greying manhattan's disaster preparedness

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december 2024
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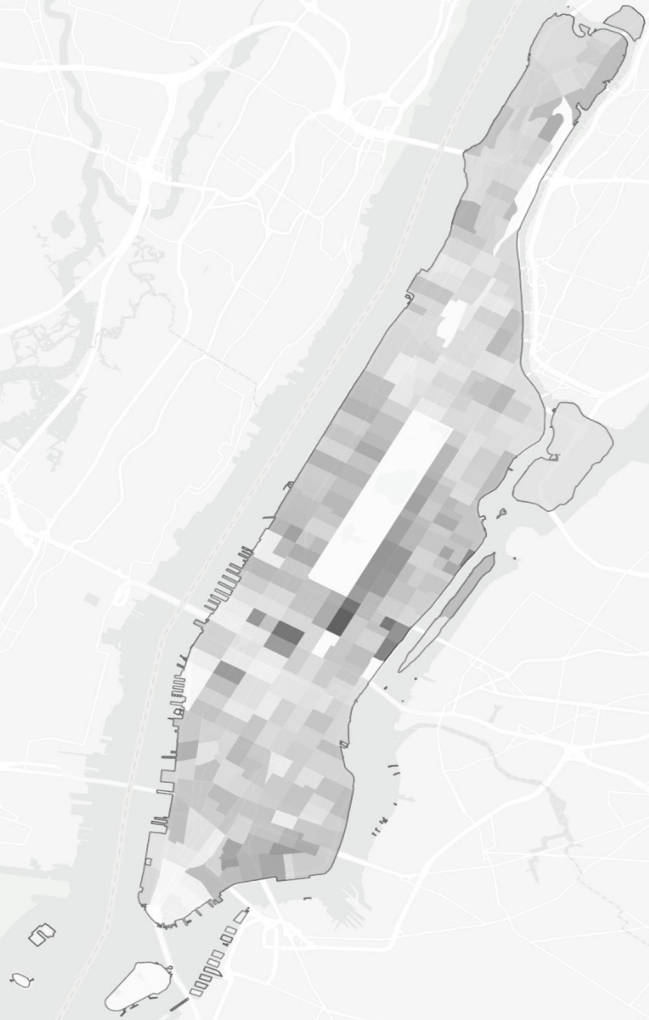


aging nyc

Our communities are getting older. People are living longer and having fewer children, meaning the United States is seeing a rapidly aging population. This demographic shift is is already impacting our economy (e.g., labor force and pensions), healthcare systems, and immigration policy.

New York City is no exception. As of 2021, 1/5 (1.77 million) New Yorkers were 60 and older, and Manhattan is the oldest of the five boroughs. Further, NYC older adults are more diverse across a host of factors compared to the US average.

While some of the baby boomer generation has been able to inherit or accumulate wealth over their lifetimes, many marginalized older adults are particularly vulnerable as they age. A lifetime of discrimination or marginalization has cumulative, significant social and financial implications (e.g., for racialized and LGBTQ older adults), meaning the impacts of marginalization is arguably most felt within this age category. Consequently, planners should see planning for older adults as a critical site in the battle for equity and social justice.

(who, 2015; nyc department for the aging, 2021; us census bureau, 2022)

