- The Commonwealth stands the risk of having 309,220 individuals displaced from their homes and fleeing to the “highlands” in Grove Hall.

6ft Sea level rise map

Permanent flood

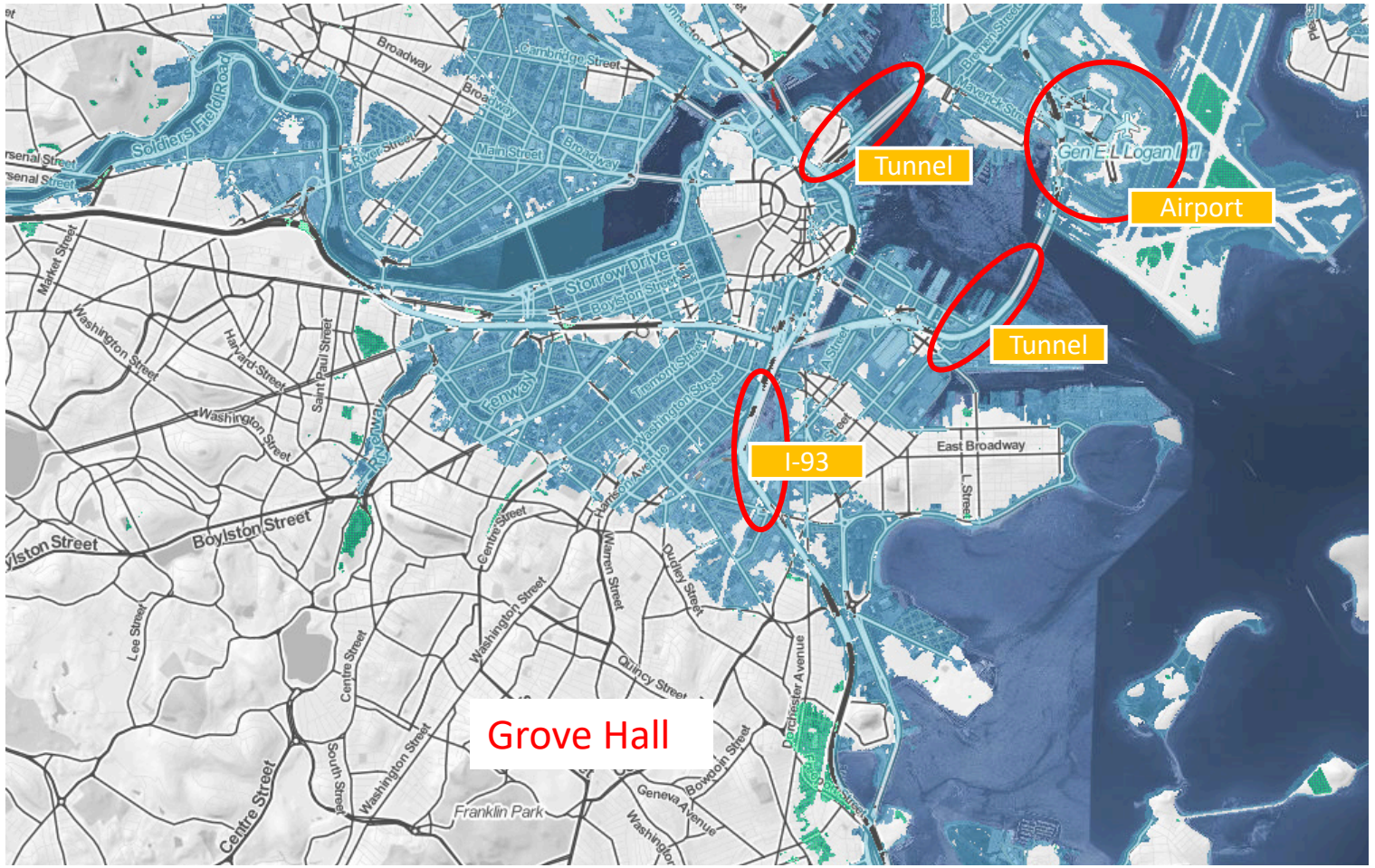


Sea level map source: Climate Central

GREATER GROVE HALL MAIN STREETS

Boston's transportation infrastructure will be severely affected

- With 6 ft sea level rise, major infrastructures such as the **Interstate 93, Central Artery, Harbor tunnels, Logan International Airport** will be damaged.

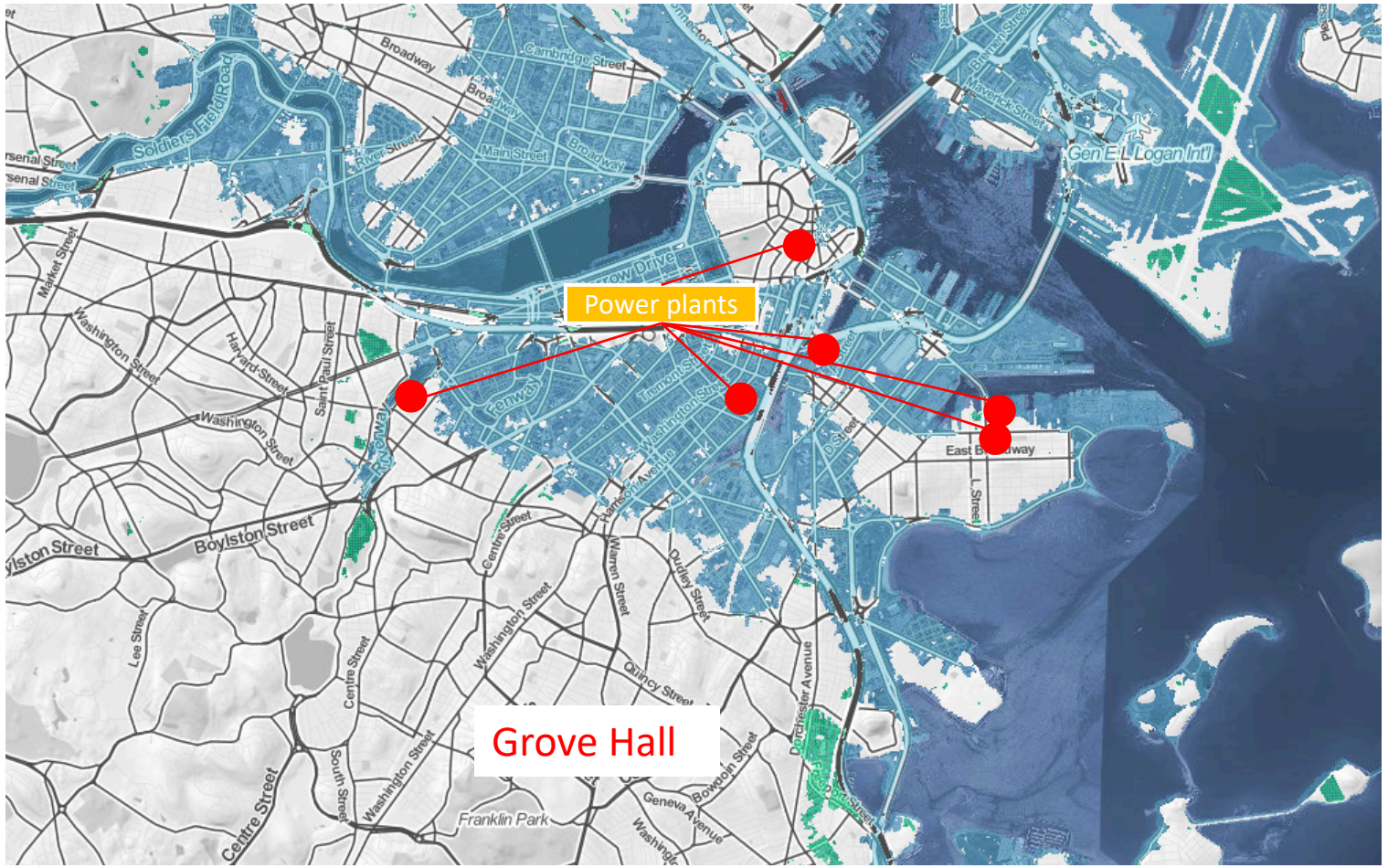


Sea level map source: Climate Central

GREATER GROVE HALL MAIN STREETS

Boston's power plants will be severely impacted

- With 6ft sea level rise, **multiple power plants** will be damaged.

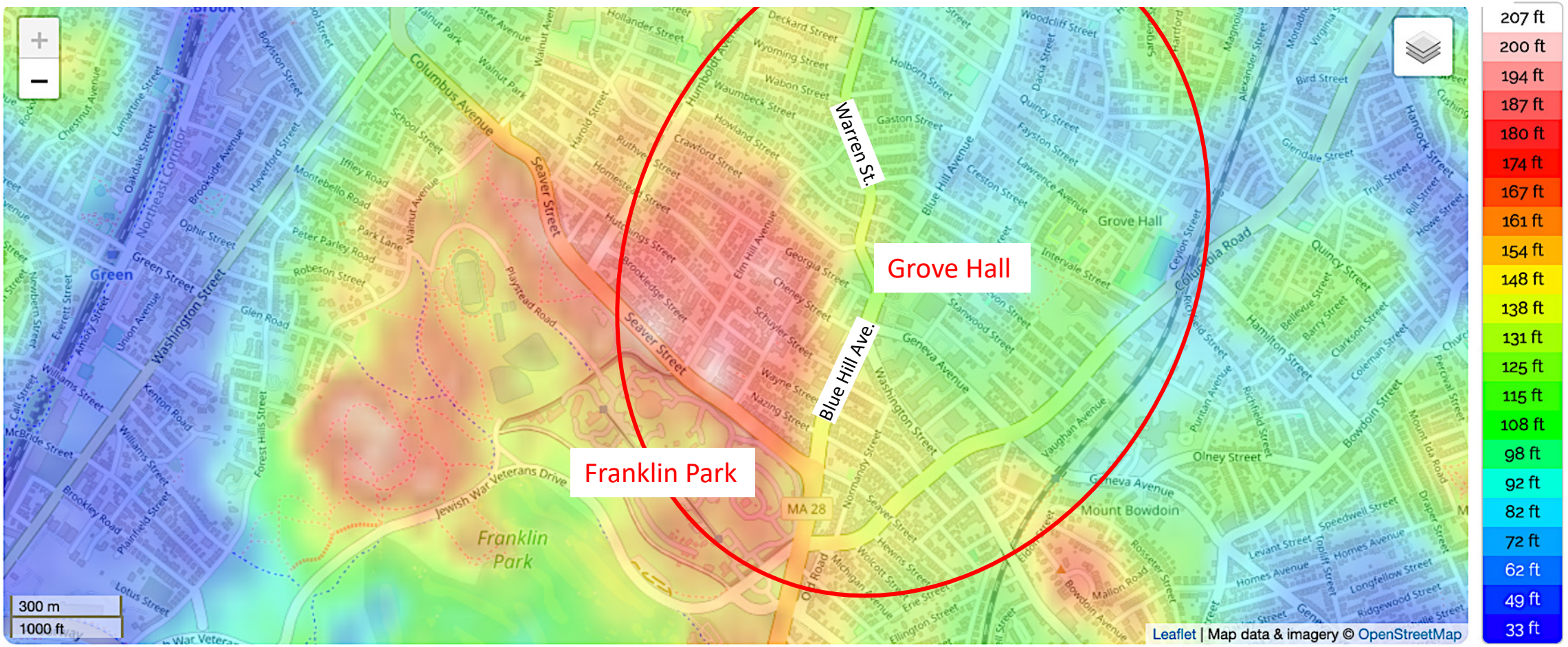


Power plants

Sea level map source: Climate Central

GREATER GROVE HALL MAIN STREETS

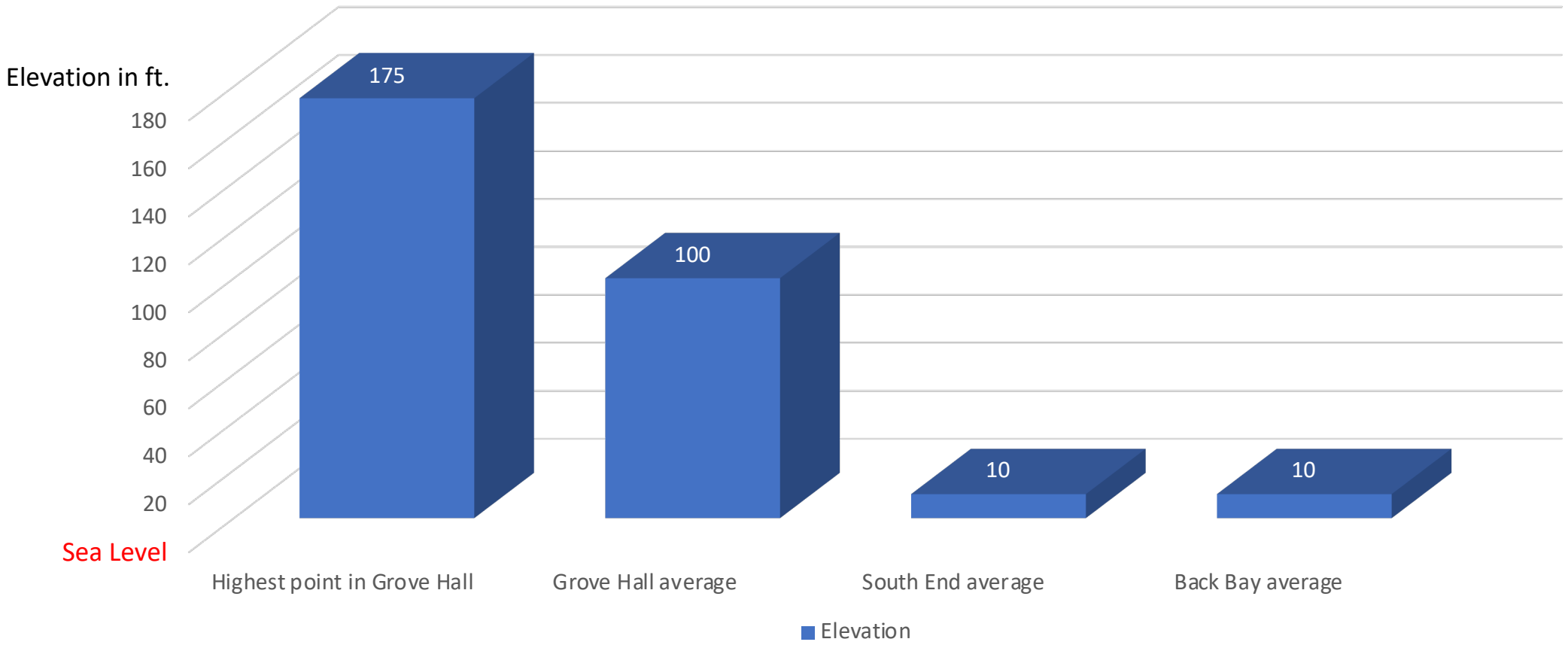
Greater Grove Hall - The Highlands
100-200 Ft above Sea Level



https://en-gb.topographic-map.com/maps/fhnn/Boston/

GREATER GROVE HALL MAIN STREETS

Grove Hall elevation compared to other areas in Boston



Data source: World Topographic Map

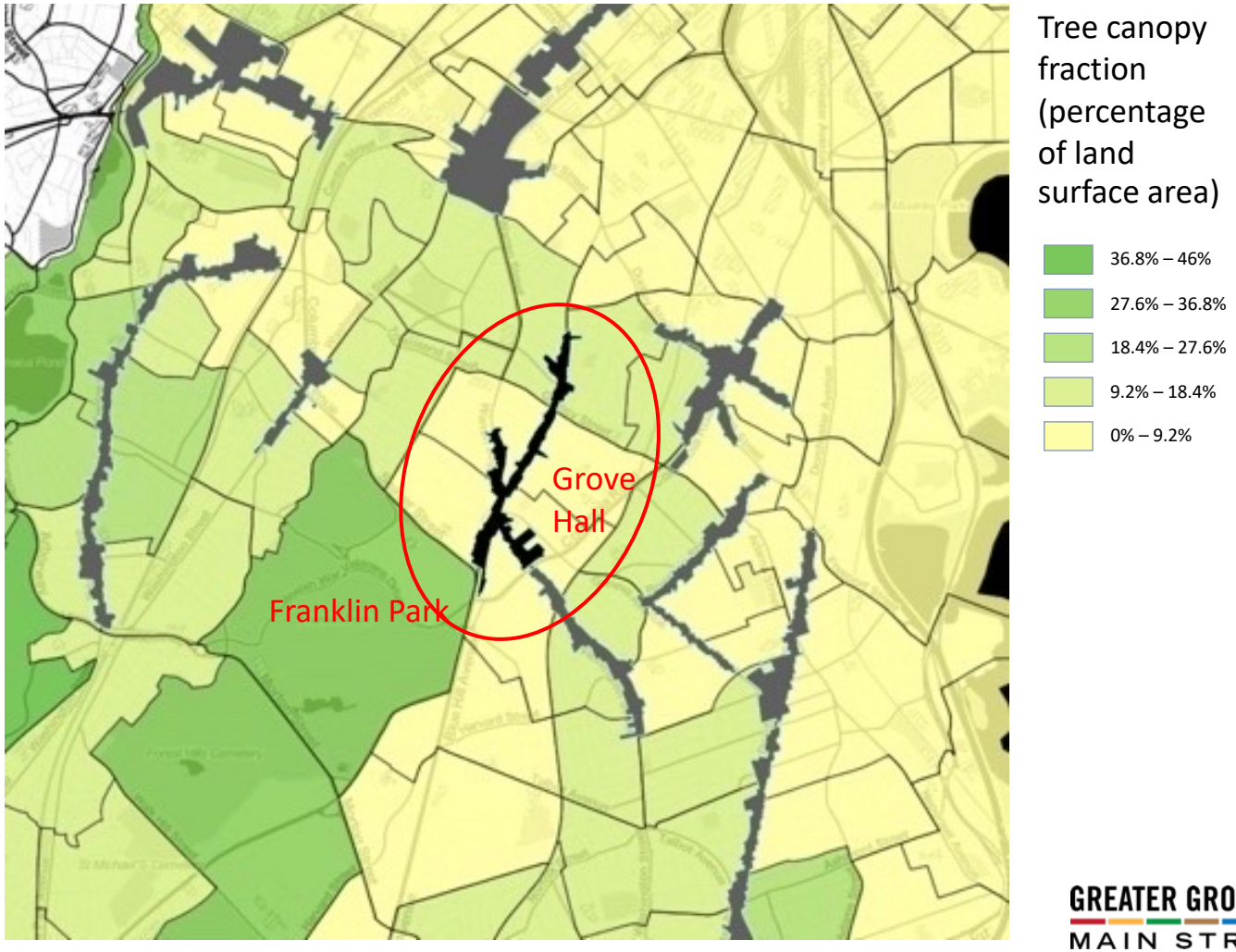
GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Lacks critical green infrastructure

- Little to no tree canopy
- High percentage of impervious surfaces
- Severe heat island effects

The Greater Grove Hall area: Low amount of tree canopy in public areas

- The Greater Grove Hall area (in light green) represents the lowest amount of tree canopy at 4% - 10% in public areas.
- Greener color = more tree canopy coverage

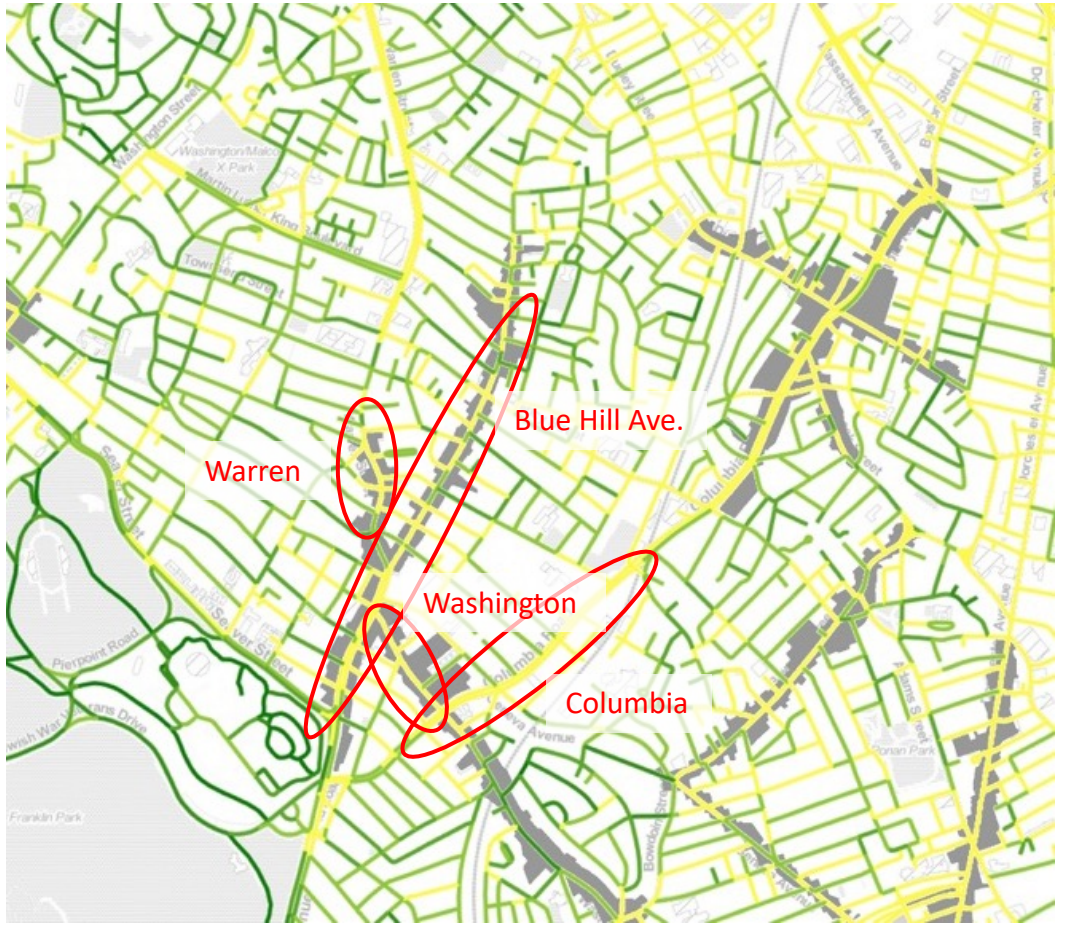


Source: Boston Area Research Initiative

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Little tree canopy on main streets

- In the Greater Grove Hall area, main streets such as **Blue Hill Ave., Warren St., Washington St. and Columbia Rd.** have little tree coverage at 0-1%.