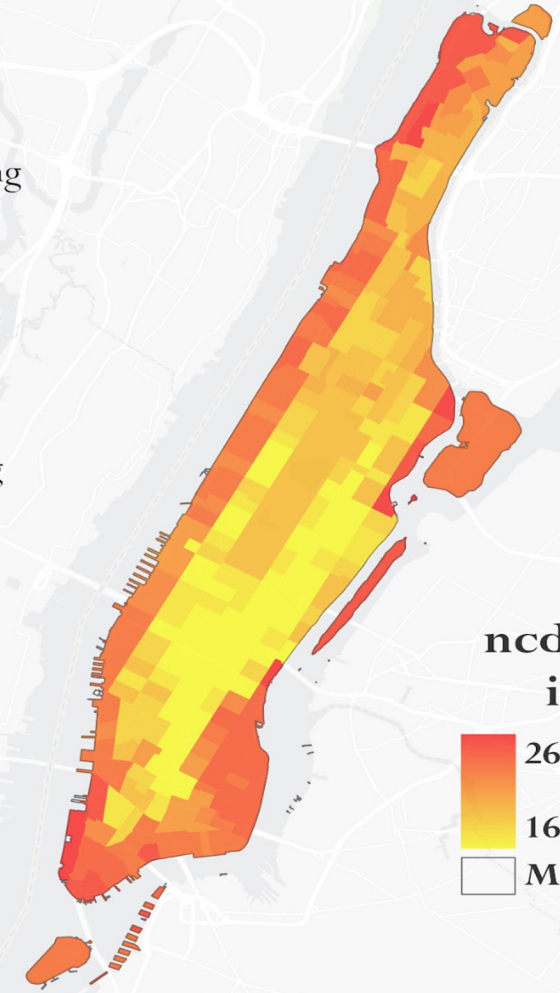
climate change

While our population ages, climate change is producing more hazards and extreme weather. The risk climate change presents is not spread across communities equally, and this relates to exposure and social vulnerability of communities, in addition to the increasing frequency and severity of extreme climate events. With this framework, climate change is described as a "threat multiplier", further exacerbating pre-existing social injustices.

These impacts will not occur evenly across NYC, and disproportionately impact marginalized communities, particularly older adults who tend to see the highest mortality rates by disasters (e.g., Katrina, Sandy).

The good news: many deaths due to extreme weather are largely considered preventable.

how manhattan varies by natural hazard index scores, which combines 14 types of hazards into a total score



ncdp's all hazard index score

26

more hazards

16

MN boundary

1 Mi

(jonkman et al., 2009; matthiews & menne, 2009; shindell et al., 2020; thomas & soliman, 2003)

background

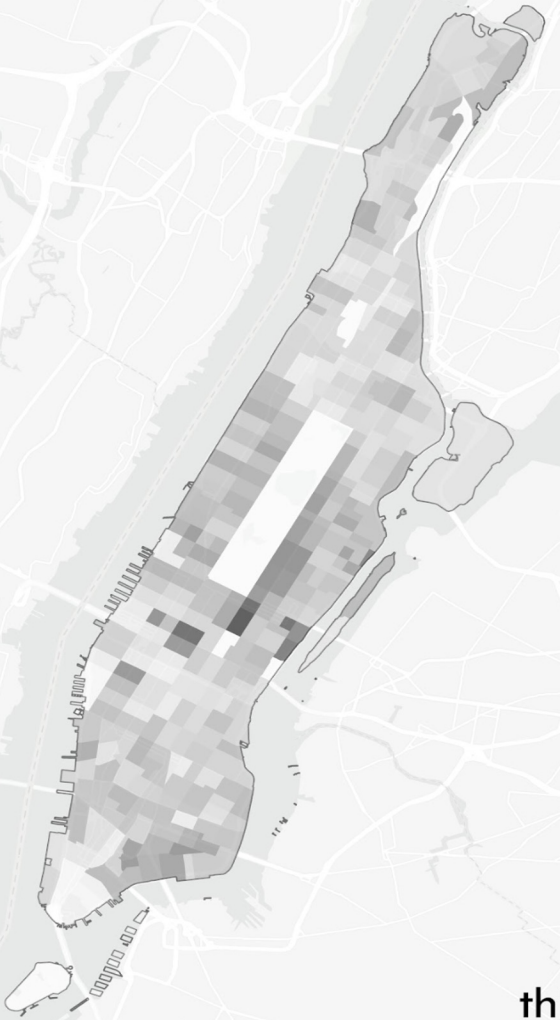
research questions

1) how do aging communities differ across manhattan?

2) how do hazards overlap with these different communities to produce risk?

3) where are current mitigation investments being targeted in manhattan, and do these match the identified risk?

4) how can characterizing aging communities and their respective built environments be used to tailor high-impact disaster preparedness and response efforts?



this project

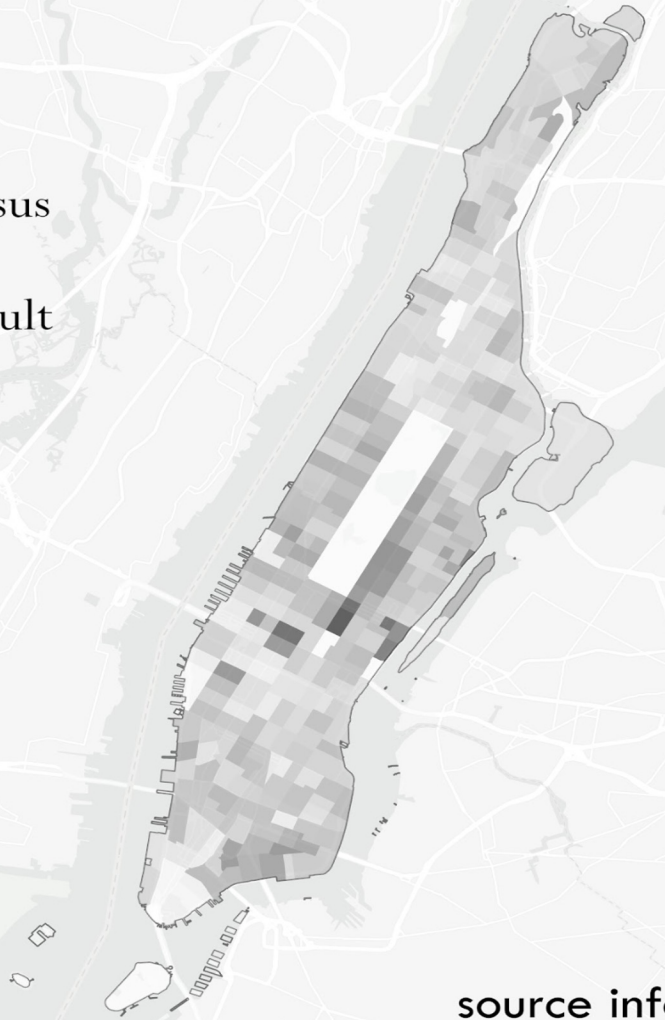
data

all demographic data came from the us census bureau's acs 2022 five year estimate tables. nine were used to characterize the older adult population.

hazard data came from the natural hazards index (version 2) produced by the national center for disaster preparedness.

hazard mitigation plans come from the nyc hazard mitigation plan database (from their points, lines, and polygons tables).

parcel data came from nyc's pluto dataset.

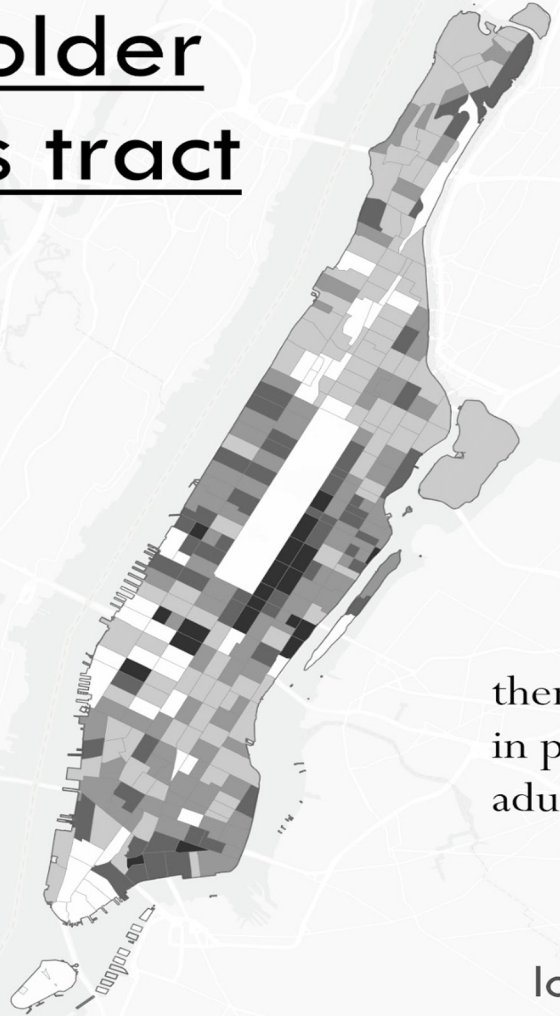


source information

percentage of older adults by census tract

What communities are home to more older residents?

With an average of 17.3% of census tracts being 65 and older, some communities see over half of their residents being 65 and older. This clustering of older adults has serious implications for planning.