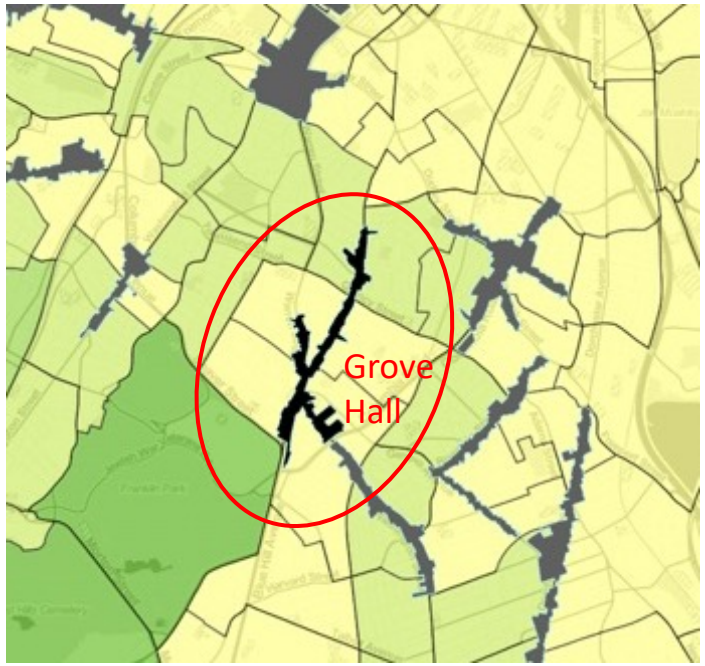


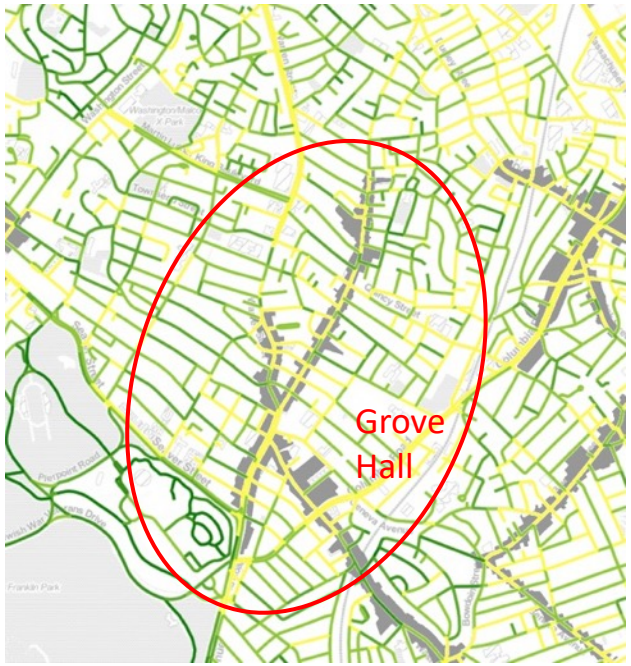
Source: Boston Area Research Initiative

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Overall, the area has little to no tree canopy

- Data diagrams and street view photos show how little tree canopy the area has.





GREATER GROVE HALL
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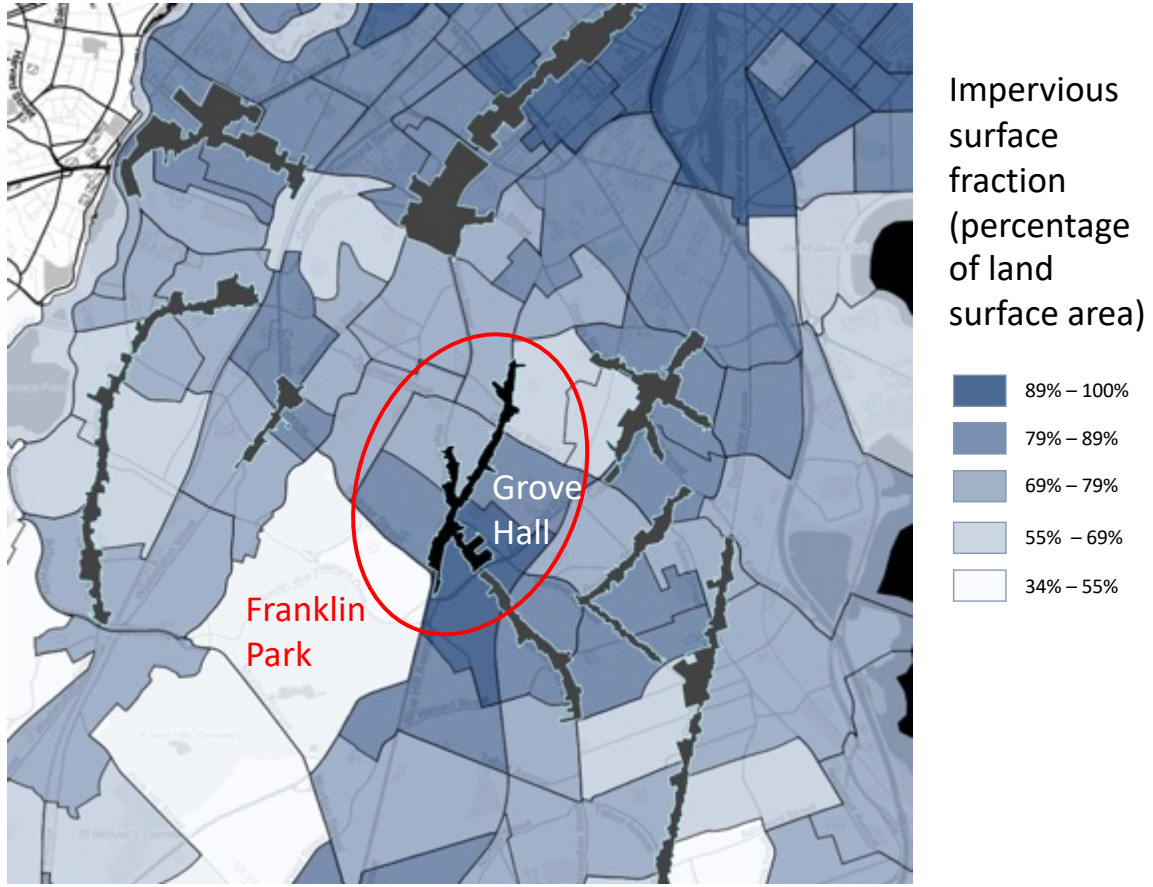
The Greater Grove Hall area: High amount of impervious surfaces

- Impervious surfaces: artificial structures such as cement pavement, asphalt, etc.
- The Greater Grove Hall area (in dark blue) represents a high amount of impervious surfaces at 74% - 91% .
- Darker color = less permeability
- This contributes to problems such as stormwater runoff and heat islands.

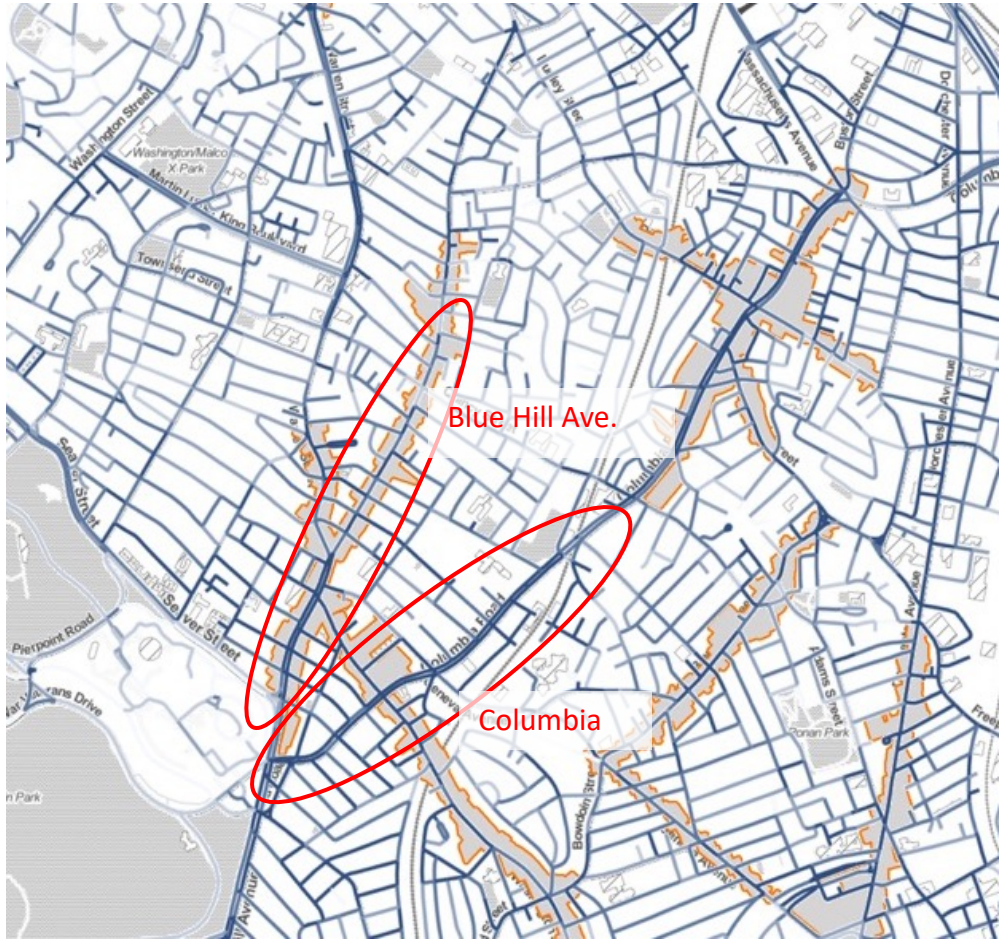


Source: Boston Area Research Initiative

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Impervious surfaces on main streets

- Main streets such as **Blue Hill Ave. and Columbia Rd.** are highly impervious at 96% - 100%.



Source: Boston Area Research Initiative

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: High amount of surface parking lots

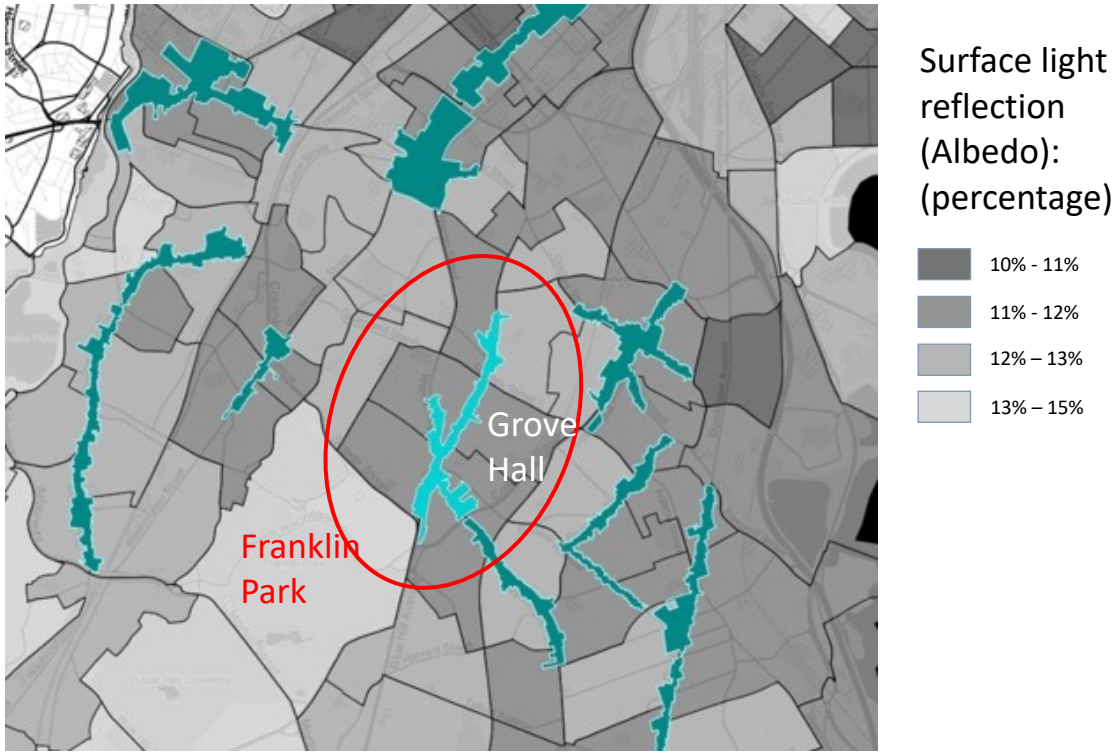
- There are about **25** surface parking lots, publicly and privately owned, in the Greater Grove Hall area.
- These impervious surfaces contribute to the heat island effect, and stormwater runoff problems.

Surface parking lots

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Low percentage of tree canopy and high amount of impervious surfaces result in urban heat island

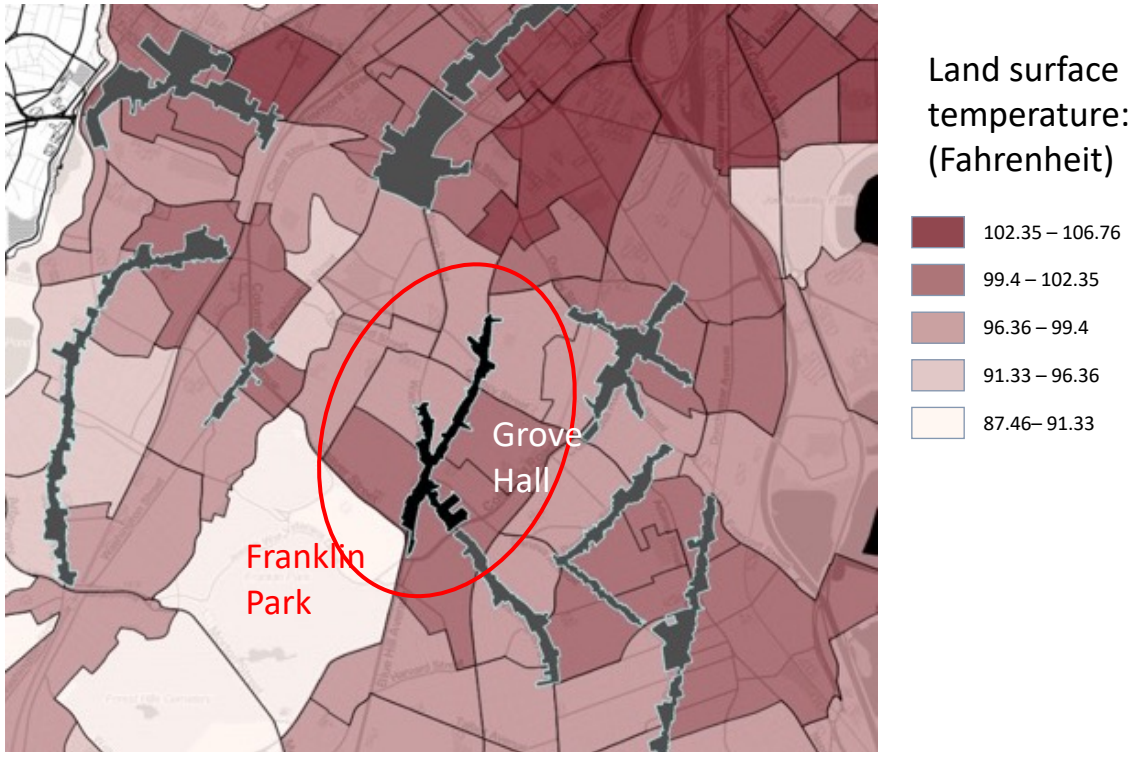
- The Greater Grove Hall area has less surface light reflection at 12% and absorbs more sunlight



Darker color = lower light reflection

Source: Boston Area Research Initiative

- The Greater Grove Hall area has high land surface temperatures at 98 – 102 °F

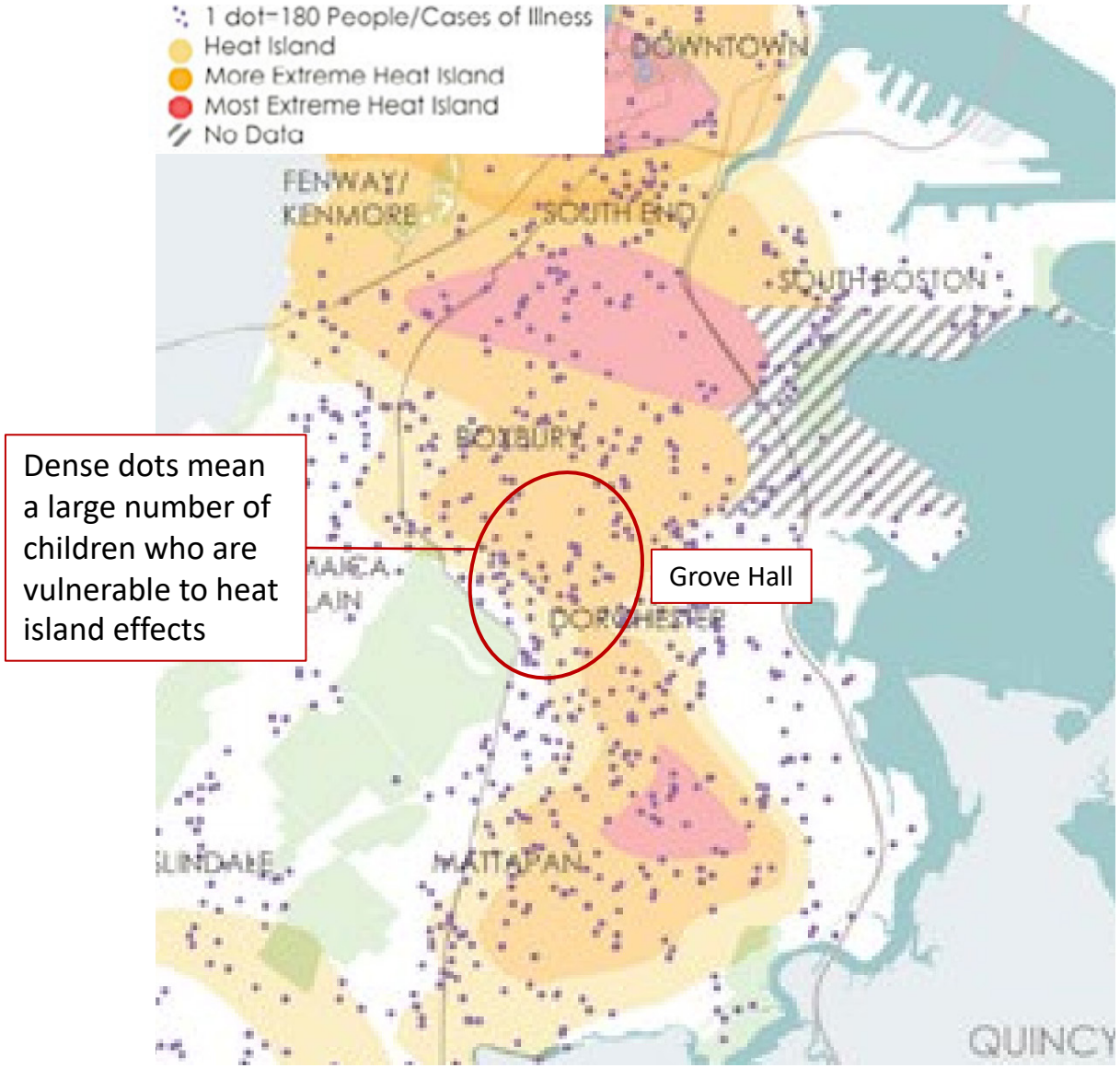


Darker color =higher temperature

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Large vulnerable population, susceptible to heat island effects

- The Greater Grove Hall area has a lot of children (more than 10,800 people under 18 years old) vulnerable to severe heat island effect.



Source: Climate Ready Boston Vulnerability Assessment
https://www.boston.gov/sites/default/files/imce-uploads/2017-01/crb_-_focus_area_va.pdf

GREATER GROVE HALL MAIN STREETS

Urban heat Islands are catalysts for health problems

- Global temperature rise
- Loss of green cover
- Impervious paving
- Increased emissions
- Building materials that retain heat (brick, stone)

- Increases energy costs (e.g., for air conditioning)
- Increase air & water pollution levels
- Heat-related illness

- Neighborhoods and communities disproportionately affected
- Increased health problems (lung and respiratory infections)
- Reduced quality of life, increased cost of living
- Mortality

GREATER GROVE HALL
MAIN STREETS

The Greater Grove Hall area: Suffers from health & safety related problems

- Physical inactivity
- Chronic health problems such as obesity
- High percentage of people experiencing poor mental health
- Large number of medical emergencies

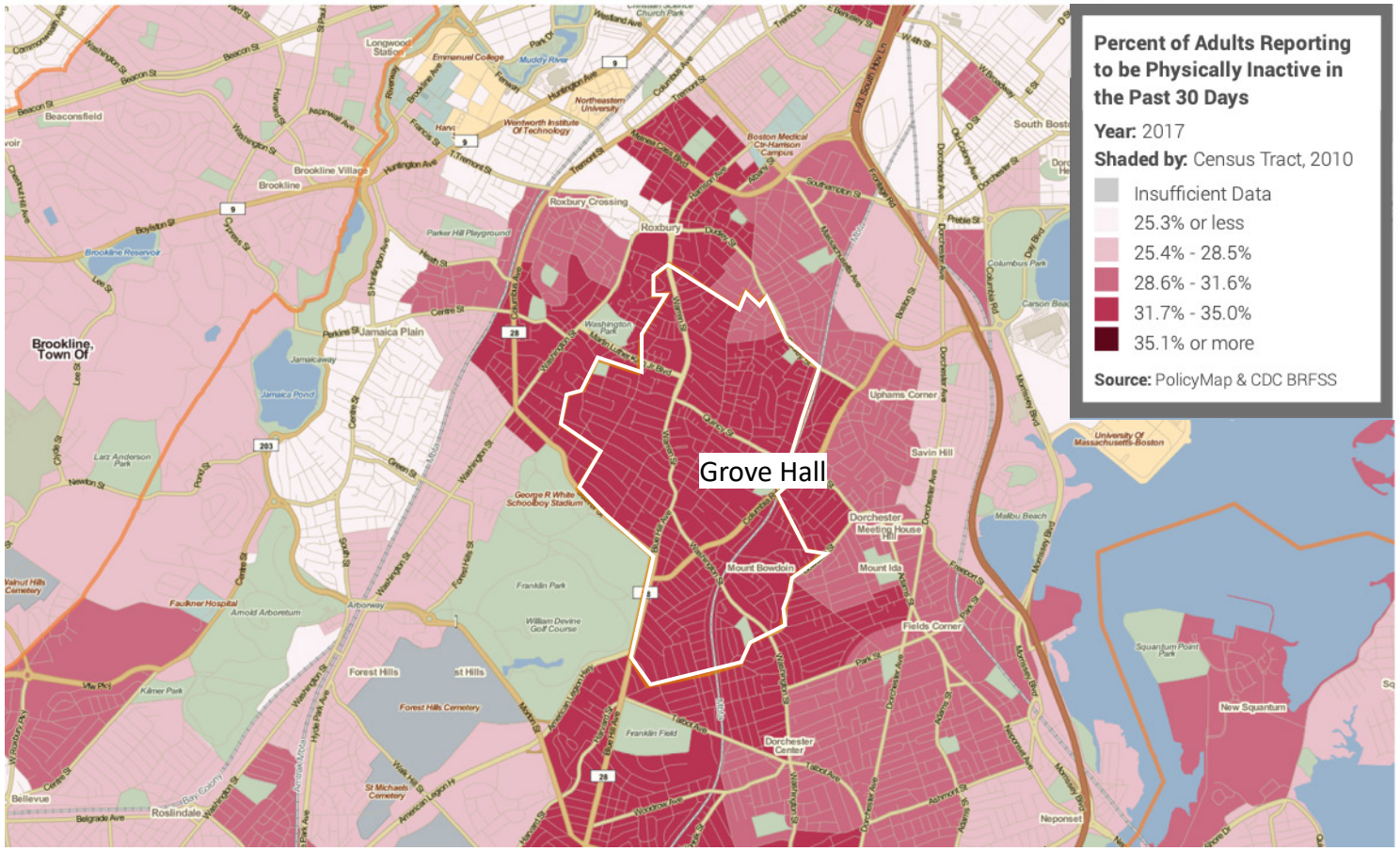
Is there a relationship between mental and physical health and environmental justice?