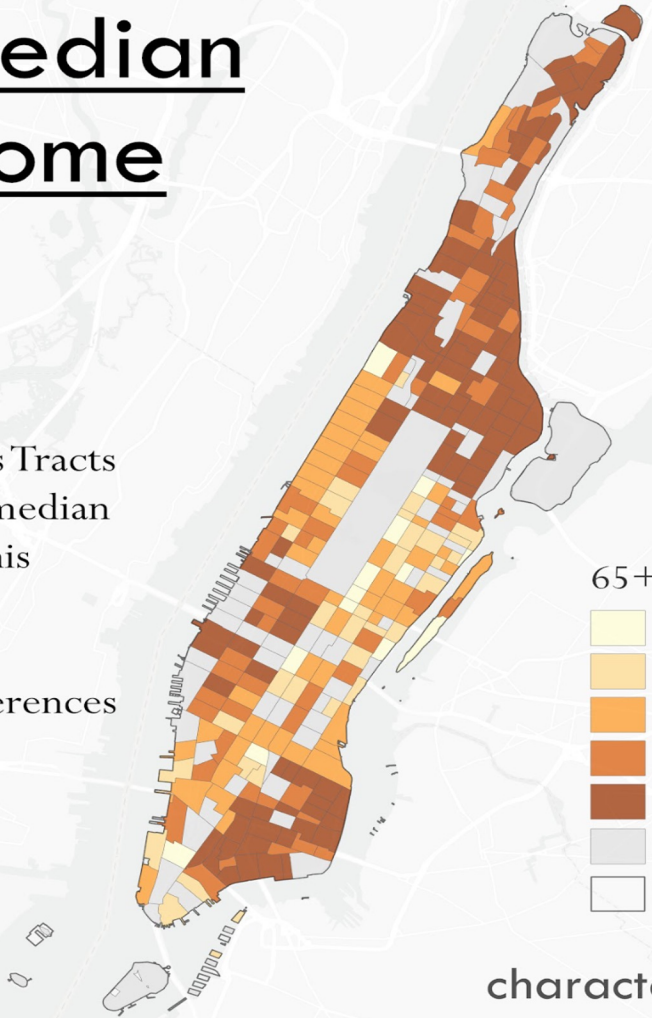
there is a significant range in proportions of older adults across census tracts

older adult median household income

The median older adult median household income is $56,364 in Manhattan.

Across all 310 Manhattan Census Tracts (CT), 123 Manhattan CTs have median household incomes lower than this value.

Clearly, there are significant differences by income in the 65 and older community, and many further discrepancies exist within such communities.

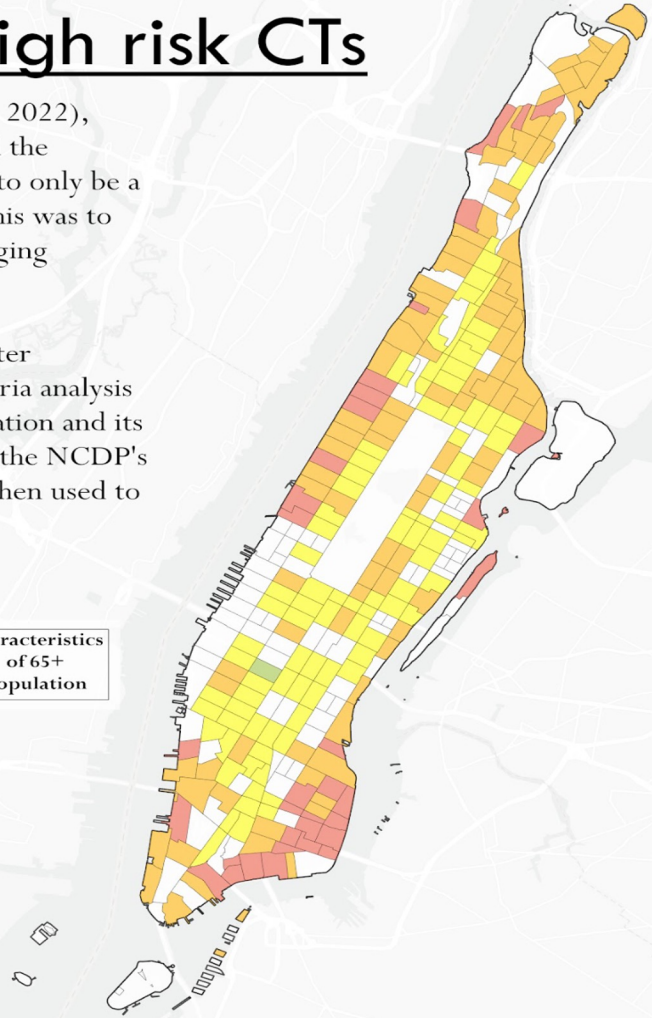


sometimes, high income areas correlate with age, but this is not always the case

mcda for locating high risk CTs

While growing attention is being paid to (see FEMA, 2022), vulnerability often groups many groups together, and the proportion of older adults within a community tend to only be a single factor in an overall vulnerability assessment. This was to understand how different vulnerabilities within the aging population produce risk.