The Greater Grove Hall area: Physical activity

A lot of the residents are defined as physically inactive.

- Between **31.7%** and **35%** of the residents are physically inactive in the past 30 days in 2017.
- Higher percentage than the surrounding area.

Estimated percent of adults reporting to be physically inactive in the past 30 days in 2017.



Source: PolicyMap

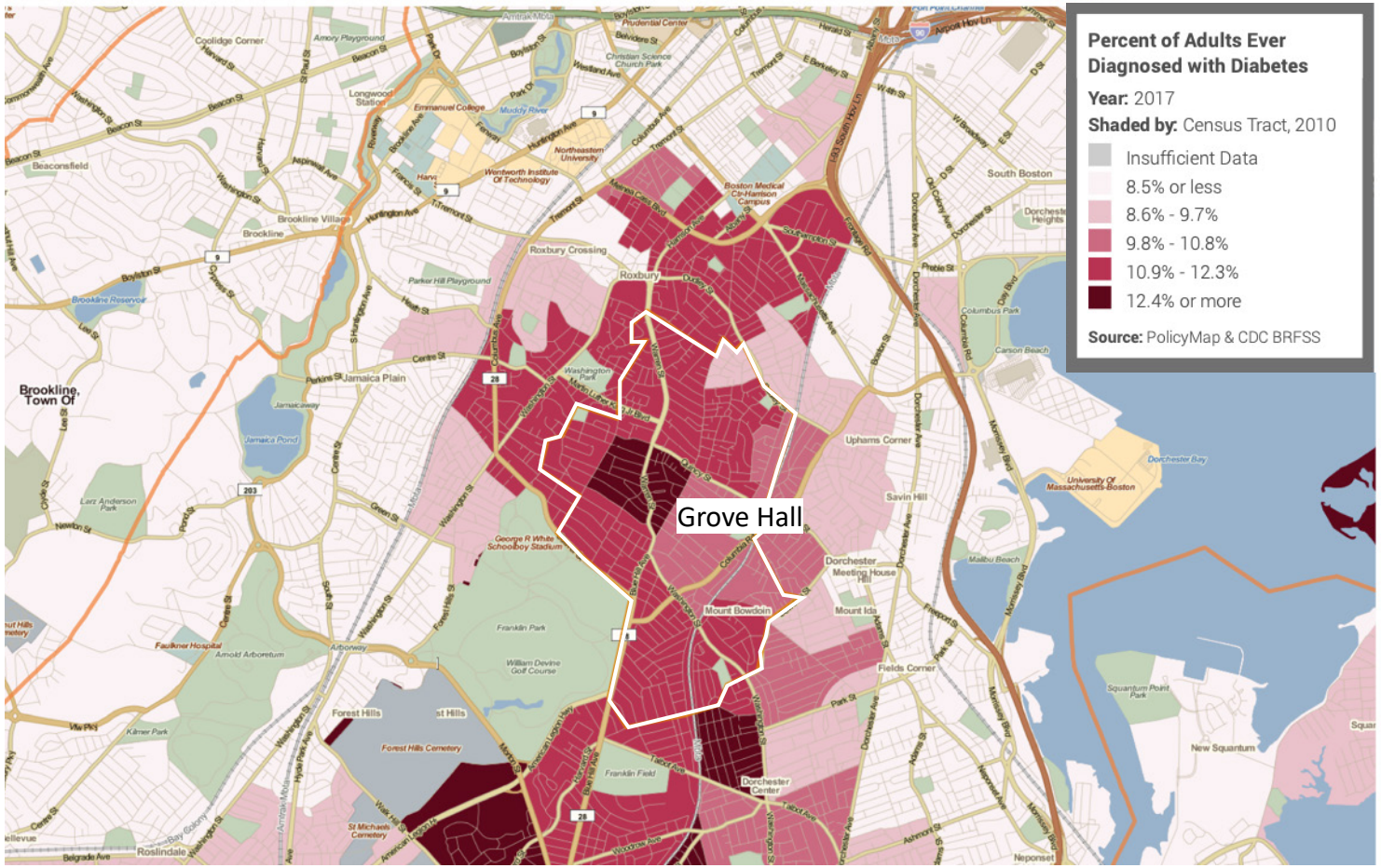
GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Obesity

A lot of the residents are defined as overweight.

- Higher percentage of overweight population than the surrounding area.

Estimated percent of adults reporting to be overweight (a body mass index greater than 24.9) in 2017.



Source: PolicyMap

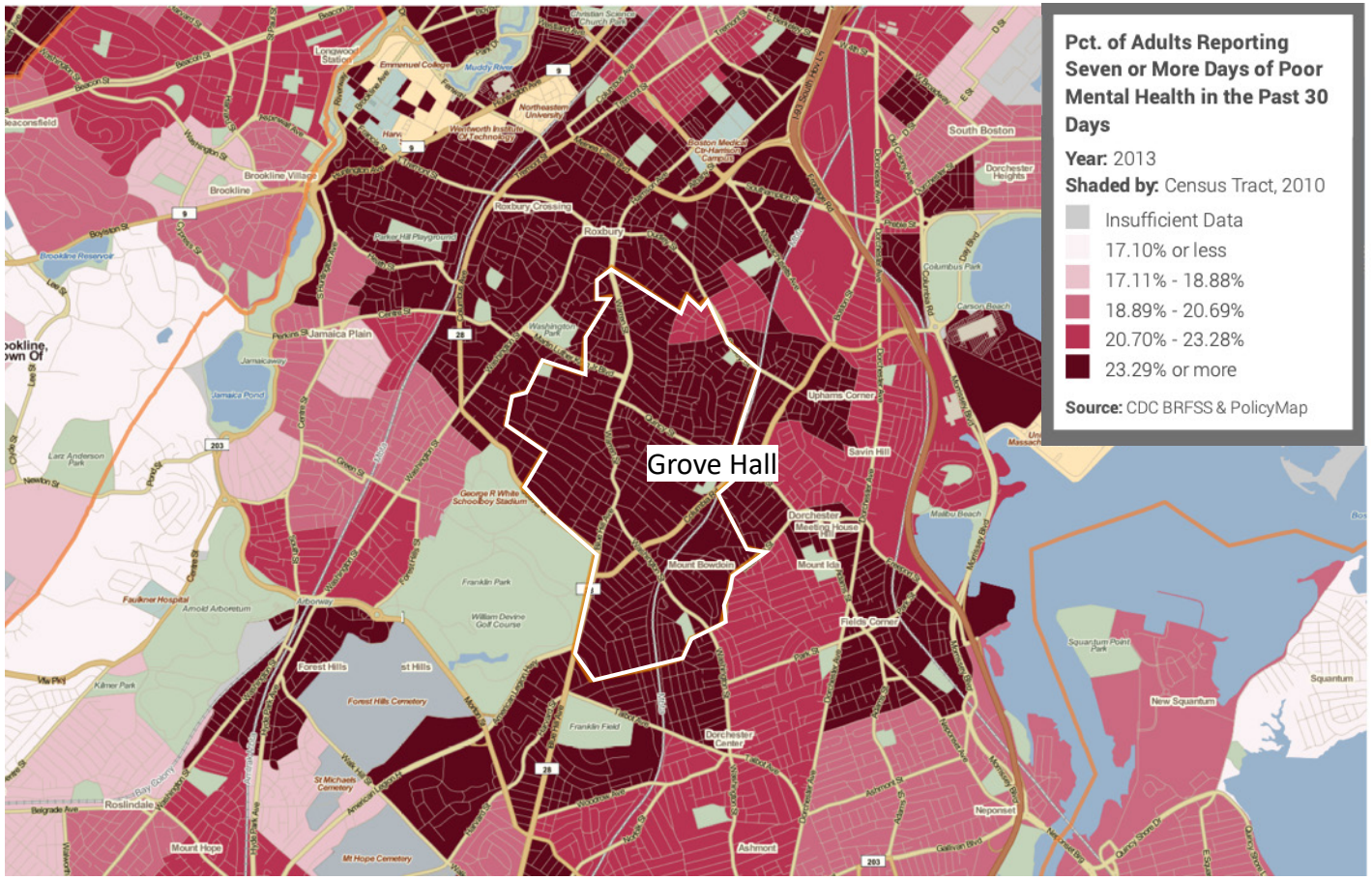
GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Mental health

A lot of the residents are experiencing poor mental health

- More than **23.9%** of the residents are reporting seven or more days of poor mental health in the past 30 days in 2013.

Estimated percent of adults reporting seven or more days of poor mental health in the past 30 days in 2013.

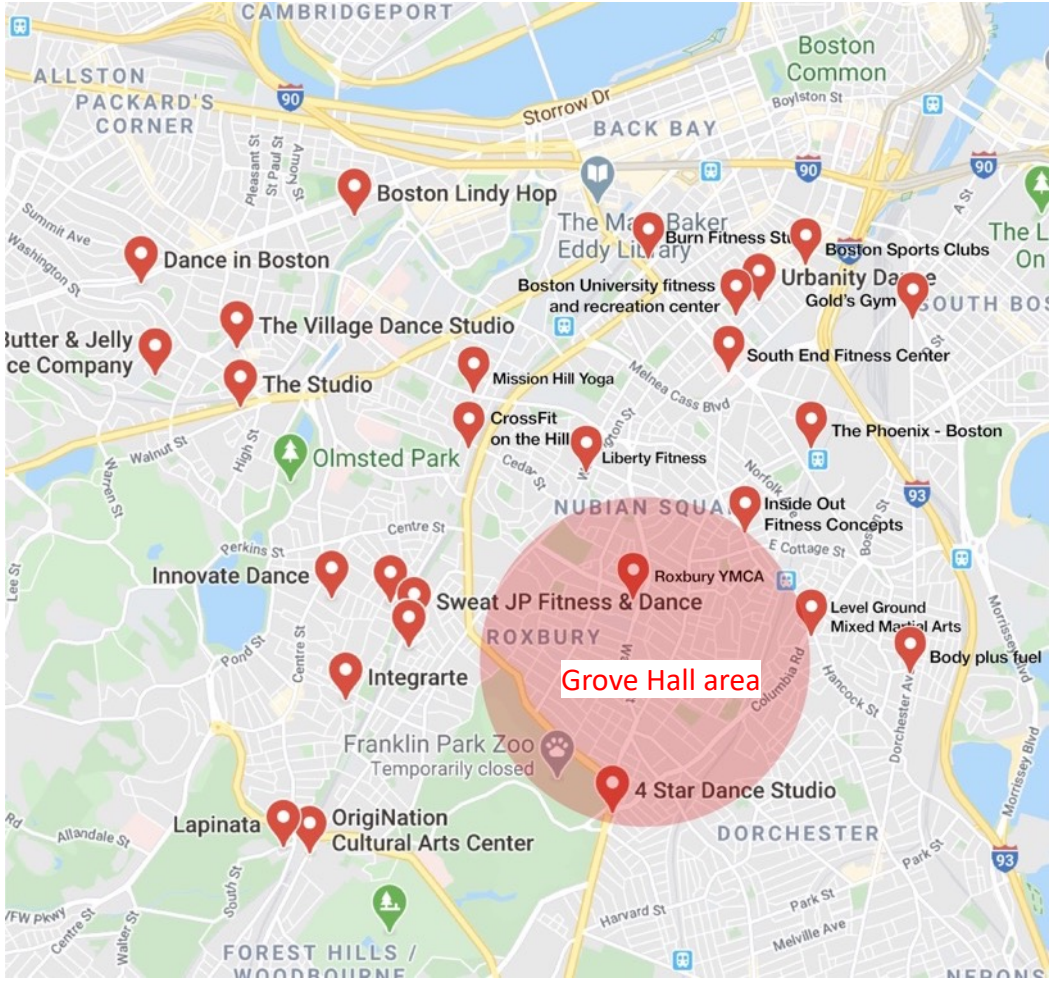


Source: PolicyMap

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Fitness facilities

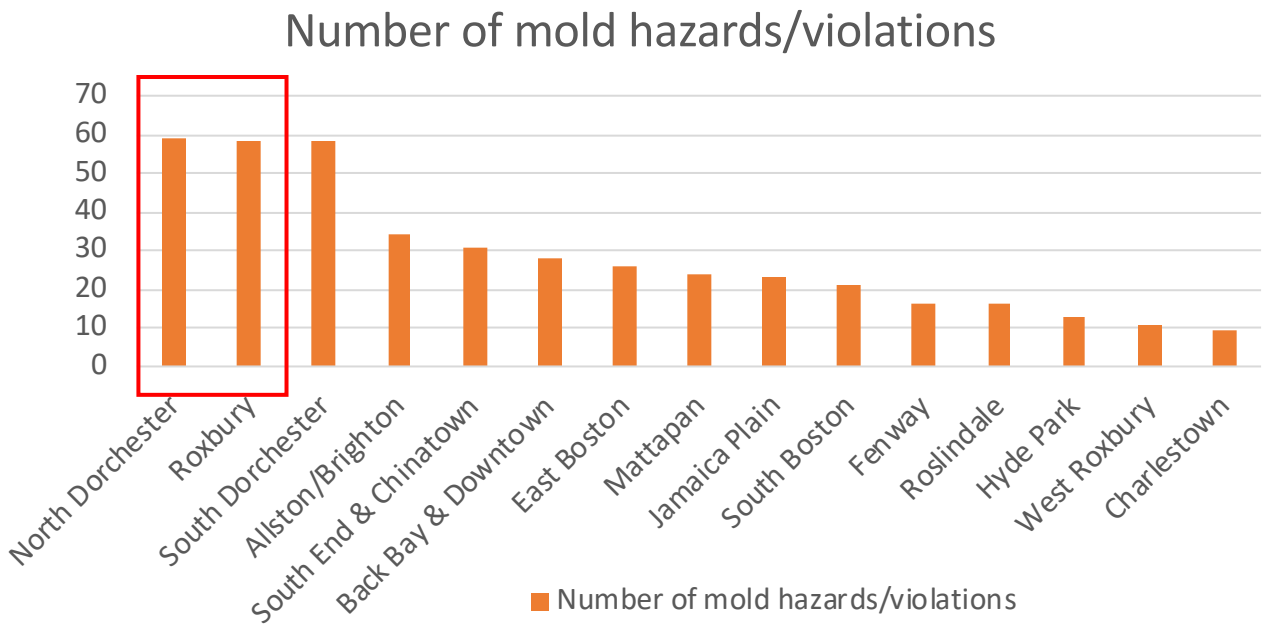
- There is a lack of fitness related business
- There are only two gym/fitness/yoga/dance/martial arts studio in the area:
  - Roxbury YMCA
  - 4 Star Dance Studio



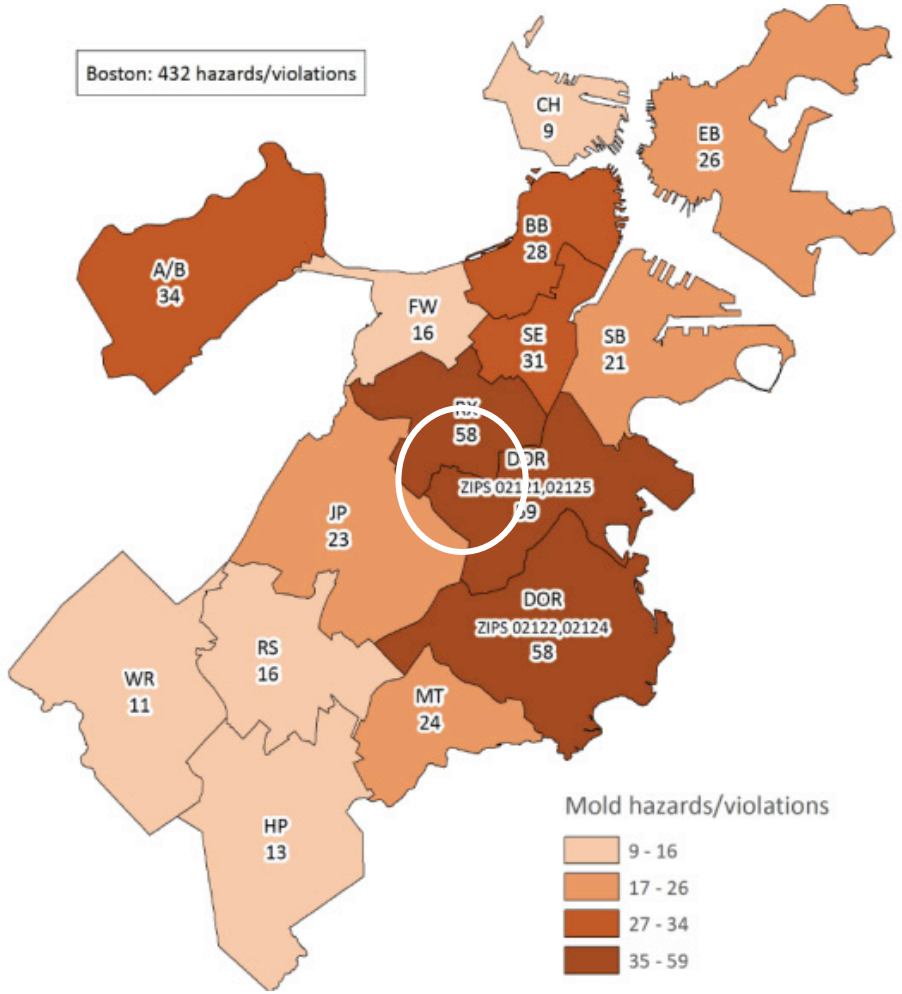
GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Mold hazards

- North Dorchester and Roxbury have the highest number of mold hazards/violations in Boston.



Mold Hazards/Violations by Neighborhood, 2012-2016

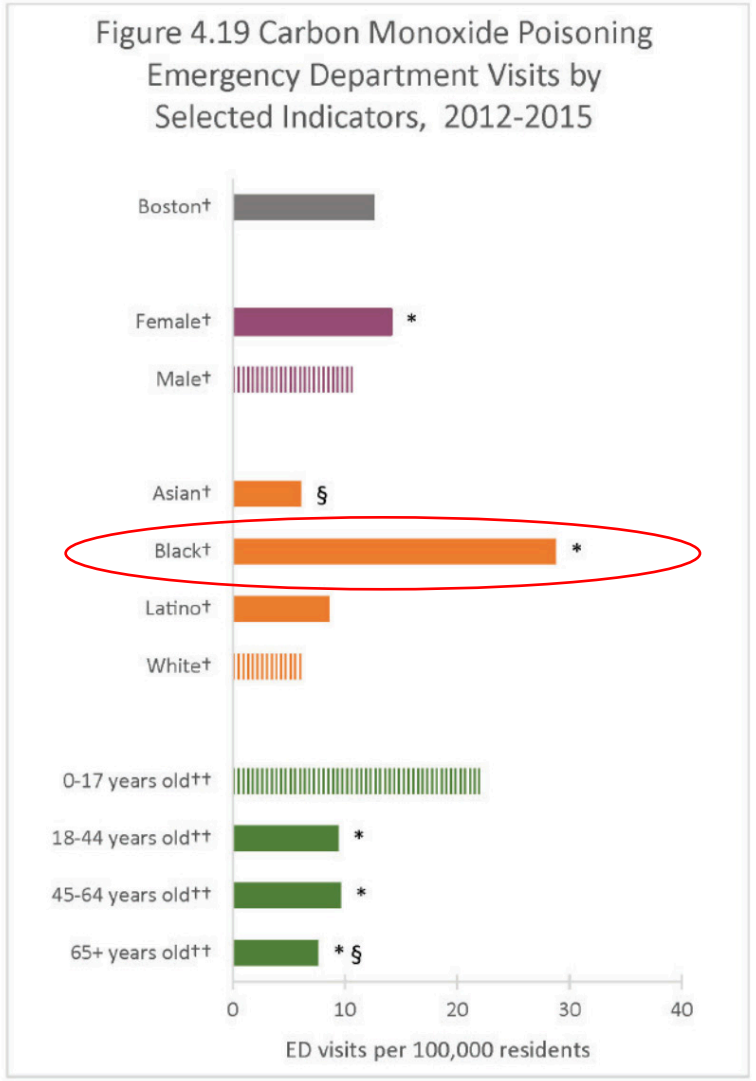


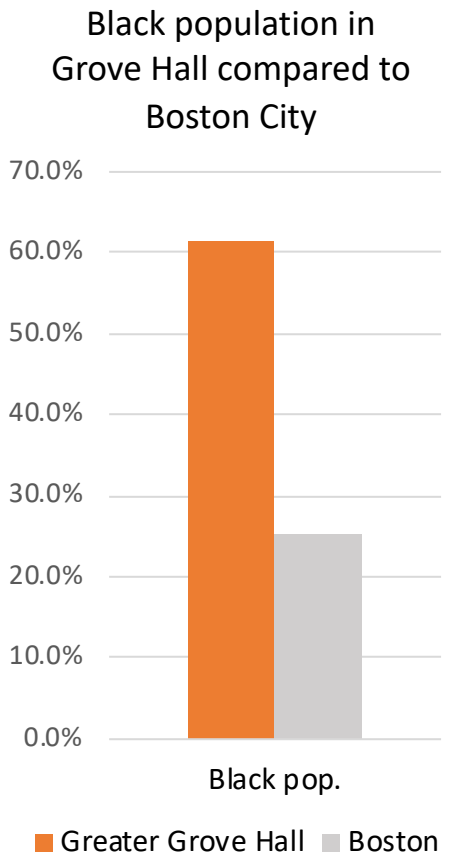
Source: Environmental and Occupational Health Division, Boston Public Health Commission

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Carbon monoxide poisoning

- The Emergency Department visit rate for carbon monoxide poisoning was **4.6 times** higher for Black residents (28.8) than for White residents (6.2).
- **61.6%** of the total residents in the Greater Grove Hall area are black.





Source: Environmental and Occupational Health Division, Boston Public Health Commission

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Large number of medical emergencies

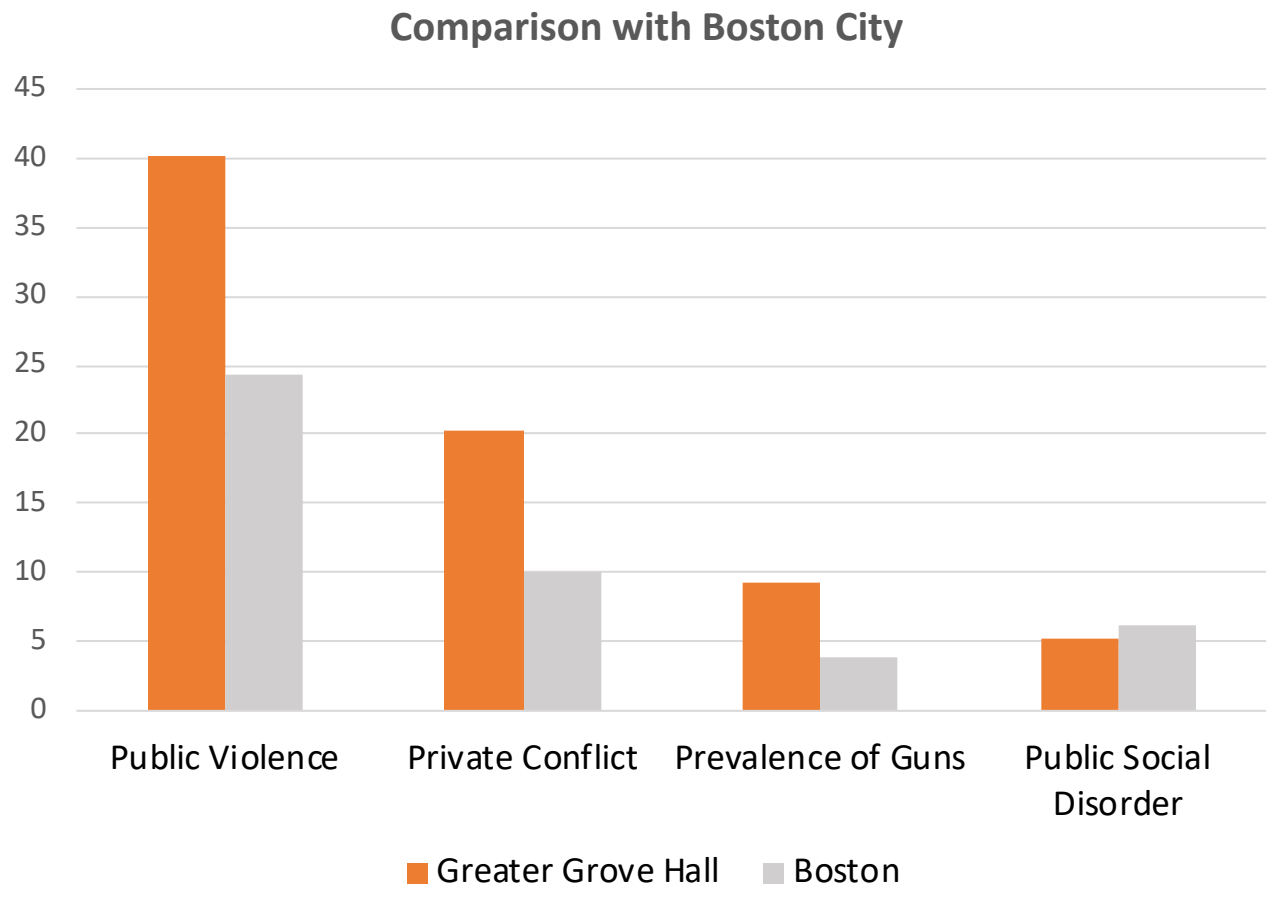
- Medical Emergencies (top image):
  - **65-80** cases per 1000 people in 2014
  - Darker color = more prevalent medical emergencies
- Youth Health Emergencies (bottom image):
  - **47-62** cases per 1000 people in 2014
  - Darker color = more prevalent youth health emergencies

- The area has a higher rate of medical emergencies, especially surrounding youth health, than other areas.

Source: Boston Area Research Initiative

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Public safety issues



Source: Boston Area Research Initiative

Public Safety is a major concern in the Grove Hall area

- Public violence: **40.19** (24.27 – Boston)
- Private conflict: **20.18** (10.06 – Boston)
- Prevalence of guns: **9.36** (3.87 – Boston)
- Public social disorder: **5.14** (6.20 – Boston)

(2018 yearly rate of events per 1000 people)

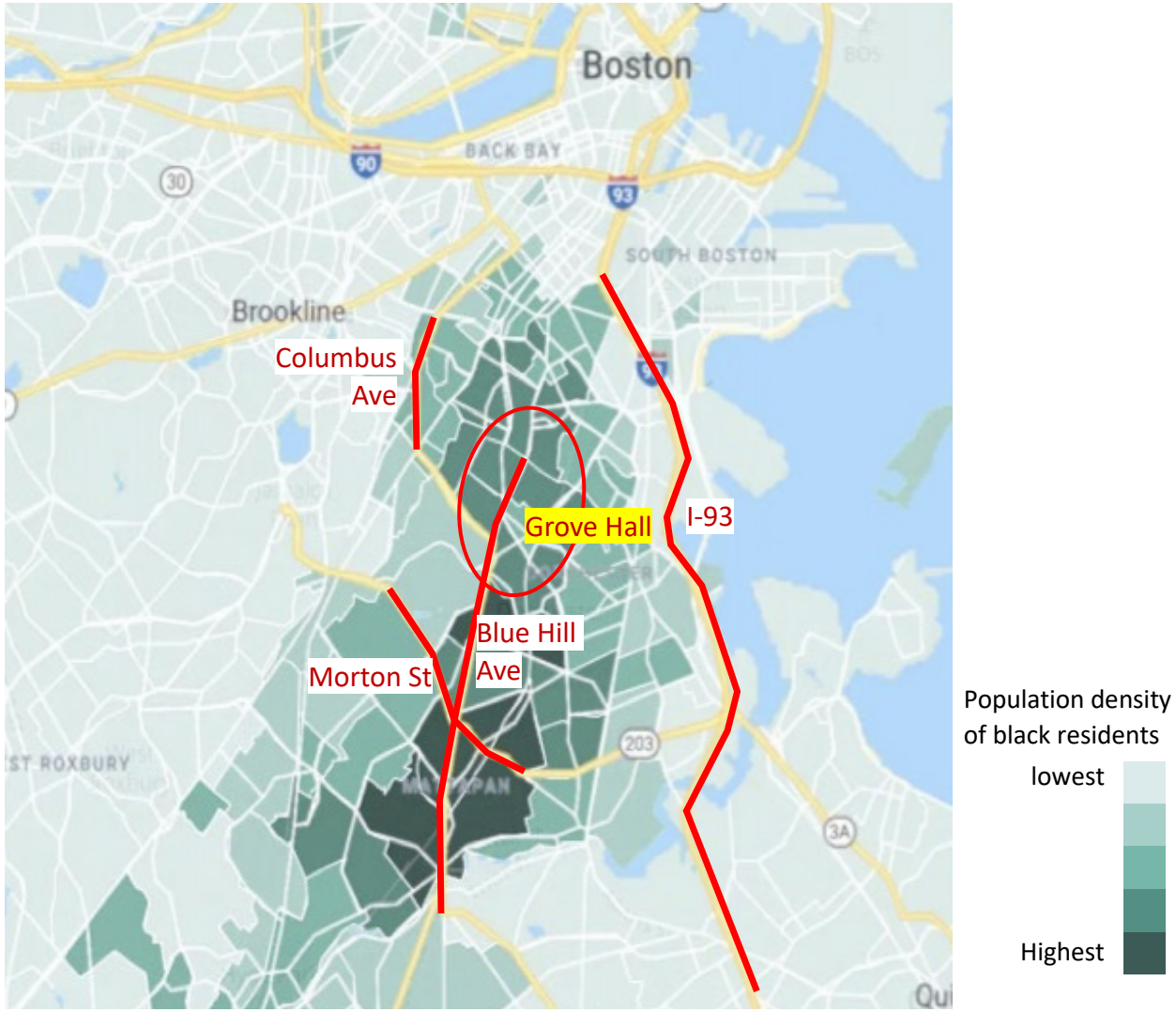
GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Suffers from environmental injustice

- The area suffers from poor air quality, causing increased asthma cases
- The area has a high number of vacant and distressed plots with lead contamination in the soil
- The area is exposed to a disproportionate amount of environmental hazards, making it socially vulnerable.

People of Color suffer higher health risks from traffic pollution

- Black residents of the metropolitan area are most concentrated around busy multi-lane arterials like **Columbus Avenue, Morton Street and Blue Hill Avenue**
- Airborne particulates from the SE-Expressway are blown over the communities of color, with diurnal sea breezes

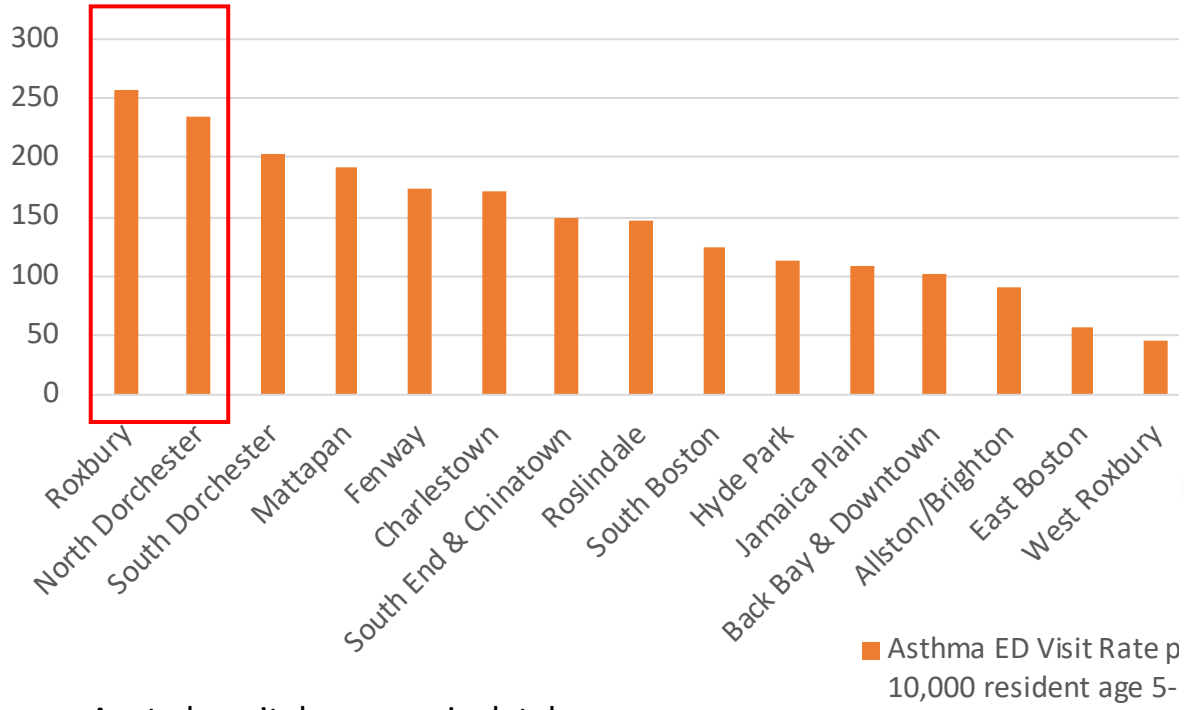


A map of the U.S. Census Bureau's estimated population density of black residents in the Boston area, courtesy of CensusReporter.org

https://mass.streetsblog.org/2019/06/28/study-minorities-suffer-higher-health-risks-from-highway-pollution/

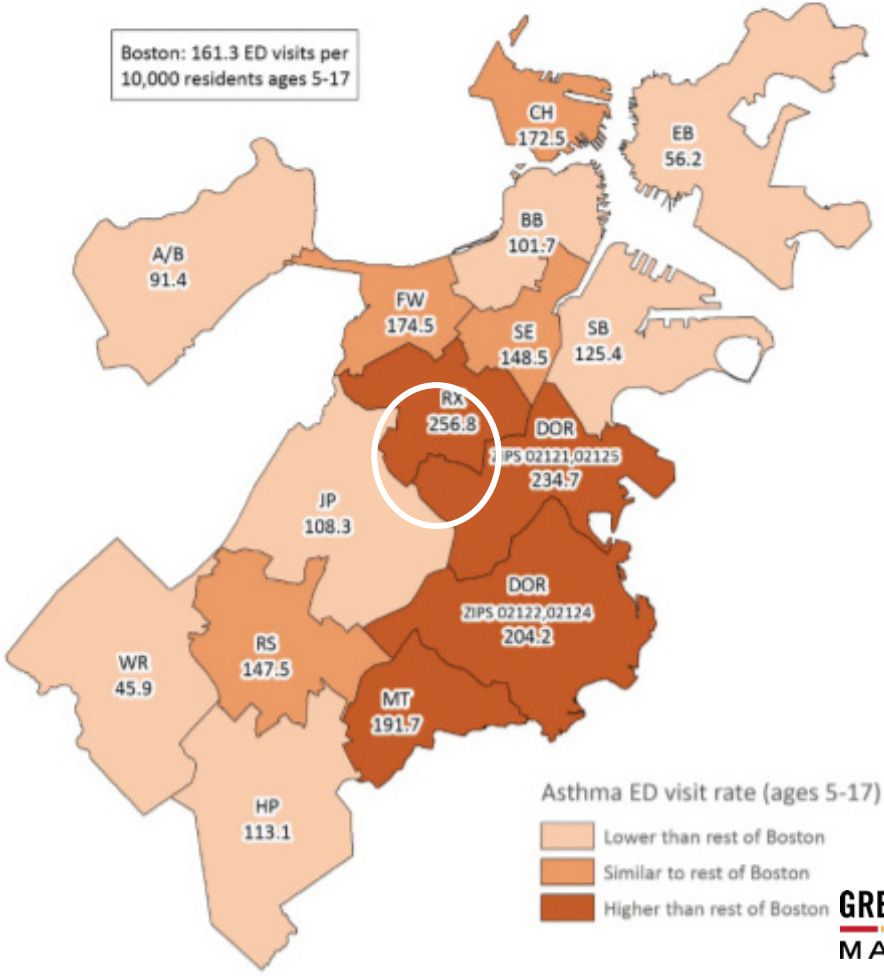
The Greater Grove Hall area: Higher asthma rates than the rest of Boston

- Roxbury and North Dorchester have the highest asthma emergency department visit rates among all areas in Boston



Source: Acute hospital case – mix databases, Massachusetts Center for Health Information and Analysis

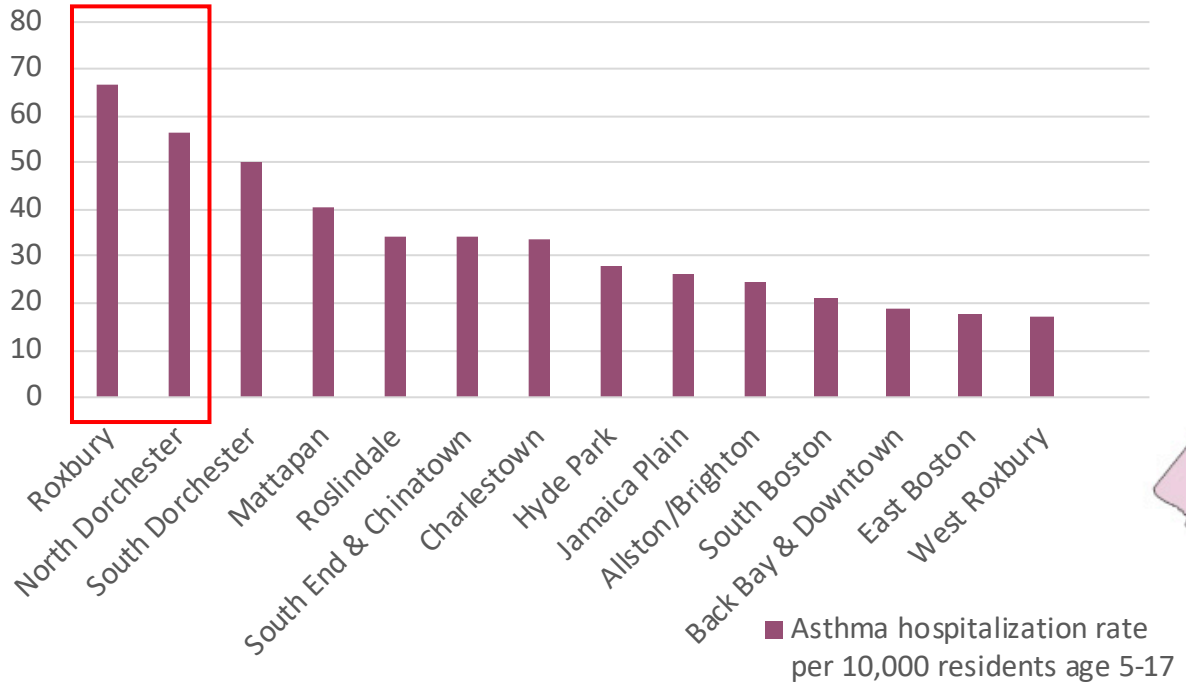
Figure 4.11 Asthma Emergency Department (ED) Visits[1] Among 5- to 17-Year-Olds by Neighborhood, 2014-2015



GREATER GROVE HALL MAIN STREETS

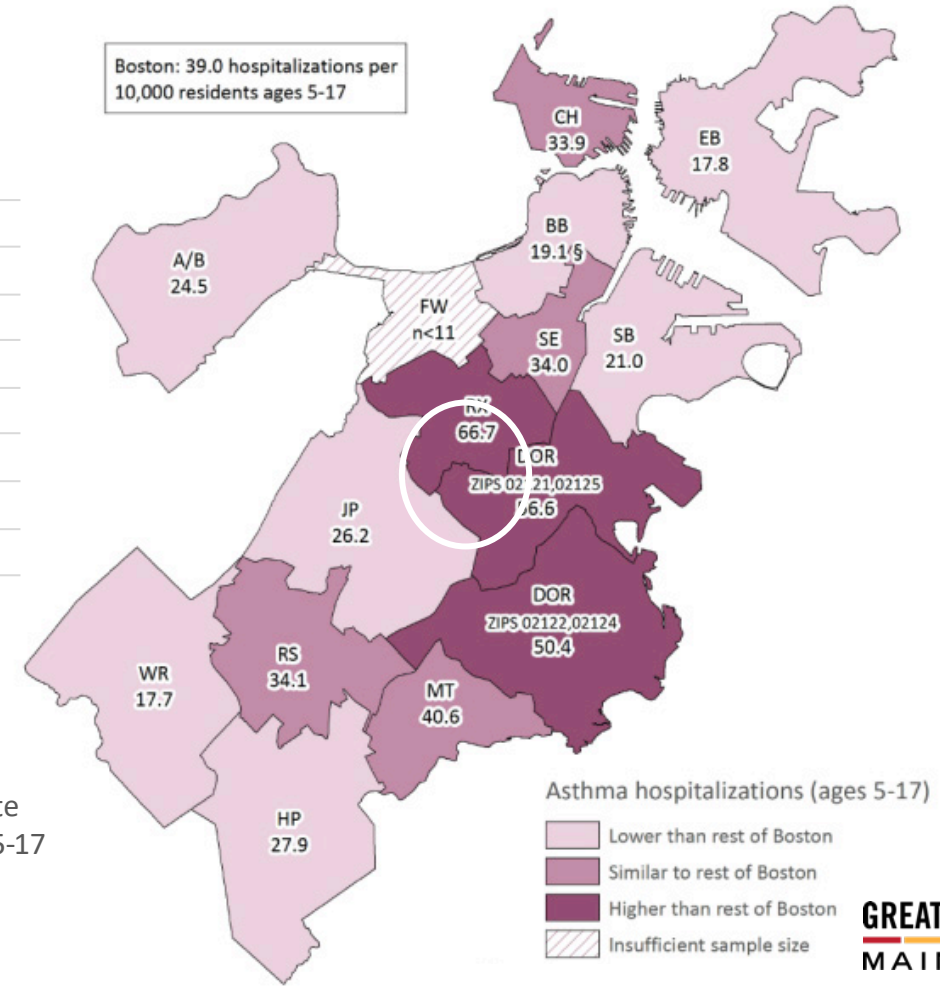
The Greater Grove Hall area: Higher asthma hospitalization than the rest of Boston

- Roxbury and North Dorchester have the highest asthma hospitalization rates among all areas in Boston



Source: Acute hospital case – mix databases, Massachusetts Center for Health Information and Analysis

Figure 4.14 Asthma Hospitalizations[1] Among 5- to 17-Year-Olds by Neighborhood, 2011-2015



GREATER GROVE HALL MAIN STREETS

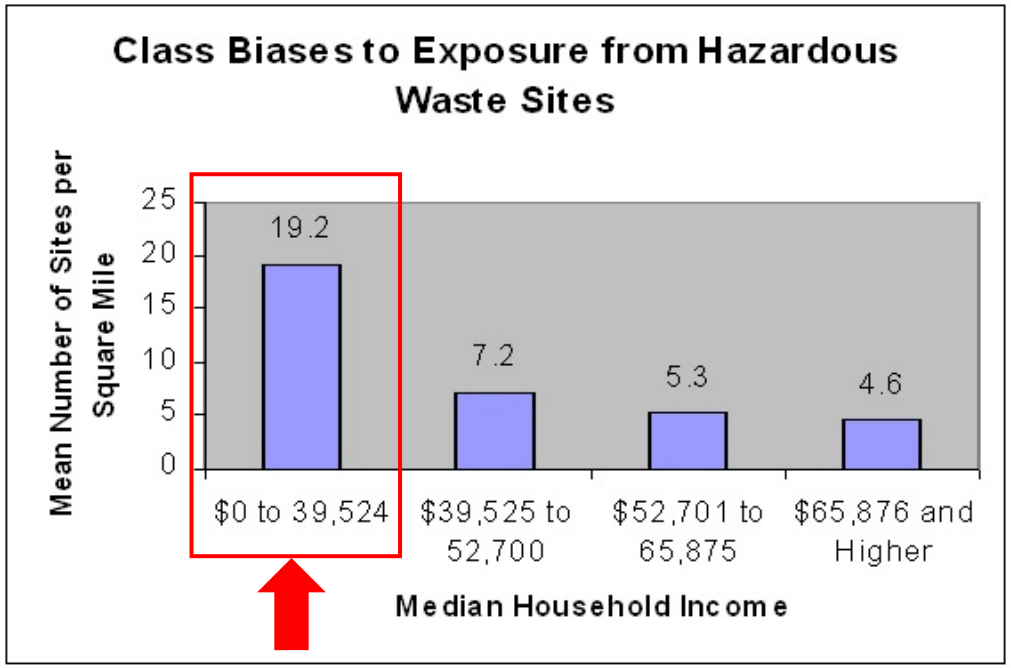
The Greater Grove Hall area:
Residents are disproportionately exposed to hazardous sites

- Daniel Faber, the director of the Northeastern University Environmental Justice Research Collaborative concluded that:

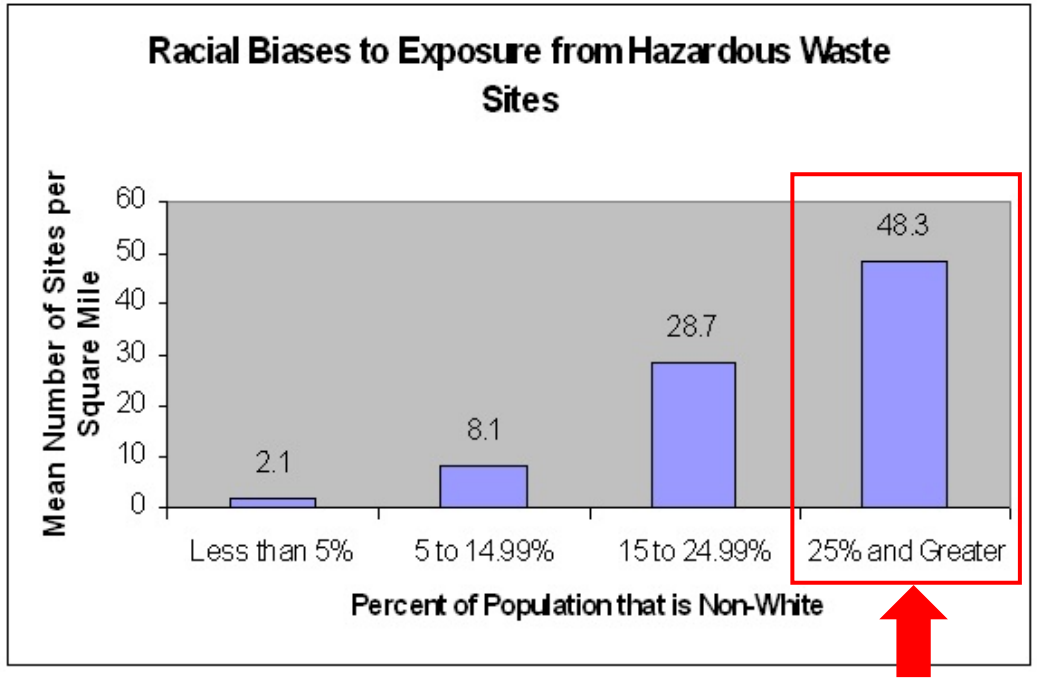
> **"[I]f you live in a white community, then you have a 1.8 percent chance of living in the most environmentally hazardous communities in the state. However, if you live in a community of color, then there is a 70.6 percent chance that you live in one of the most hazardous towns."**

The Greater Grove Hall area has the highest exposure to hazardous sites

Economic class and racial biases to exposure from hazardous sites



Grove Hall



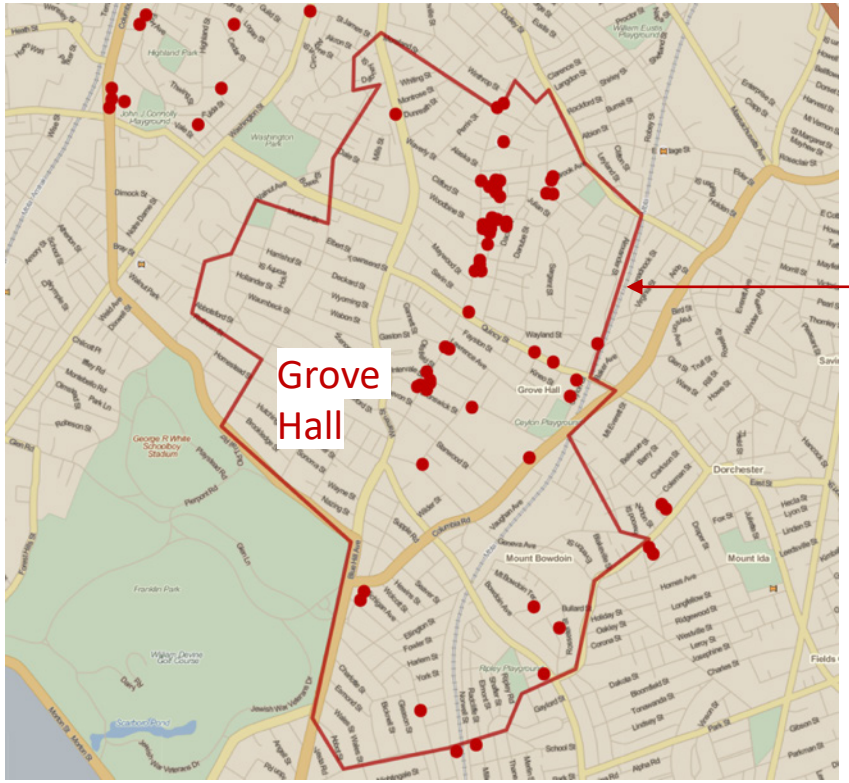
Grove Hall

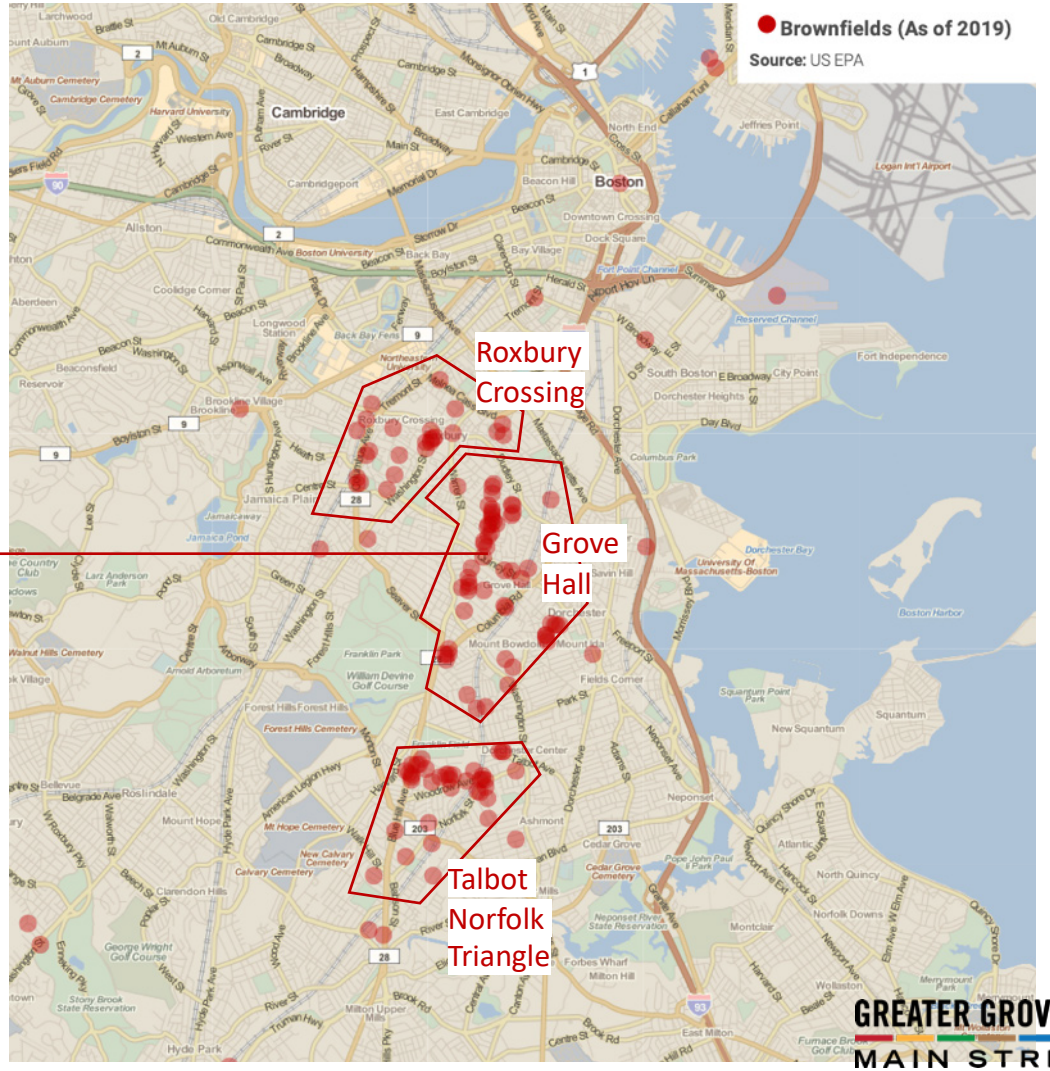
Source: Unequal Exposure to Ecological Hazards 2005:
Environmental Injustices in the Commonwealth of Massachusetts

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area:
The leading area for brownfields in Boston

- There are three clusters of brownfields in Boston. Grove Hall has the most.





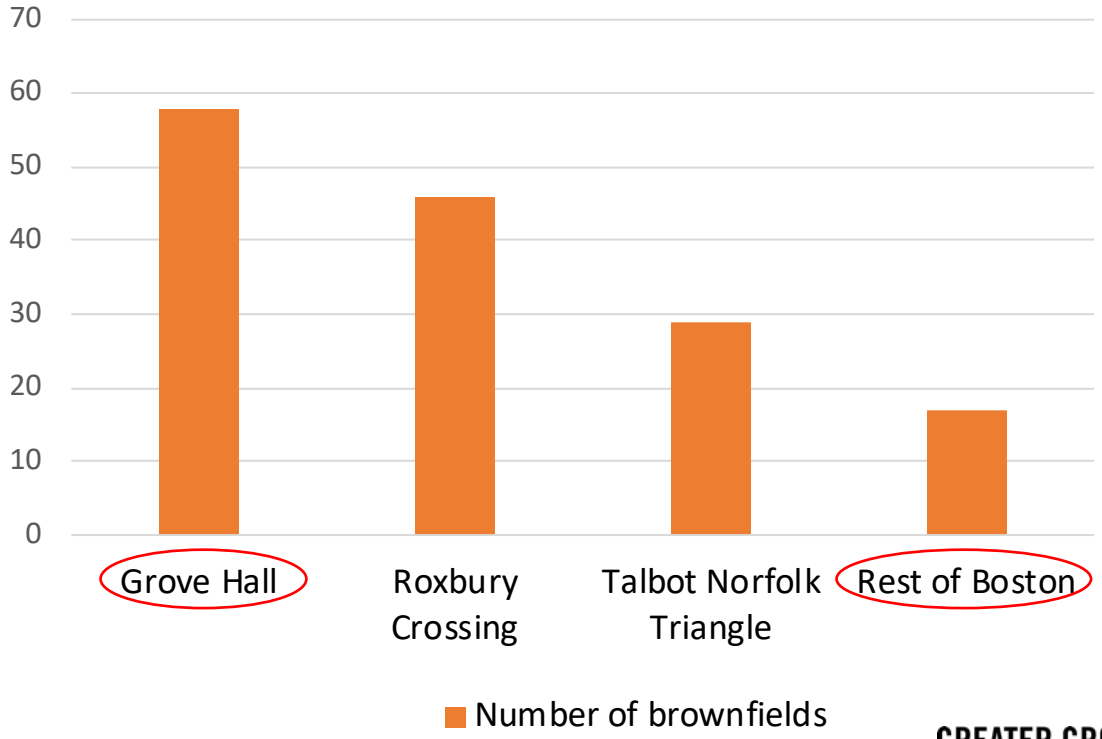
Source: US EPA, PolicyMap

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: The leading site for brownfields in Boston

- Grove Hall is the neighborhood with highest number of brownfields. There are **58** brownfields in Grove Hall.

- Grove Hall has a land area that is **3.33%** of Boston but has **38.67%** of all the brownfields.

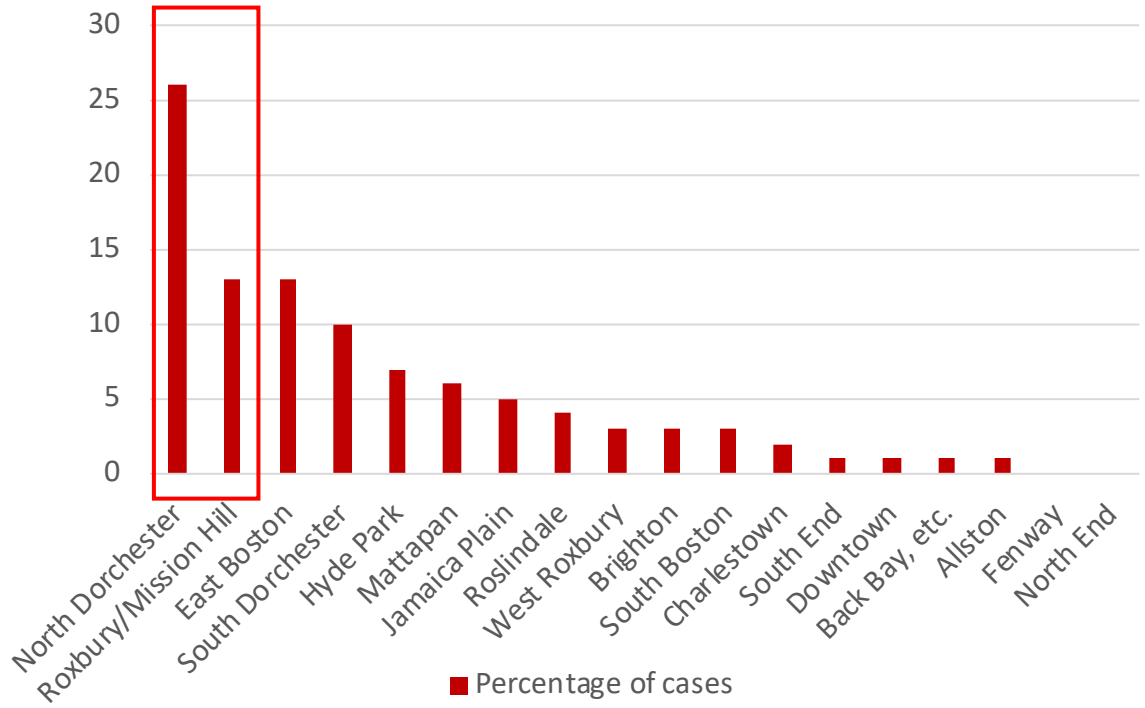


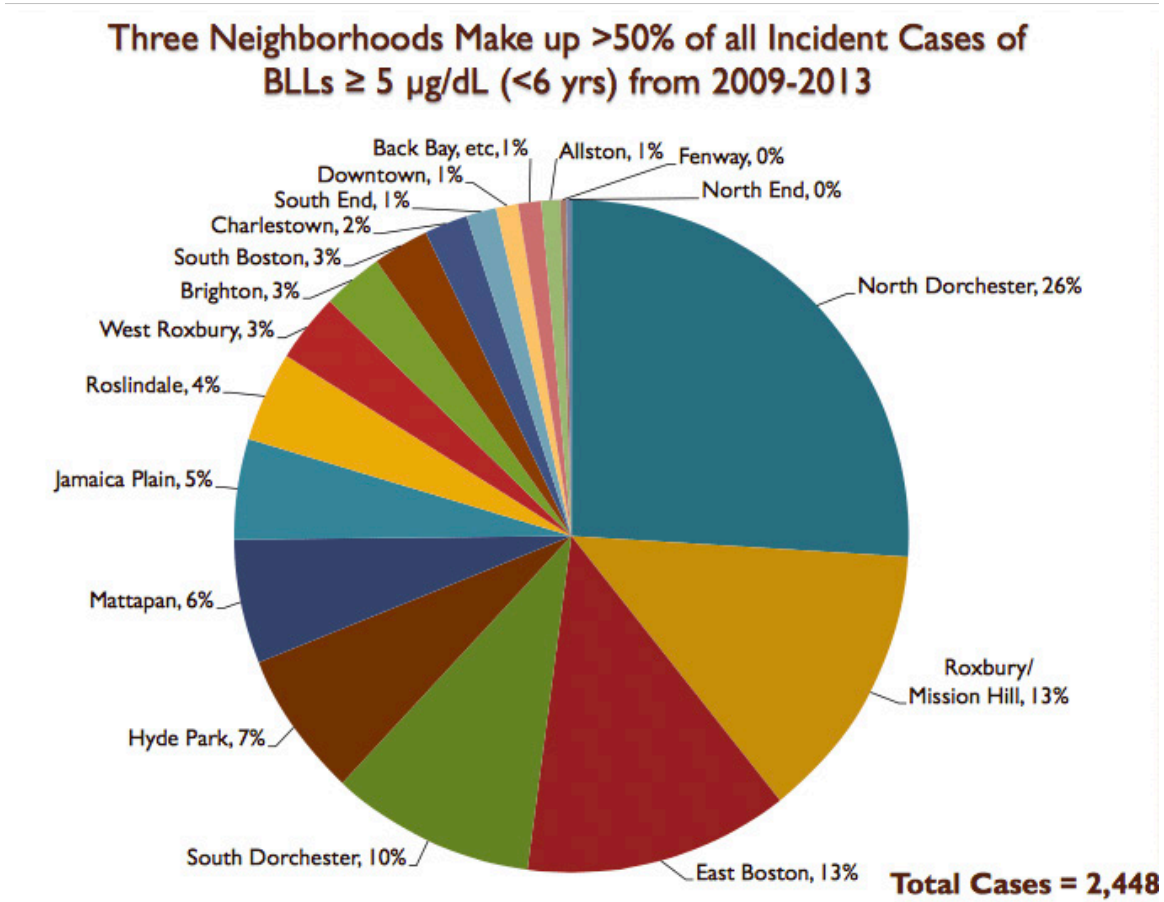
Source: US EPA, PolicyMap

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Lead contamination in the soil

- Among all incident cases of children under 6 yrs. old with Blood Lead Levels over 5 µg/dL, **26%** of them live in North Dorchester and **13%** in Roxbury.

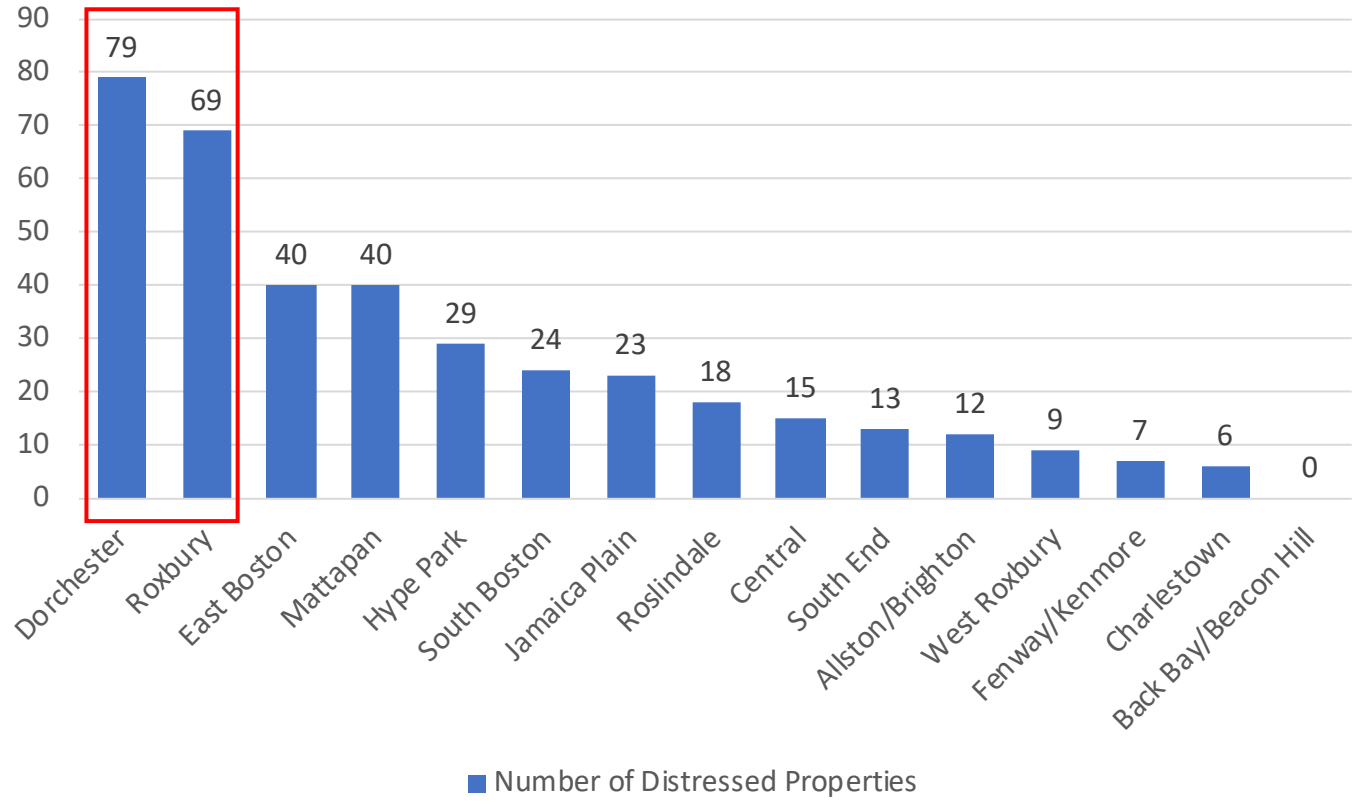




GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: Distressed properties

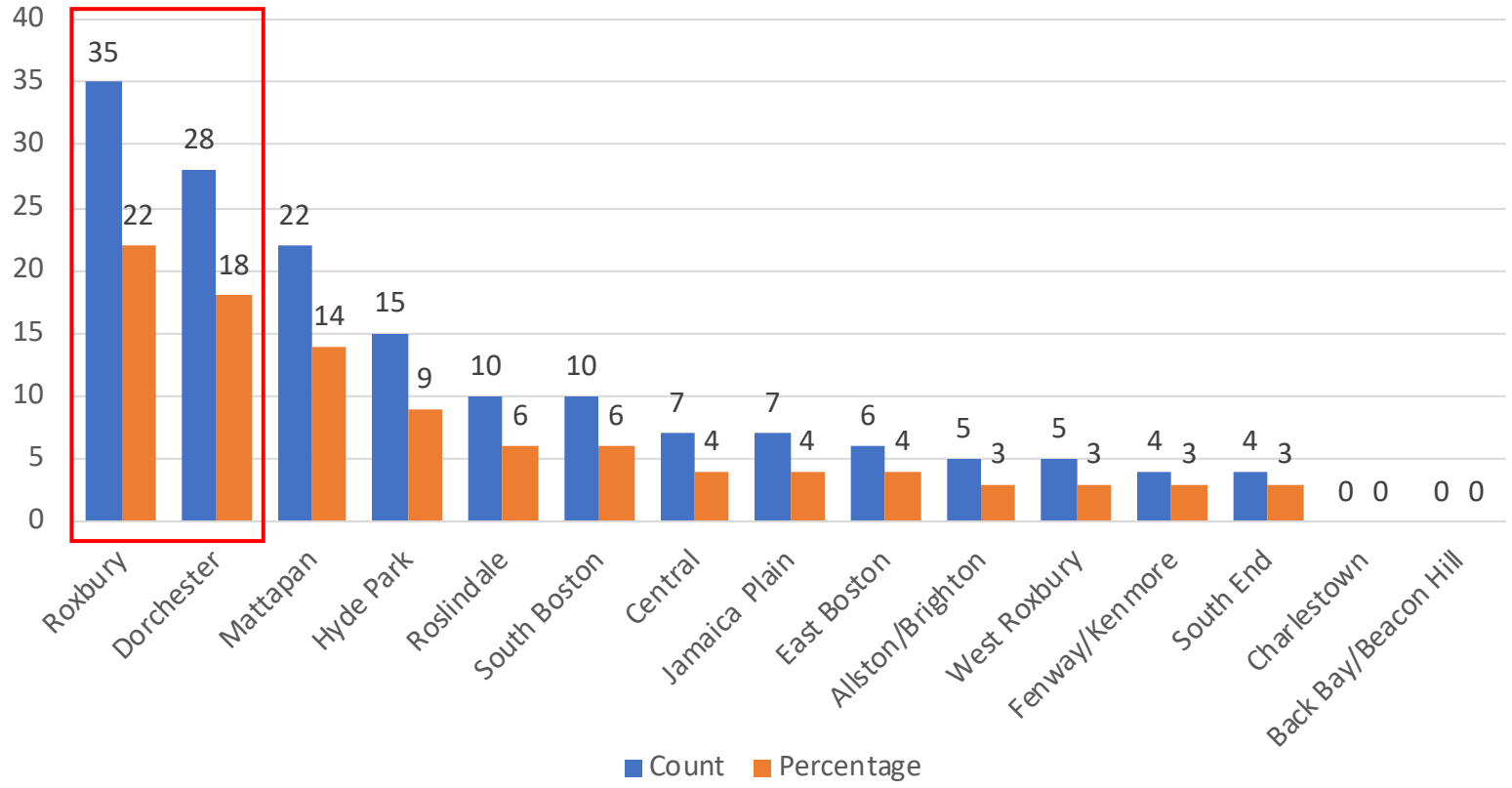
- According's the City's 2018 report, Roxbury and Dorchester have the highest number of distressed properties.



GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area:
Distressed properties with no rehabilitation plan

- According's the City's 2018 report, Roxbury and Dorchester have the highest number of distressed properties with no rehabilitation plan.



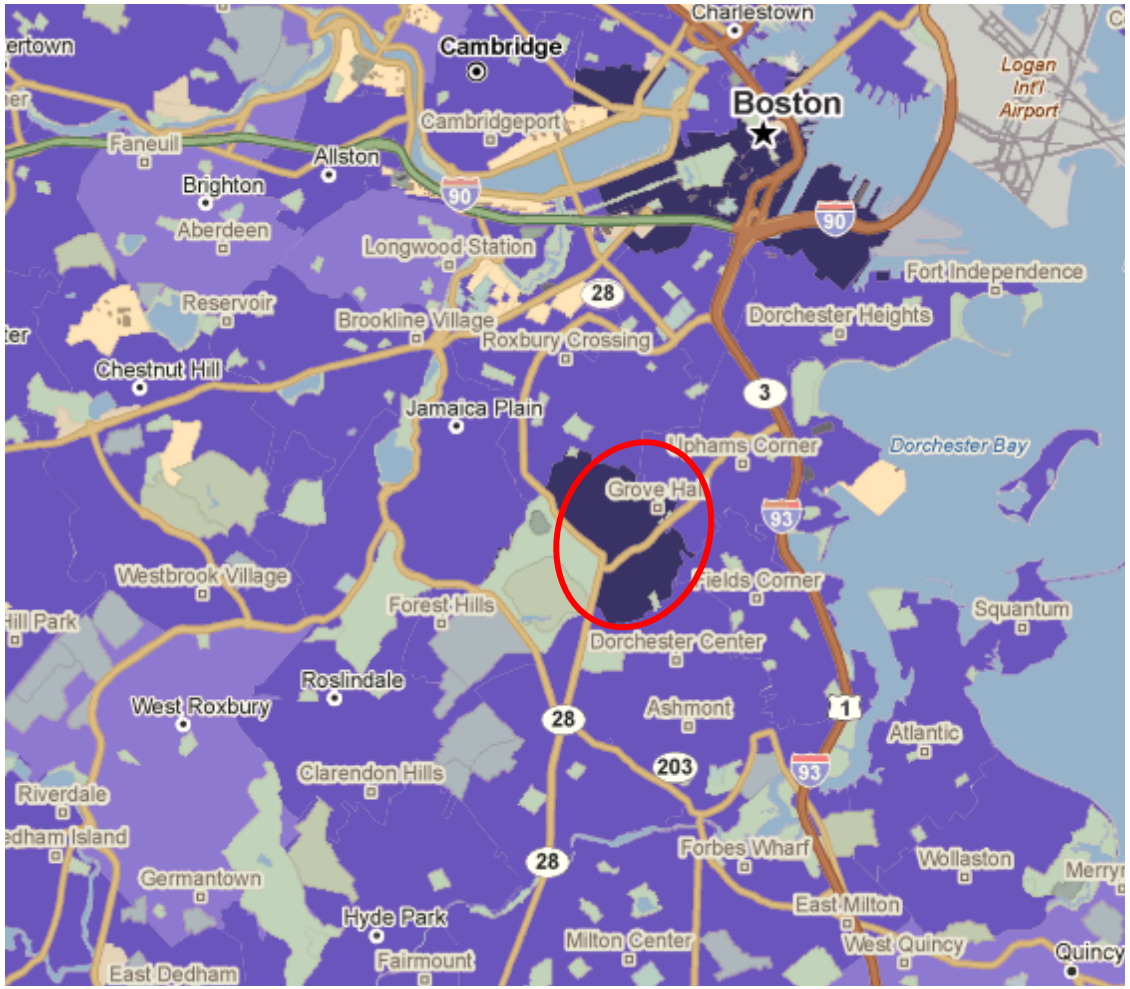
GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: High vacancy rate

- The zip code 02121 has a high percentage of all addresses (including commercial and residential) that are vacant at 4.24%

Percentage of all addresses that are vacant second quarter 2020 (shaded by Zip)

- 0.00% – 0.01%
- 0.02% – 0.02%
- 0.03% – 0.93%
- 0.94% – 3.17%
- More than 3.18%



Source: PolicyMap

GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area:
Meets the criteria of an Environmental Justice community

In Massachusetts, a community is identified as an Environmental Justice community if **any** of the following are true:

- Annual median household income is equal to or less than 65 percent of the statewide median ($62,072 in 2010, 65% is **$40,346**);

✓ Grove Hall:
Median household income: $ **35,500**

- Or **25%** or more of the residents identify as a race other than white;

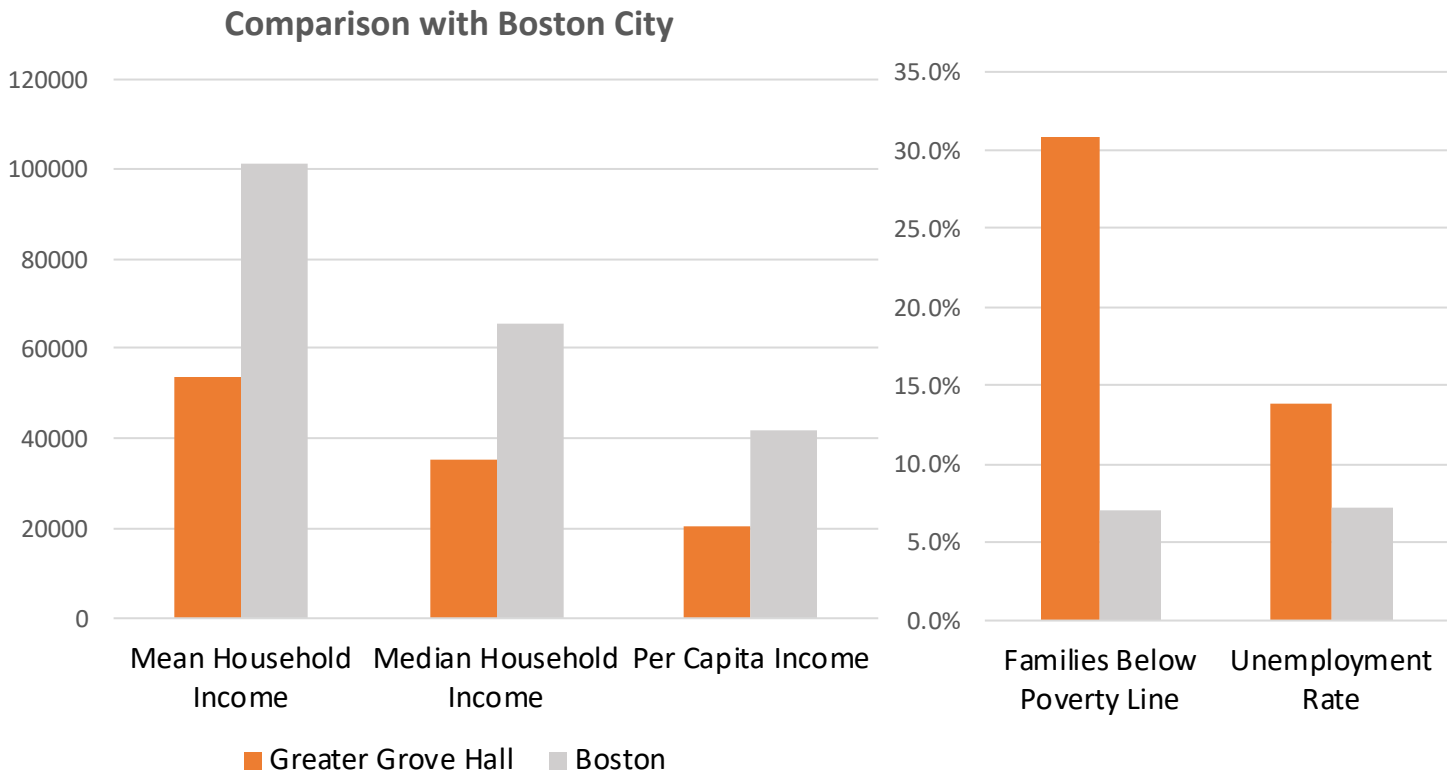
✓ Grove Hall:
Black population: **61.6%** Hispanic population: **30.6%**

- Or **25%** or more of households have no one over the age of 14 who speaks English only or very well - English Isolation

Grove Hall:
Speaks English less than very well: **21.2%**

GREATER GROVE HALL
MAIN STREETS

The Greater Grove Hall area:
One of the poorest sections in the City of Boston

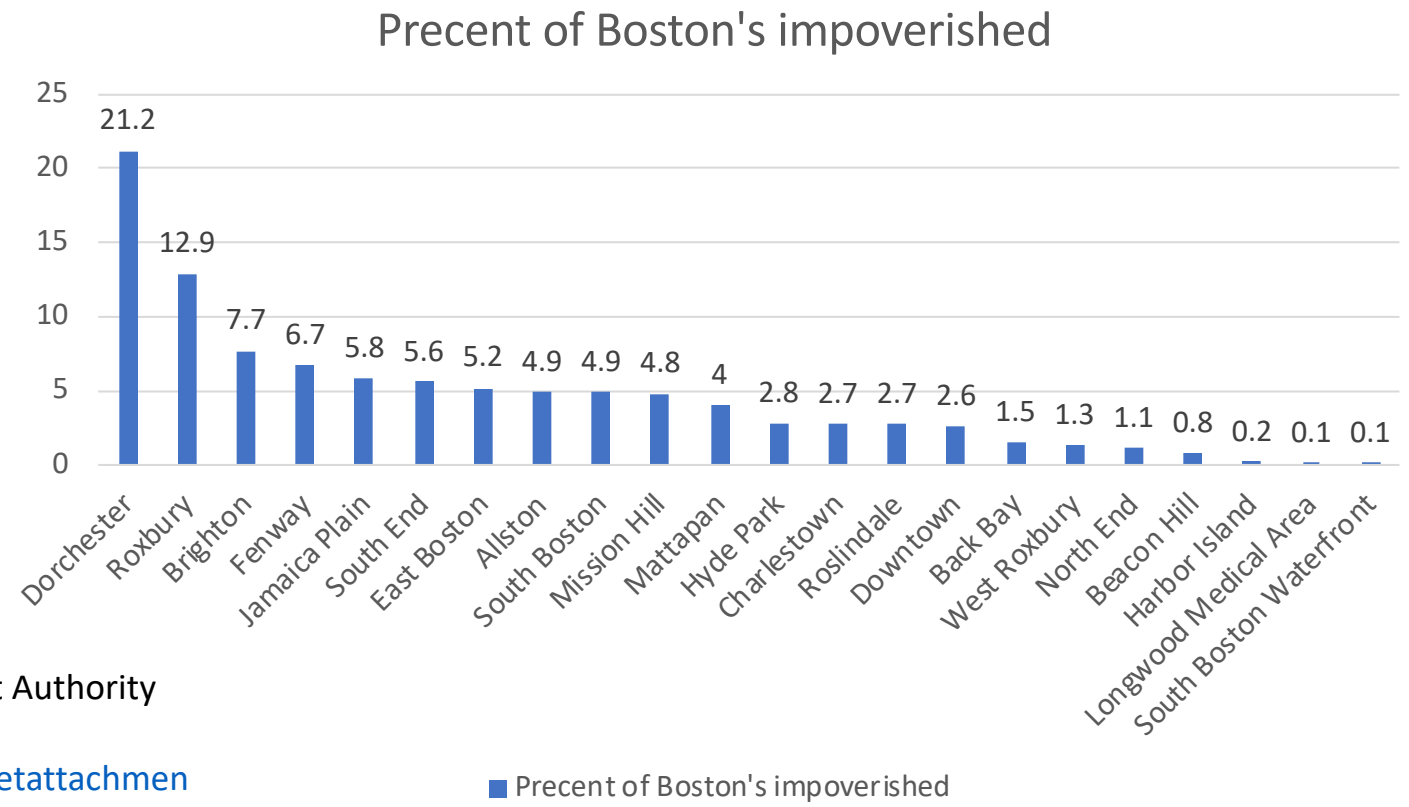


Median household income: **35500** (65900 - Boston)
Mean household income: **53600*** (101300 - Boston)
Per capita income: **20200*** (42000 - Boston)
Families below the poverty line: **30.8%** (7.0% - Boston)
Unemployment rate: **13.8%*** (7.2% - Boston)

GREATER GROVE HALL
MAIN STREETS

The Greater Grove Hall area:
One of the poorest sections in the City of Boston

Most of Boston's impoverished population is in Dorchester and Roxbury.

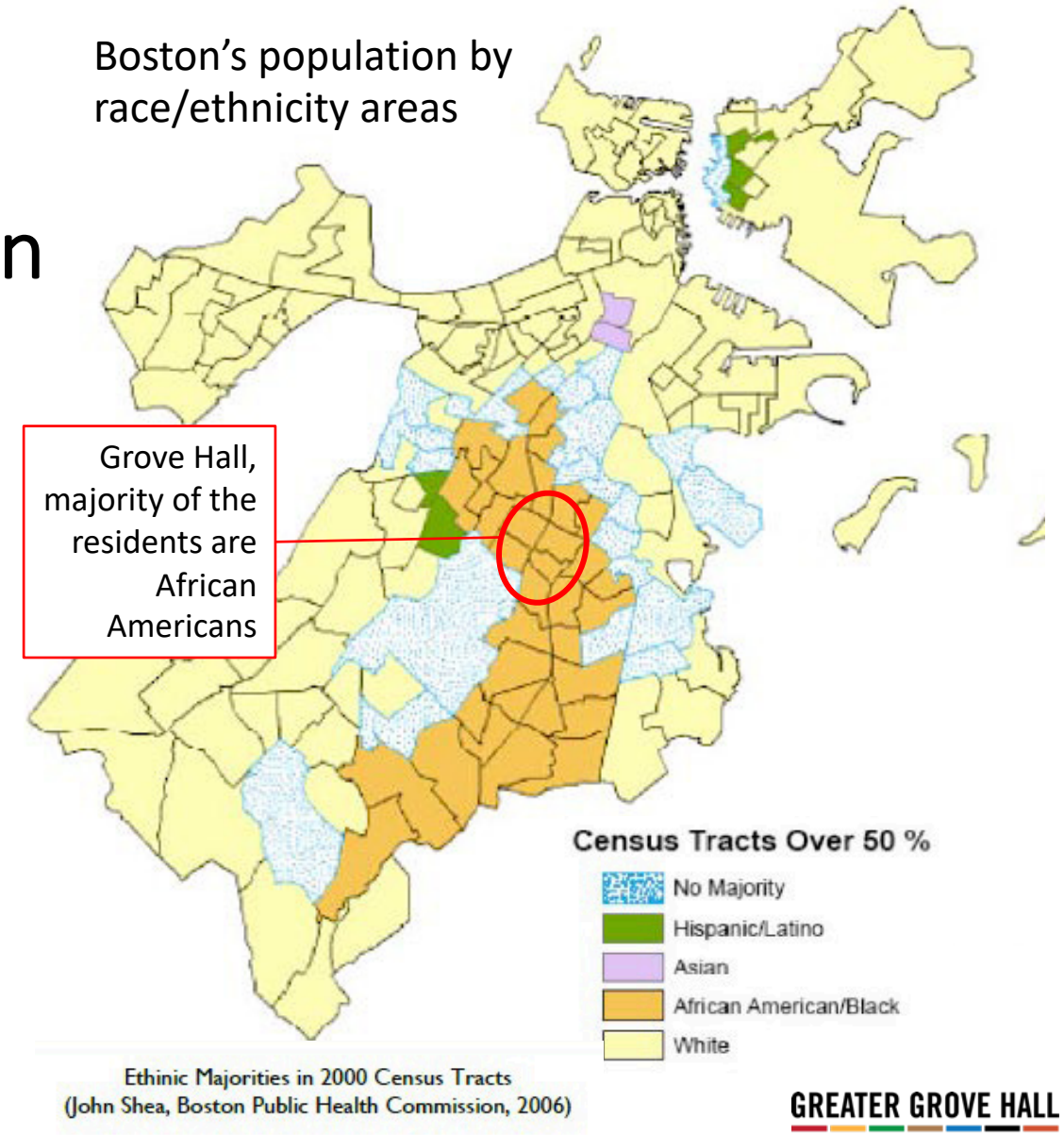


Source: Boston Redevelopment Authority
Research Division
http://www.bostonplans.org/getattachment/f1ecaf8a-d529-40b6-a9bc- 8b4419587b86

GREATER GROVE HALL
MAIN STREETS

The Greater Grove Hall area: One of the most culturally diverse neighborhoods in Boston

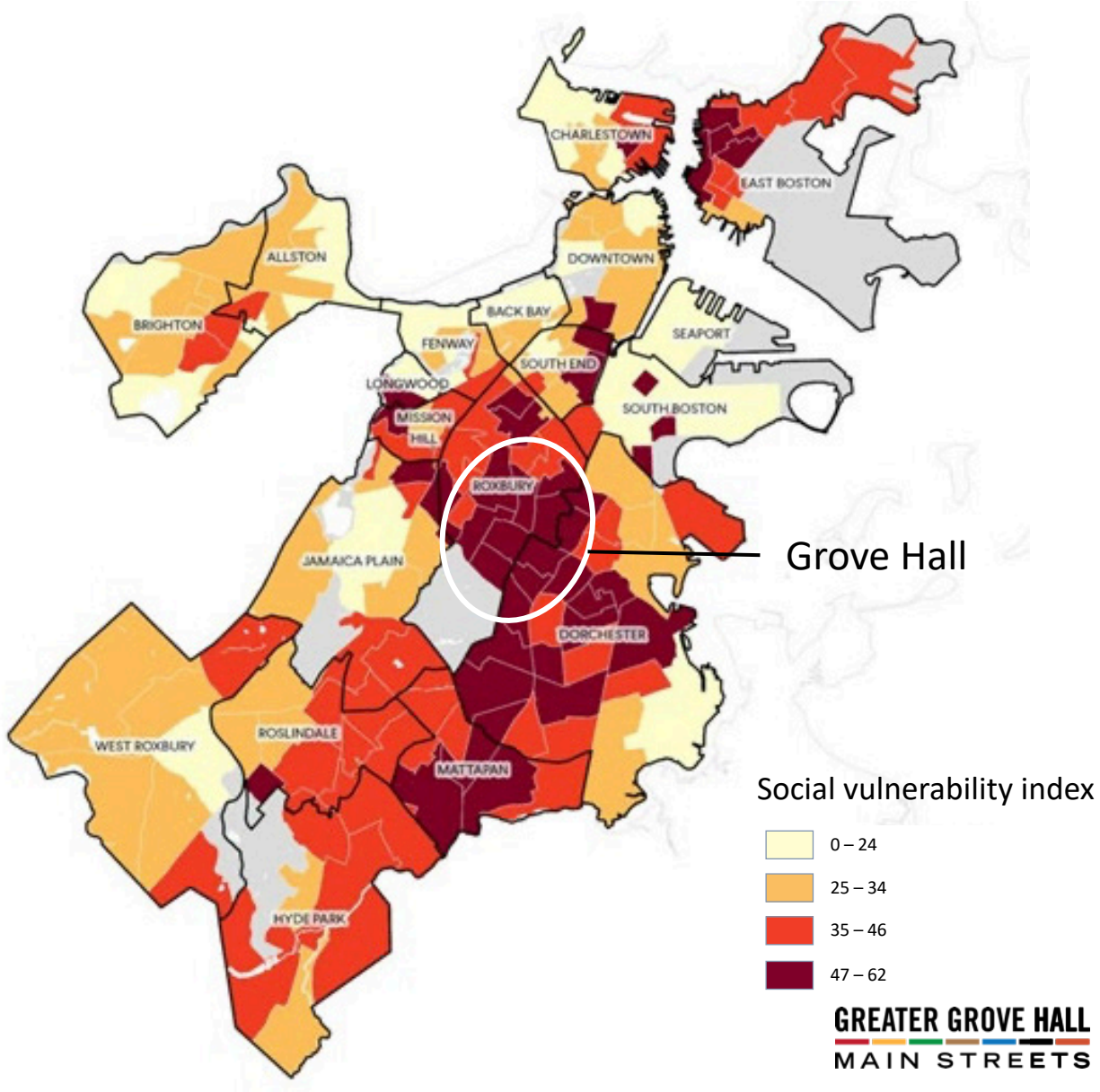
- Home to many Vietnamese, Haitian, Jamaican, Cape Verdean, Hispanic, African-American, Irish, and other populations
- However, African- Americans are the most numerous.



GREATER GROVE HALL MAIN STREETS

The Greater Grove Hall area: High social vulnerability

- Grove Hall area has a high social vulnerability index (social vulnerability refers to the resilience of communities when confronted by external stresses on human health, stresses such as natural or human-caused disasters, or disease outbreaks).
- More likely to face disproportionate impacts from both climate change and they are less likely to have access to the resources that buffer those impacts.



Source: Carbon Free Boston Social Equity Report

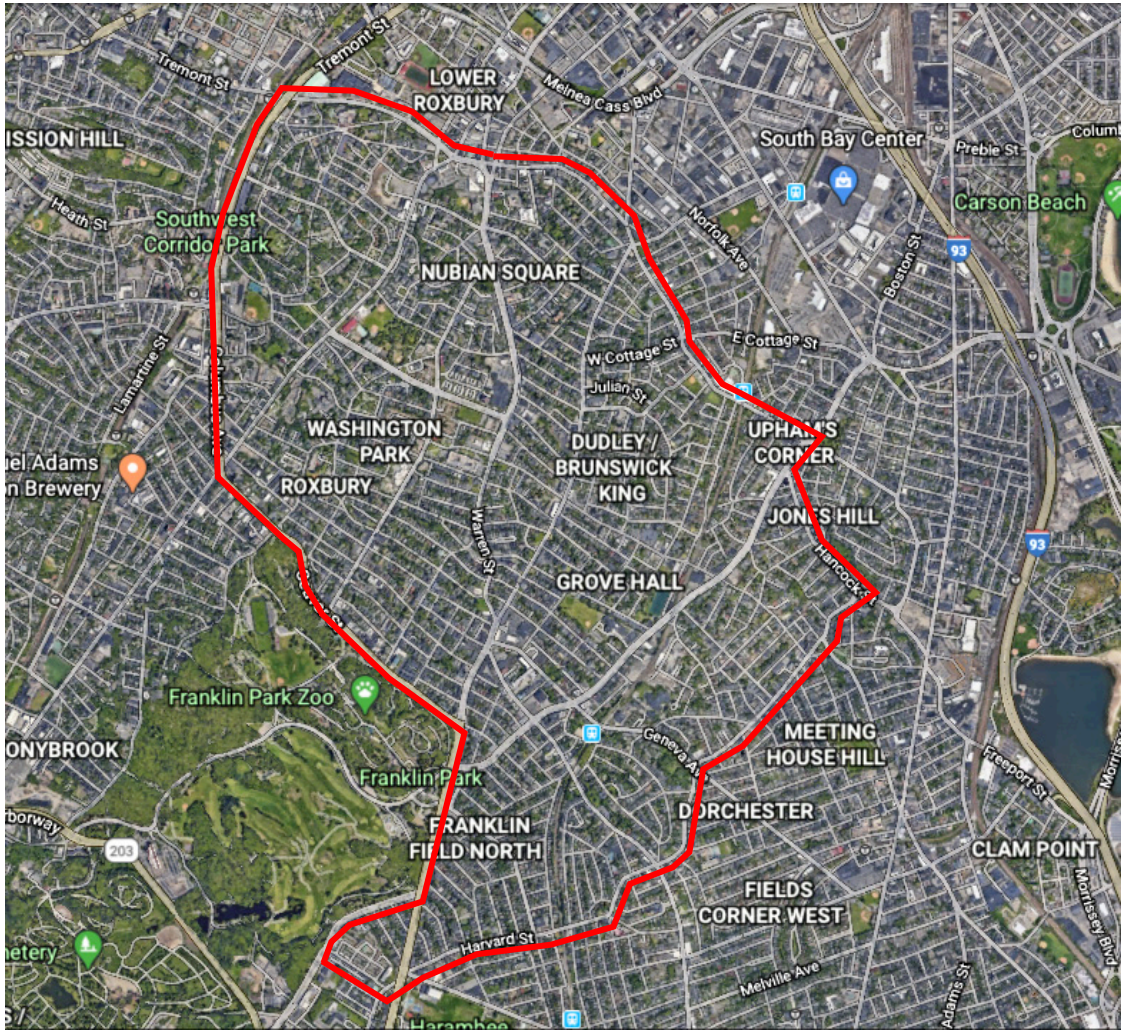
GREATER GROVE HALL MAIN STREETS

Creating an Urban Green Zone

- As a minority-majority city, Boston's climate change efforts must engage stakeholders of color.
- As minority groups in Boston and elsewhere face current threats of poverty, gentrification and displacement, they fail to perceive climate change as an urgent priority.
- A poll of African-American priorities ranked "Tackling Climate Change" 16th out of their 17 choices. Only a concerted effort of civic society, business and political leaders like the one that GGHMS is proposing (including community mobilization and incentives for businesses and residents) will produce the sustainable change we need in Boston.

Proposed Green Zone boundary

- Preliminary proposed boundary includes Grove Hall, part of Roxbury and part of North Dorchester.
- Criteria definition includes: Environmental Justice community, current state of green infrastructures, pollution, vacancy, demographics, topography, etc.



GREATER GROVE HALL MAIN STREETS

The most common elements that contribute to a Green Zone

NEIGHBORHOOD DEVELOPMENT

Implementation of sustainable design strategies that contribute to a broad range of sustainability goals through good neighborhood design and development.

HEALTH

Implementation of sustainable design strategies that intend to improve the overall quality of life and fitness opportunities for both residents and users.

ENERGY: DISTRICT

Implementation of sustainable design strategies that reduce energy use through efficient district energy systems.

EDUCATION

Implementation of sustainable design strategies that support behaviors through education on green living for EcoDistrict residents and users, as well as the community at large.

ENERGY: BUILDING

Implementation of sustainable design strategies in the built environment that reduce the use of non-renewable, imported energy and associated greenhouse gas emissions.

HABITAT

Implementation of sustainable design strategies that promote biodiversity and responsible landscaping, even as development increases the intensity of the built environment.

TRANSPORTATION

Implementation of sustainable design strategies that reduce negative environmental impact of vehicle usage by maximizing the opportunity for walking, biking, ride-sharing, and transit use.

CULTURE

Implementation of sustainable design strategies that enrich social networks and the cultural environment.

STORMWATER & WATER

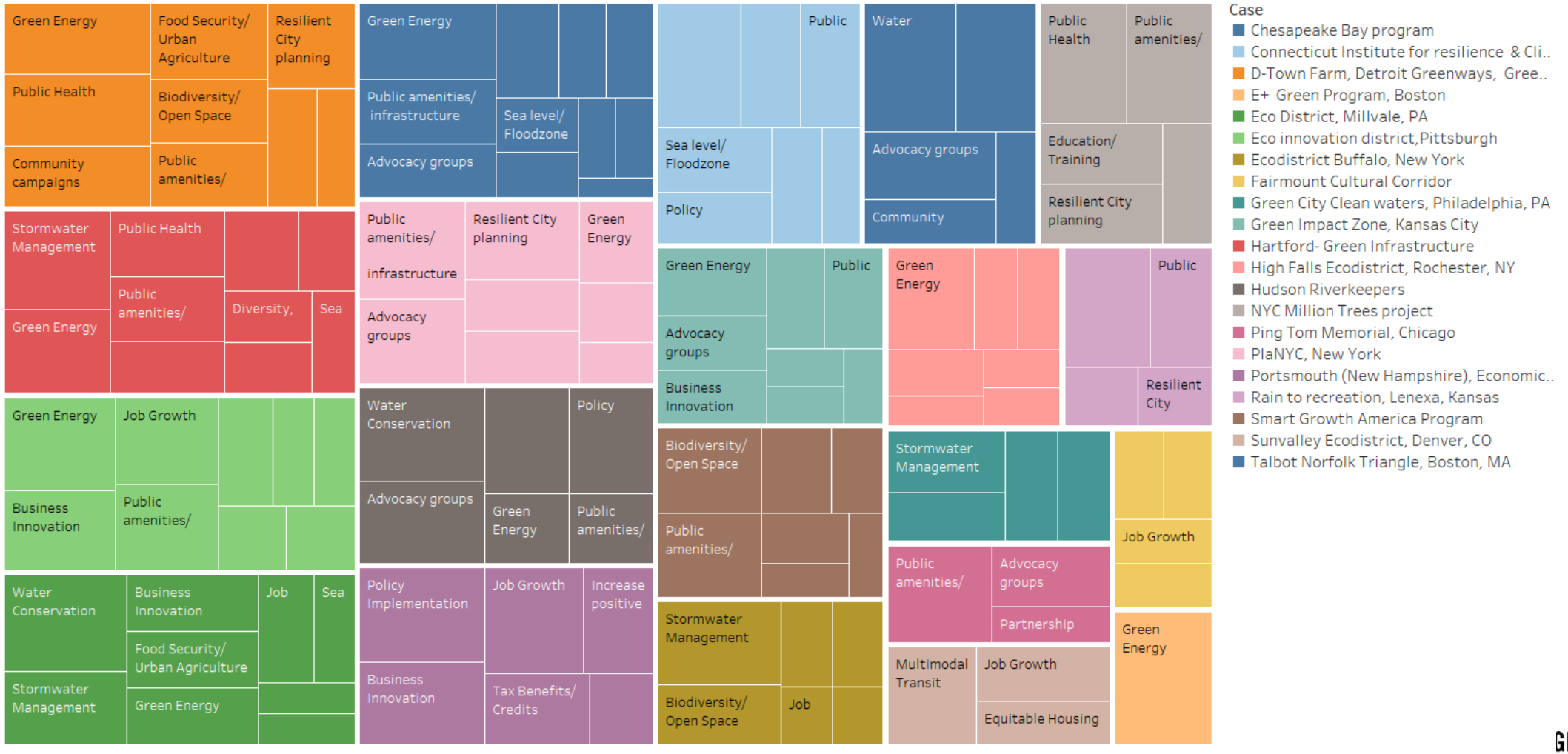
Implementation of sustainable design strategies that conserve and reuse potable water, and provide relief for stormwater runoff through natural drainage systems.

EQUITY

Implementation of sustainable design strategies that enable an EcoDistrict to benefit the broadest spectrum of people.

We studied 21 cases

Case studies and their focused elements



Category. Color shows details about Case. Size shows sum of Score. The marks are labeled by Category.

GREATER GROVE HALL MAIN STREETS

What should we do to achieve a Green Zone? The three aspects:

Strengthen and preserve existing community	Establish new green development	Invest in sustainable infrastructure
• Encourage existing households and businesses to adopt green practices	• Attract green businesses to Grove Hall • Set green standard for new development	• Design green infrastructures that mitigate negative environmental impacts

GREATER GROVE HALL
MAIN STREETS

Who should take the actions?

Residents & business owners in Grove Hall

Strengthen and preserve existing community

- Encourage existing households and businesses to adopt green practices

Potential businesses & Investors

Establish new green development

- Attract green businesses to Grove Hall
- Set green standard for new development

The City with the help of expertise in engineering, planning and design

Invest in sustainable infrastructure

- Design green infrastructures that mitigate negative environmental impacts

Who should provide the incentives?

The City: tax benefits, incentives, rewards and recognition, regulation and enforcement, policy establishment

The City: funding programs and projects

Residents & Business owners in Grove Hall

Potential businesses & Investors

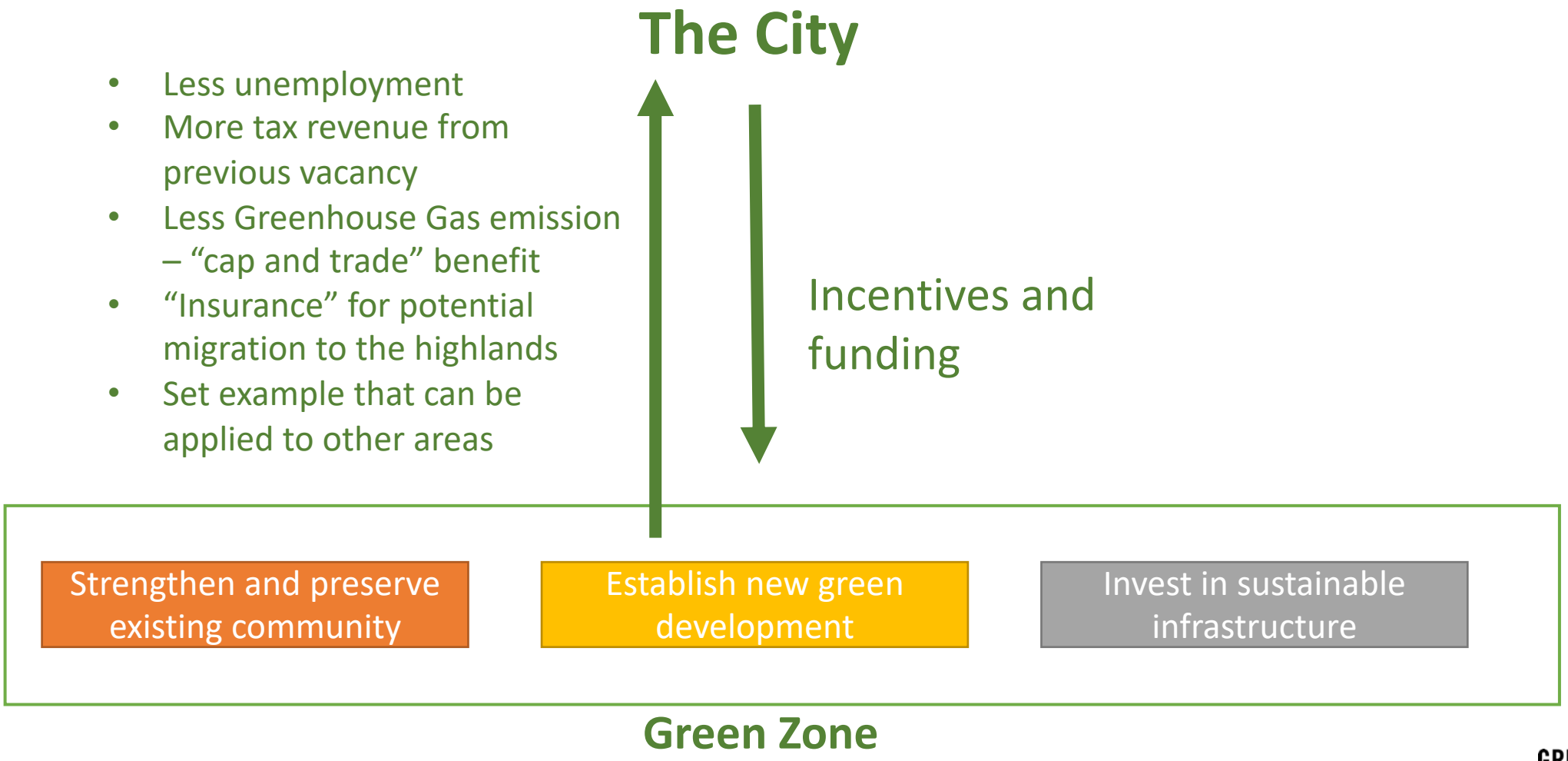
The City with the help of expertise in engineering, planning and design

Strengthen and preserve existing community

Establish new green development

Invest in sustainable infrastructure

Return of the investment



GREATER GROVE HALL MAIN STREETS

Interventions

We identified some opportunities for green interventions in the Grove Hall area that can transform the neighborhood into a resilient and just community.

- Turn flat roofs into green roofs or solar roofs
- Retrofit public housing, triple-deckers and other residential buildings
- Brownfield redevelopment
- Install permeable pavement
- Create rain gardens and bioswales
- Commercial recycling
- Green education
- Transportation options

Turn the flat roofs into green roofs

(May not be feasible due to building's structural capacity)

Urban tree canopies decrease the urban heat island effect.

The recommended average canopy cover is **40%** for metropolitan areas east of the Mississippi and in the Pacific Northwest and 25% for metropolitan areas in the Southwest and West.

Grove Hall area is currently at **4-10%** tree canopy coverage in public areas.

Stormwater runoff from the built environment is a principal contributor to water quality impairment of water bodies nationwide.

Sources:

American Forests (2009) "Setting Urban Tree Canopy Goals."

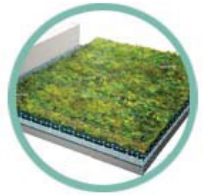
U.S. Department of Agriculture (USDA) (2010) Sustaining America's Urban Trees and Forests.

National Research Council (2008) Urban Stormwater Management in the United States.

Turn the flat roofs into green roofs

(May not be feasible due to building's structural capacity)

There are at least **1,250,000 ft²** potential green roof coverage in Grove Hall.



Green roofs can:

- Reduce summer energy demands by more than **75 percent.**
- Help reduce the urban heat Island effect.
- Reduce and slow stormwater runoff.
- Mitigate air pollution.

GREATER GROVE HALL MAIN STREETS

Turn the flat roofs into green roofs

(May not be feasible due to building's structural capacity)

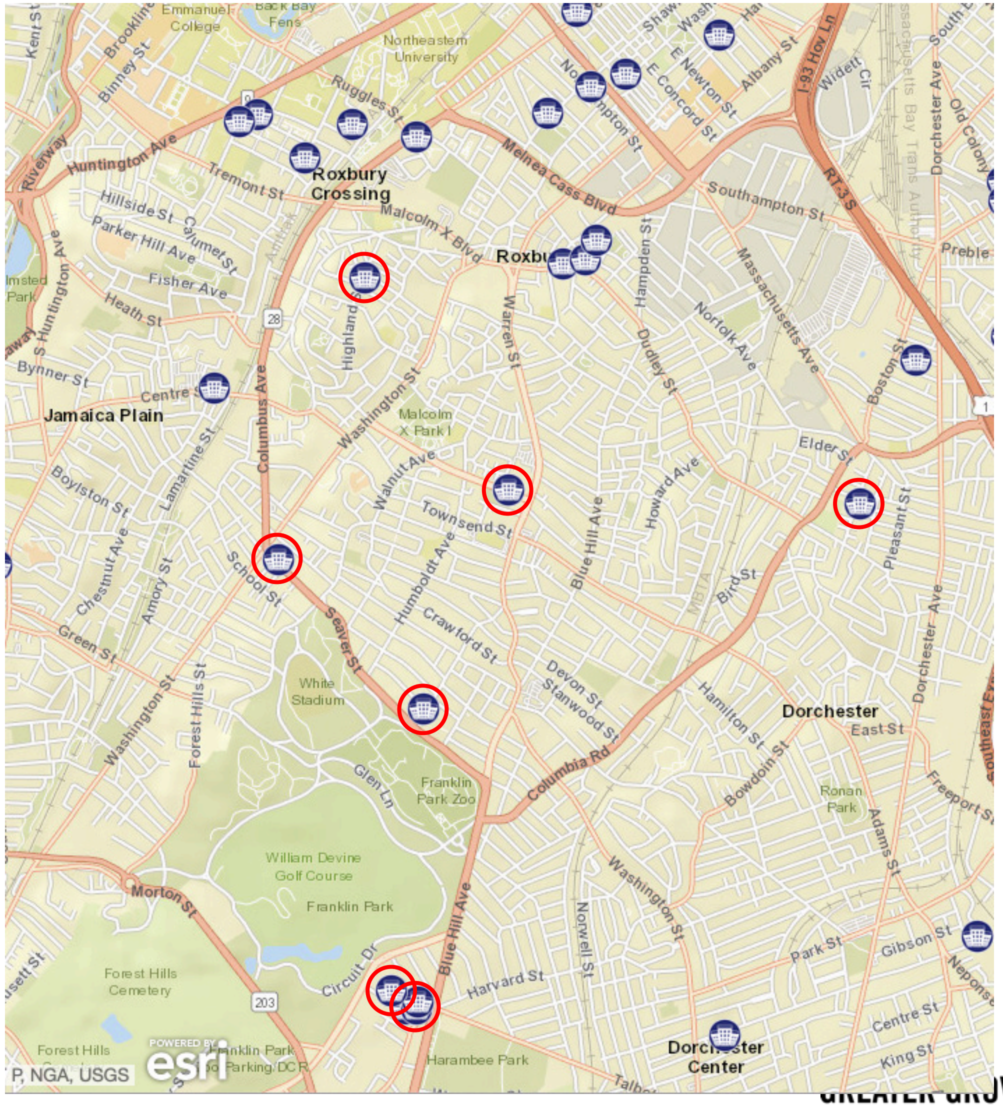
- The average cost for a bare-bones green roof—including the design, permitting, and installation—will typically run between **$18 and $22 per square foot.**
- Incentives can include:
  - Free consultation program
  - Establish funding to subsidize homeowners/businesses projects
  - Collaborate with designated design firm, planning team, and contractor to get discounted rate.
  - Tax rebate

Turn dark roofs into white reflective roofs

- Fresh asphalt reflects only **4%** of sunlight compared to as much as **25%** for natural grassland and up to **90%** for a white surface such as fresh snow.
- The systematic replacement of dark surfaces with white could lower heat wave maximum temperatures by **2°C or 3.6 °F** or more.

Retrofit public housing

- **Seven** public housing developments in the preliminary Green Zone boundary
- Interventions can include:
  - Turn the flat roofs into green roofs, white roofs or install solar panels
  - Better insulated windows and other measures to increase energy efficiency

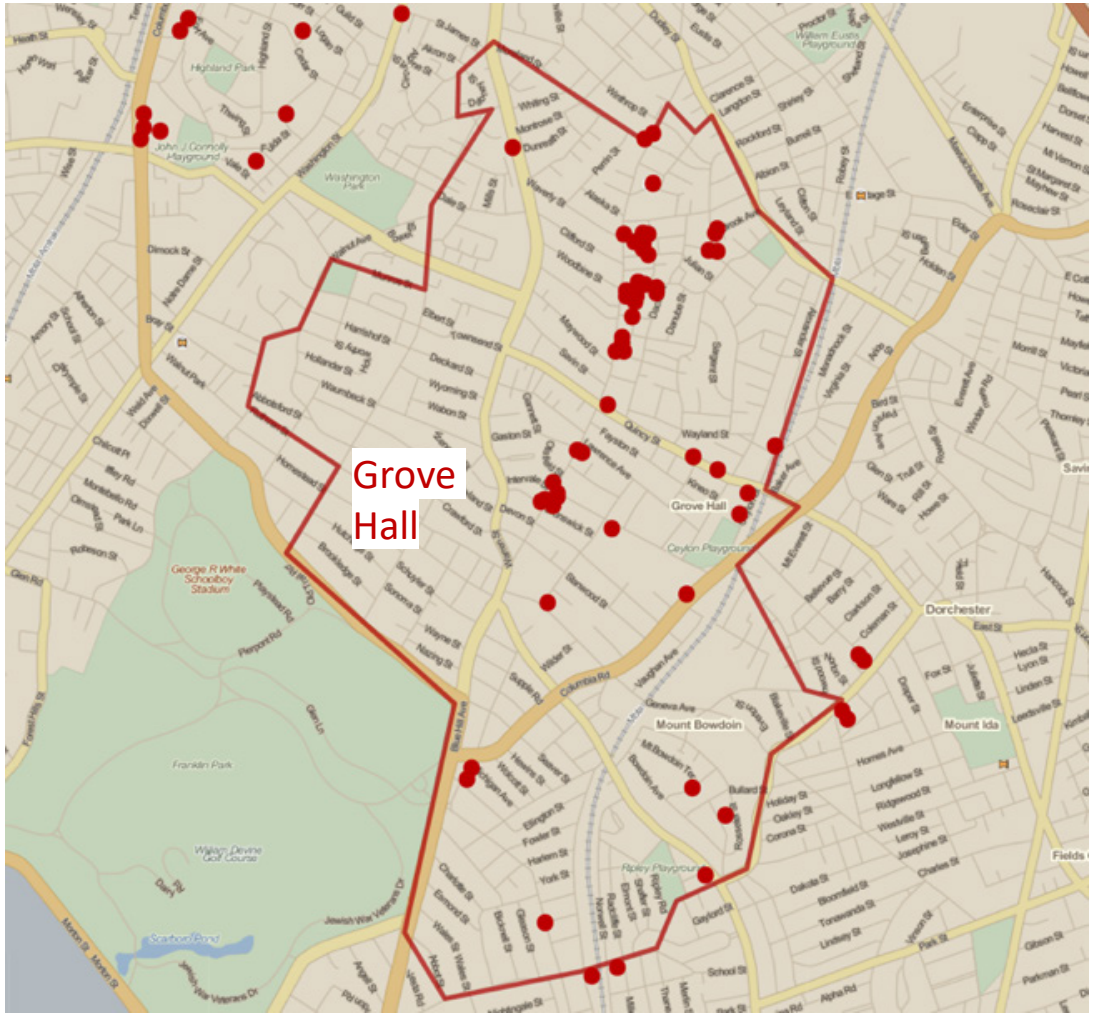


Retrofit triple-deckers and other residential buildings

- It is estimated that approximately 15,000 three-deckers were built in Boston between 1880 and 1930, a third of them in Dorchester.
- Interventions can include:
  - Incentives to encourage owners to turn the flat roofs into solar roofs or white reflective roofs (see previous slides)
  - Start a pilot program that would pay a certain percentage of the costs of an eligible retrofit.
  - Support for low-income tenants who would have to vacate their home during a retrofit.

Brownfield Redevelopment

- There are **58** brownfields in Greater Grove Hall
- Eight still require cleanup
- Only seven are redeveloped



GREATER GROVE HALL
MAIN STREETS

Brownfield Redevelopment

- Brownfields account for **20.26 acres** of vacant land, **more than 18 football fields**

X 18

Brownfield Redevelopment

Brownfields could be used for container farms:

- These are less expensive than most reclamation projects
- These would have other benefits such as:
  - Food equality and security
  - Create jobs
  - Promote healthy living and education
  - Foster therapeutic space

Freight Farm

GREATER GROVE HALL MAIN STREETS

Brownfield Redevelopment

Brownfields could be used for playground with solar panels as canopy :

- Generate sustainable energy
- Serve the community with high youth population
- Provide youth education

GREATER GROVE HALL
MAIN STREETS

Brownfield Redevelopment

Brownfields could be used for housing or retail :

- Revitalize the neighborhood
- Economic development
- Set new green design standard for the Green Zone

GREATER GROVE HALL
MAIN STREETS

Install permeable pavement

There are at least **31,000 ft** in length or **580,000 ft²** sidewalk area on major streets that can be transformed into permeable pavement within preliminary Green Zone boundary.

Impervious main streets:

- Blue Hill Ave. – 6000 ft. 2 sides
- Warren St. – 7000 ft. 2 sides
- Columbia Rd. – 7200 ft. 2 sides
- Seaver St. – 4000 ft. 1 side
- Columbus Ave. – 6800 ft. 2 sides

GREATER GROVE HALL MAIN STREETS

Install permeable pavement

- Permeable pavement can:
  - Reduce water runoff
  - Mitigate heat island effect
  - Eliminate ice piling problem since water seeps through
  - It can be made using recycled materials

- With different kinds of pavers, cost ranges from **$1.5 to $10** per sqft. However, it requires less time to install and functions as a stormwater management system with all the other benefits.

GREATER GROVE HALL
MAIN STREETS

Create rain gardens and bioswales

There are around **13,000 ft. or 200,000 ft²** of medians on major streets within preliminary Green Zone boundary.

- Blue Hill Ave. – 3000 ft.
- Warren St. – 2000 ft.
- Columbia Rd. – 4200 ft.
- Columbus Ave. – 2200 ft.
- MLK Blvd. – 1500 ft.

Current condition of major streets medians

Current condition of parking lots

Create rain gardens and bioswales

- Rain gardens and bioswales can:
  - Reduce stormwater runoff: a 13-feet swale can reduce approximately 25 percent of total rainfall runoff.
  - Reduced pollutants: Bioswales/bioretention ponds remove pollutants by filtering stormwater runoff through natural vegetation and soil-based systems.
  - Reduce pressure on existing systems and the maintenance costs associated with centralized stormwater management systems.
  - Mitigate heat island effect
  - Aesthetically pleasing

Commercial recycling

- Majority of businesses in the Grove Hall area are small. They are not participating in any recycling program.
- Many small businesses have large cumulative effect. For example, there are **25** takeout restaurants/convenience stores in Greater Grove Hall Main Street area alone, throwing away a lot of food packages and takeout boxes unrecycled.

Trash in empty lots

GREATER GROVE HALL
MAIN STREETS

Commercial recycling

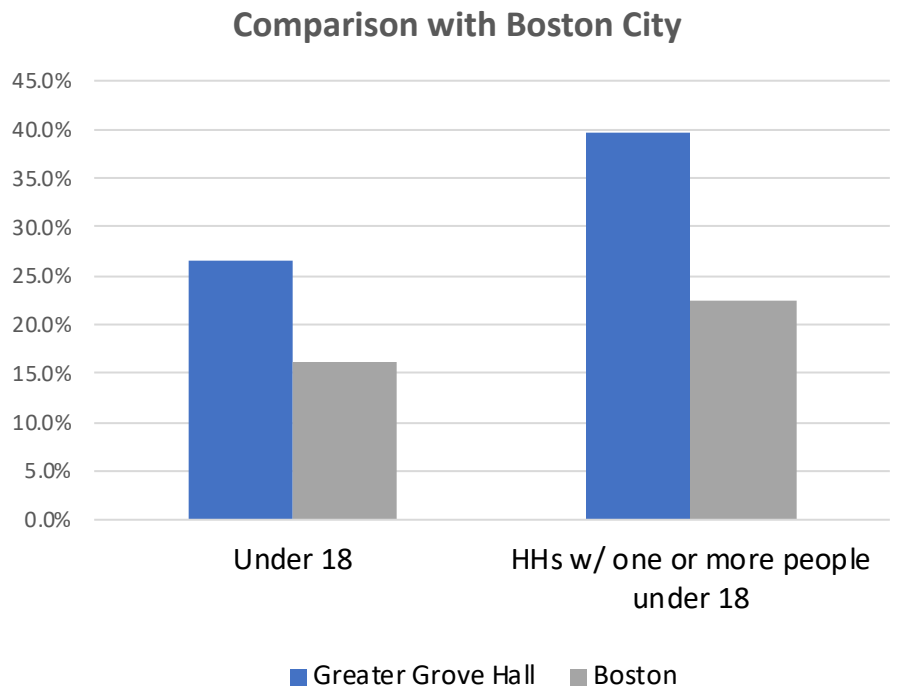
- Interventions can include:
  - Determine specific recyclable wastes that the local businesses produce the most (for example, takeout boxes, hair care bottles, liquor bottles, etc.)
  - Team up with local recycling hauler to provide free or discounted recycling pick up service
  - Communicate and educate the small businesses about the benefits of participating in the recycling program, focusing on monetary benefit such as reduced waste management cost

Green education

There is an opportunity to provide green education

There are a large number of children in Grove Hall

- Under 18: **26.6%** (16.2% - Boston)
  - Households with one or more people under 18 years: **39.8%** (22.4% - Boston)



Raw data from ACS 5-year Estimates 2014-18

GREATER GROVE HALL MAIN STREETS

Green education

There is an opportunity to provide green education

There are **23** schools within the preliminary Green Zone boundary

There are several educational facilities such as the Boys & Girls Club, Roxbury YMCA, Freedom House, Grove Hall Library.

The Children’s Room in Grove Hall Library

Green education

- Green education should include:
  - Training on green living in schools. Teach sustainability as a course.
  - Establish youth program for regularly organized activities such as tree planting, watering and caring, trash collecting and recycling, etc.
  - School supplies, lunch boxes and other items that the schools provide should use reusable or recyclable materials.
  - Perform energy audit for school buildings and retrofit them as needed.

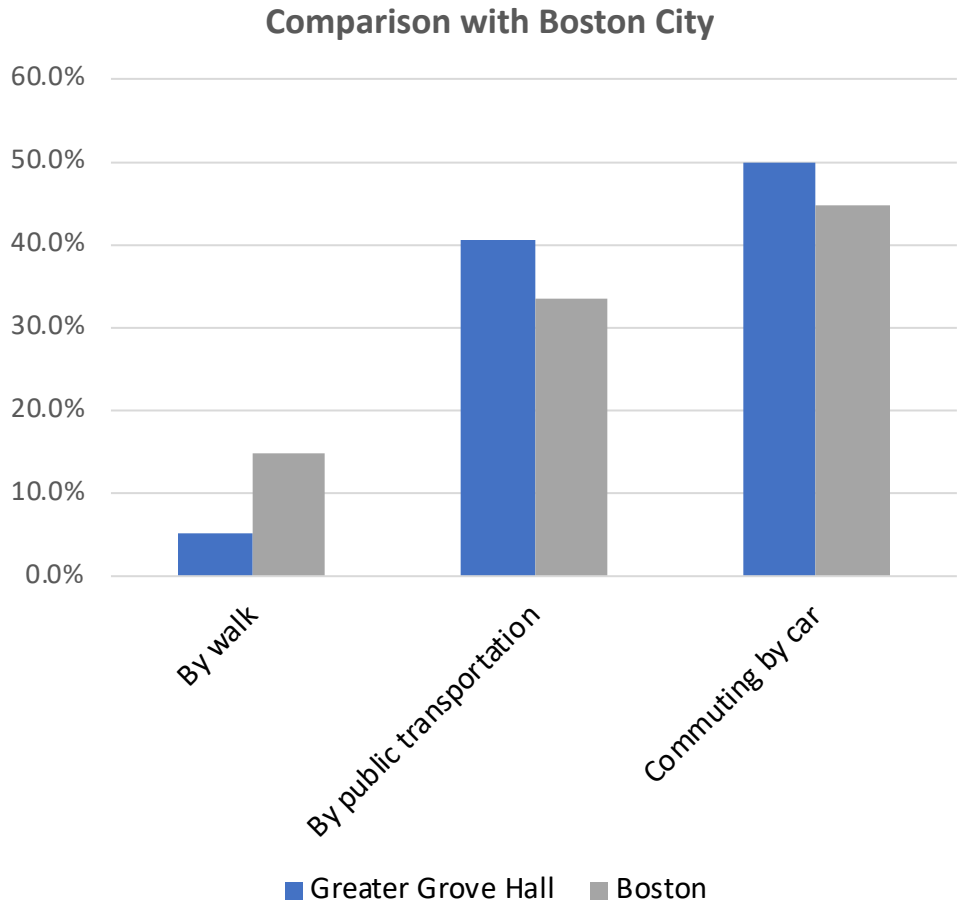
Zoo New England's team of volunteers mulching trees in Grove Hall Plaza

GREATER GROVE HALL MAIN STREETS

Transportation options

Grove Hall area has a vehicle oriented commuting pattern. Although 39.3% of the housing units do not have a car, they prefer commuting with a car including carpool.

- Commuting method:
  - By walk: **5.2%** (14.7% - Boston)
  - By public transportation: **40.4%** (33.4% - Boston)
  - By car (including carpool): **49.9%** (44.7% - Boston)
  - Mean travel time to work: **32.8 min.**



Raw data from ACS 5-year Estimates 2014-18 and BTD

GREATER GROVE HALL MAIN STREETS

Transportation options

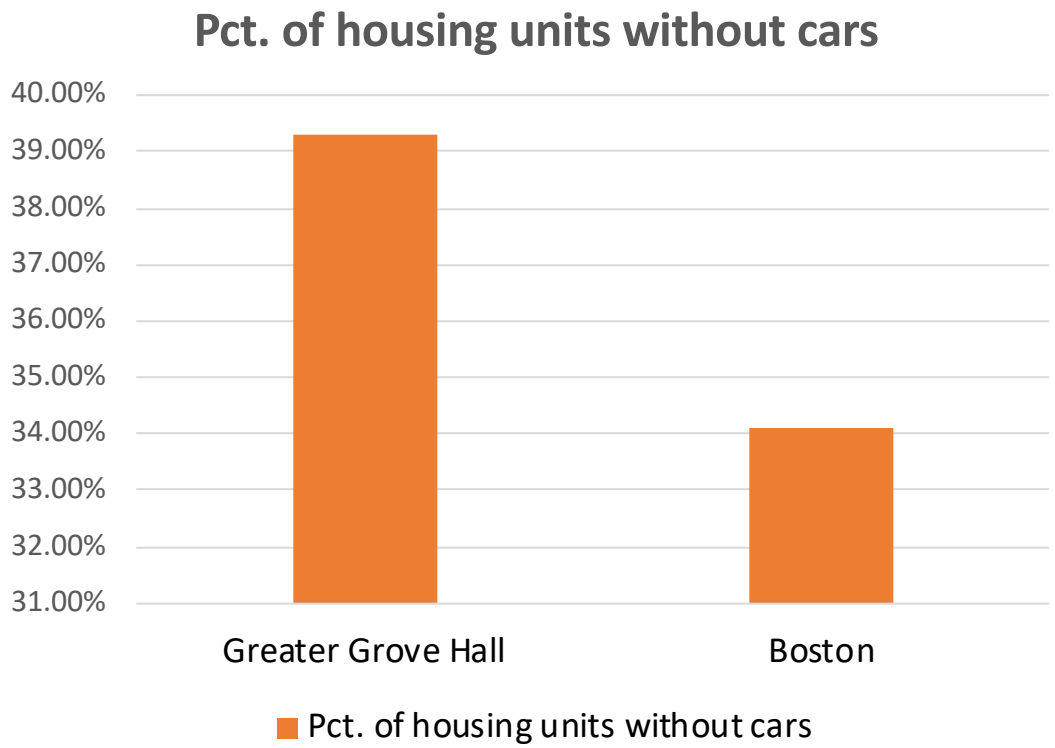
Major streets such as Blue Hill Ave. are very busy, causing air pollution and traffic accidents.

- 24-hour traffic count northbound **24,388** and southbound **25,601** at Blue Hill Ave. and Seaver St. intersection, Sept.27th, 2018.

- **10,000** Kilograms of CO_2 emission per day on Blue Hill Ave. (from Seaver St. to Julian St., about 1-mile distance)

Transportation options

- There are **39.3%** of the housing units in Grove Hall that have no vehicle available for the entire unit, compared to 34.1% in Boston.



GREATER GROVE HALL MAIN STREETS

Transportation recommendation

- **To reduce congestion and improve mobility**, interventions can include:
  - Create a better and safer environment for pedestrians (plant street trees with big canopy, re-design streetscape to create visual interest along the way, etc.)
  - Strategically place more Blue Bike stations in Green Zone and create bike lanes on major streets
  - Create rapid transit lines from major hubs in the Green Zone to other parts of Boston, connecting with rail stations
  - Partner with Uber/Lyft to alleviate first/last mile problem (discounted rides within certain geographic areas, subsidized rides to/from public transportation stations, etc. https://nytransit.org/resources/transit-tncs/205-transit-tncs)
  - Support bus rapid transit

Summary of potential interventions

- Potential interventions, including development and policy changes, are summarized and divided into the three categories mentioned earlier:

Strengthen and preserve existing community	Establish new green development	Invest in sustainable infrastructure
• Encourage existing households and businesses to adopt green practices	• Attract green businesses to Grove Hall • Set green standard for new development	• Design green infrastructures that mitigate negative environmental impacts

Strengthen and preserve existing community

Possible interventions

- Retrofit existing flat-roofed structures with **green roofs or solar roofs**
- Retrofit public housing, private-owned triple-deckers and other residential buildings to have **better energy performance**
- Delegate a subgroup in the **Mass Save** program to focus on assisting Grove Hall residents and businesses
- Set up incentives and programs to encourage local businesses to **recycle**
- Incorporate **green education** in schools
- Establish **youth program** for green awareness and activities such as tree planting, watering and caring, trash collecting and recycling, etc.

Establish new green development

Possible interventions

- Rental discount or tax benefit to **attract green businesses** such as:
  - Local recycling hauler
  - Repair and refurbishing
  - Secondhand store
  - Eco-friendly retail (organic food, handmade products, etc.)
  - Farmers market
  - Sustainable construction materials
  - Eco-consulting
  - Solar panel installation
  - Environmental impact and carbon emissions education

Establish new green development

Possible interventions

- Set **green standard for new development** (e.g. LEED certified, etc.)
- **Brownfield redevelopment**
- Encourage **start-ups and innovation** effort in sustainability by providing flexible spaces, housing support, grants, etc.

Invest in sustainable infrastructure

Possible interventions

- Fund and collaborate with engineers, landscape architects and planners to **design green infrastructures** that mitigate negative environmental impacts:
  - Install permeable pavement
  - Plant street trees
  - Create rain gardens and bioswales

Invest in sustainable infrastructure

Possible interventions

- Collaborate with BTD and experts in transportation design and development to **reduce congestion and improve mobility**
  - More pedestrian friendly streetscape
  - Better bike facility and safer environment
  - Rapid transit line
  - Solve first/last mile problem

Proposed Process

Establish Organizational Structure

The City designate a Green Zone Task Force

Green Zone Task Force:

- Leverage Boston Climate Action Plan, Carbon Free Boston , E+ Green program, etc.
- Decide Green Zone boundary.
- Appoint Green Zone Council

Green Zone Council:

- Decide on **Focused Areas** (for example, energy, health, etc.)
- Develop a **Work Plan**

Work Plan Development

Designate one Working Group in each **Focused Area**.
(Working Group consists of Green Zone Council members, neighborhood development organization, non-profit environmental groups, and other stakeholder groups)

Develop a fact base by data research and community survey

Identify current neighborhood infrastructural assets, problems and opportunities

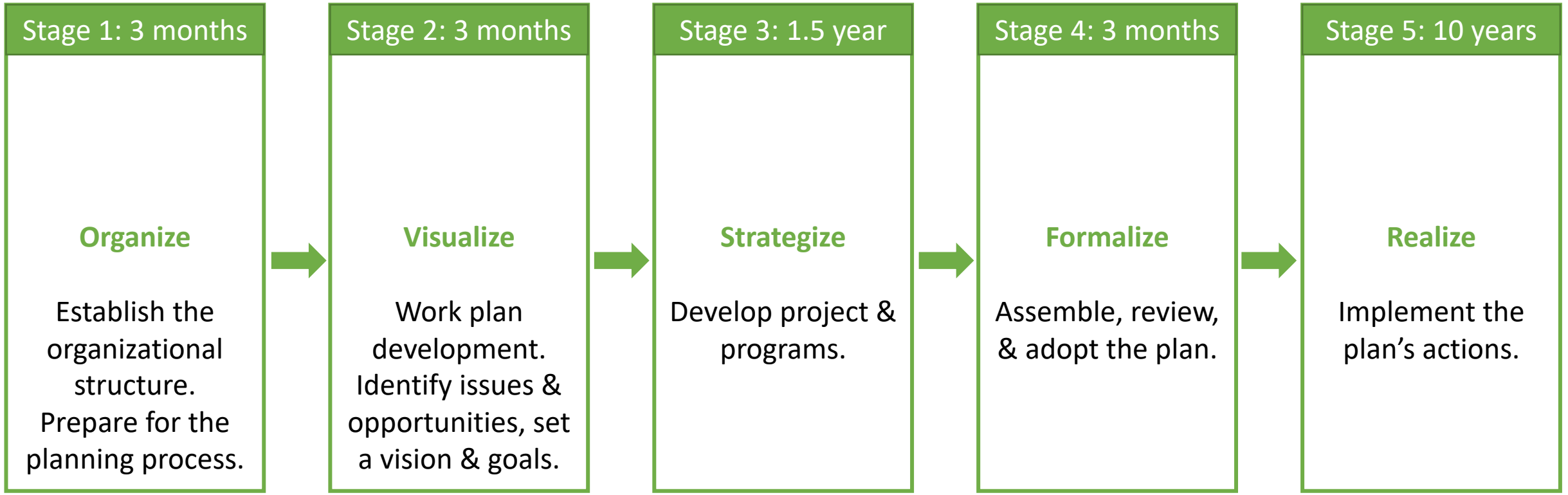
Create a list of potential projects, by consulting case studies

Identify priority projects

Referencing Minneapolis Green Zone development process

GREATER GROVE HALL MAIN STREETS

Proposed Timeline



Referencing Pittsburgh's Eco-innovation District timeline

GREATER GROVE HALL MAIN STREETS

Next steps

1. Present to city departments, stakeholder organizations and subject matter experts to gain support and create the Task Force
2. Apply for grants for internal operation
3. Establish Task Force internal structure and leaders
4. Task Force review and modify goals, aspects and areas to address in the Green Zone plan (may involve community feedback)
5. Appoint Green Zone Council
6. Establish projects , priority projects and timelines (may involve community feedback)
7. Funding for projects
8. Adoption of projects and designing the projects
9. Community outreach before implementation
10. Implementation

Appendix

What types of incentives were used to motivate residents, businesses, or others to get them to adopt green practices, invent new technologies?

For residents:

- Tax rebate when purchasing eco-friendly products.
- Provides funds to residents to weatherize/retrofit their homes. These funds are most accessible to residents in the form of direct grants to provide the upfront monetary funds that are necessary for housing upgrades.
- Offer incentives for individuals who are able to reduce their electric intake for a year by percentages. For example, if a household can reduce its electric intake by 10%, then it can factor into a tax decrease.

For businesses:

- Lower interest rate for green businesses.
- Provide loans to businesses tied to greening practices (These loans can come in the form of building upgrades, store frontal management, or the inclusion of clean technology into their firms).
- Provide grants to universities and research firms for developing a specific green technology for the city.
- Providing tax breaks, such as no property taxes on buildings that meet Gold, a mid-to-high range standard, LEED requirements.

Appendix

How successful have these Green zones been in terms of creation, implementation of best practices, and reduction of environmental pollution or improvement of resiliency?

- Existing Green Zones and projects are mostly pre-mature and hard to evaluate. Most projects have a long timeline to be completely realized, and the vision is to plan ahead for 100 years.
- Resiliency cannot be measured until there comes a disaster and the measurement would be how well that community recover from the disaster.
- The successful part of those Green Zones can only be called “early wins”.

Appendix

What types of political and economic challenges did the green zones discover when trying to create one?

- Lesson learned from TNT Eco-district: “Despite the experience and dedication of the CSNDC staff, efforts remain under-staffed and underfunded with gains made too slowly, particularly compared with private sector development efforts. Coordination with the City of Boston continues to change with incoming and outgoing political leadership. Grant funding is inconsistent and slow.”
- Most Green Zones face challenge of funding issues to finish the original plan.

Appendix

What policies, proposals or recommendations were suggested?

- Affordable housing or rental policies to mitigate gentrification displacement.
- Energy audits and retrofit existing structures to maximize energy efficiency.
- Green infrastructures including parks, rain gardens, bioswales, constructed wetlands, permeable pavement, etc.
- Increase connectivity/mobility by better transportation.
- Promote diversity and equity by workforce development programs, youth education, local business support
- Strengthen the community by preserving cultural/historic characters, promote community programs, invest in public art.
- Encourage start-ups and innovation effort in sustainability by providing flexible spaces, housing support, grants, etc.
- Smart city implementation.

Appendix

Lessons learned from “Smart City” initiatives. Are there applications to this project?

- “Smart City” is an urban area that uses different types of electronic Internet of things sensors to collect data. Insights gained from that data are used to manage assets, resources and services efficiently; in return, that data is used improve the operations across the city.
- “Smart City” is more of a methodology focused concept where data collection and analysis is the key. Green Zone is more qualitative, focusing on imperatives to achieve. We can certainly imbed some technology into buildings or infrastructures to increase their efficiency, but that will be of concern much later during the design phase of individual projects.

Appendix

What might it cost? What are the benefits?

- The cost depends on the number of projects and the nature of those projects (policy change vs. development projects). It is therefore hard to estimate the total cost of the Green Zone.
- Benefits for the City: Less unemployment, more tax revenue from previous vacancy, less Greenhouse Gas emission – “cap and trade” benefit, “Insurance” for potential migration to the highlands, set example that can be applied to other areas, etc.
- Benefits for the residents: better streetscape, more mobility, less pollution, less energy cost, employment, etc.
- Benefits for businesses: less energy cost, tax or other benefits if perform green practices, better reputation, more customers if the district is revitalized.

Appendix

Can it be implemented in pieces or does it have to be implemented all at once?

- It can be implemented in pieces. The whole process of creating a Green Zone is very long (at least 10 years from start to realization). One of the challenges is to have consistent staff and funding. Strategically it should be implemented piece by piece to break down the overwhelmingly large project.

Glossary

- **Green Zone** – Is a community transformed from a highly polluted, economically depressed neighborhood into a vibrant area with green business practices, a healthier environment and a stronger economic future.
- **Eco-District –** An eco-district is a defined urban area in which collaborative economic, community, and infrastructure redevelopment is explicitly designated to reduce negative and create positive environmental impacts. It links energy transportation, water, and land use in an integrated, efficient resource system.
- **Smart Cities –** A smart city is an urban area that uses different types of electronic Internet of things sensors to collect data. Insights gained from that data are used to manage assets, resources and services efficiently; in return, that data is used improve the operations across the city.
- A **Resilience Zone** is a special improvement district, precinct, neighborhood, or corridor designated in official planning documents for comprehensive risk management and upgrading so that it performs with **resilience** in the face of a variety of predictable and unpredictable extremes.

Glossary

- **Food Resiliency –** capacity over time of a food system and its units at multiple levels, to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances.
- **Sustainability Zones -** Certified Sustainability Zones (CSZs), a reference to municipalities or other political domains whose inhabitants (1) strive to live within their ecological means, (2) ensure the social and economic means to live, and (3) use **state-of-the-art accounting tools** to measure, manage and report their Triple Bottom Line performance.
- **Smart growth** is an urban planning and transportation theory that concentrates growth in compact walkable urban centers to avoid sprawl. It also advocates compact, transit-oriented, walkable, bicycle-friendly land use, including neighborhood schools, complete streets, and mixed-use development with a range of housing choices.
- **Environmental Justice (EJ) –** is based on the principle that all people have a right to be protected from environmental pollution and to live in and enjoy a clean and healthful environment. EJ is the equal protection and meaningful involvement of all people with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies and the equitable distribution of environmental benefits. (Mass.gov)