As this project aims to prioritize older adults in disaster preparedness efforts, 60% of the multi-decision criteria analysis weight was given to layers related to the aging population and its demographic characteristics, and 40% were given to the NCDP's overall hazard index score. The MCDA results were then used to sort CTs by risk level, as seen in the map.



input layers (10)

% 65 and older

% 85 and older
% living alone - renter
% living alone - owner
% with disability
% no english
% no vehicle access
median income (-)

hazard index score

mcda classification

- very low risk
- low risk
- medium risk
- high risk
- CT boundary
- MN borough

mcda

manhattan mitigation plans

In light of these high risk zones, what types of mitigation efforts are currently underway across Manhattan?

The NYC Hazard Mitigation Database tracks mitigation in three tables, with tables for points, lines, and polygons. All of these are typed into the same categories regardless of the geography type, with the colour guide noted below.

mitigation plan types (plans counts)

plans - points

- coastal and natural resource protection (3)
- emergency services (30)
- infrastructure projects (8)
- prevention and policy (13)
- property protection (23)

plans - lines

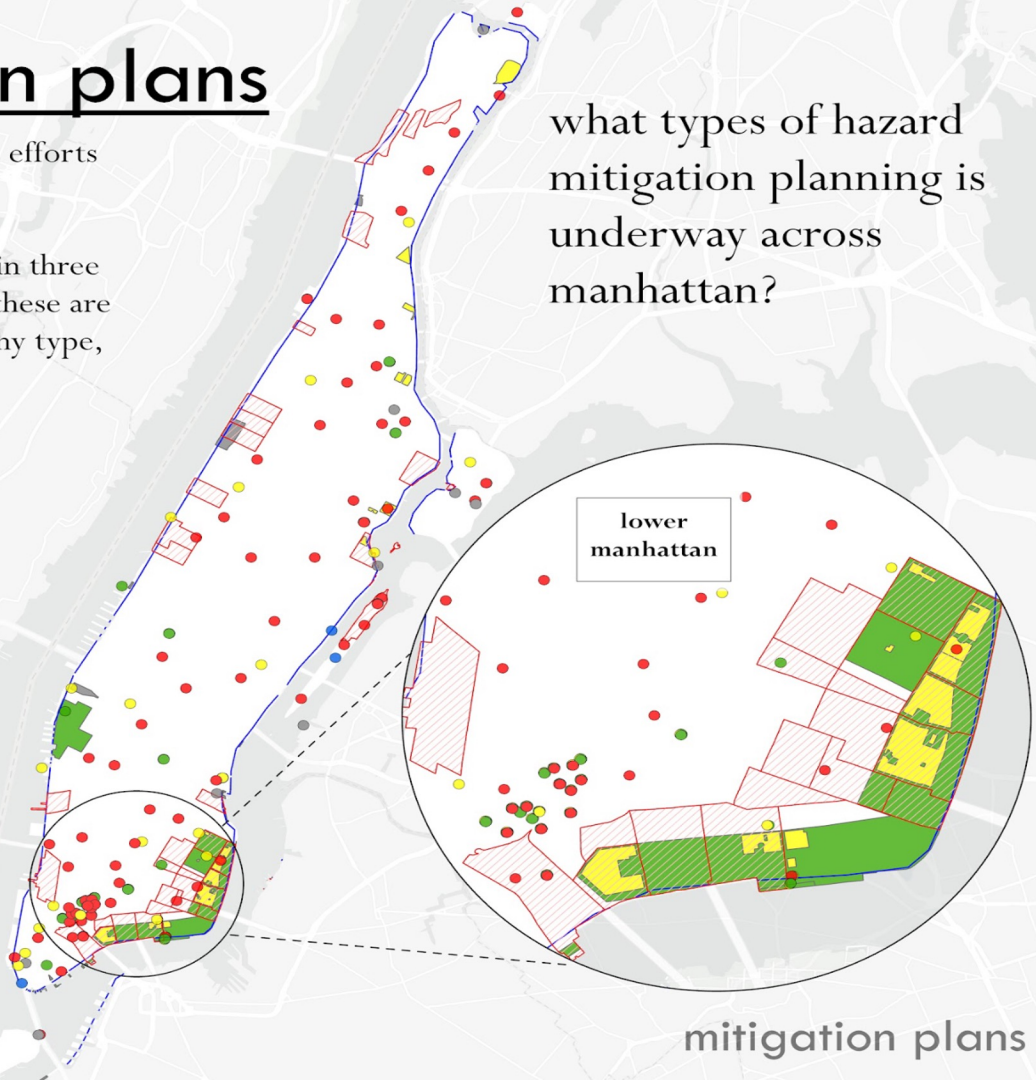
- coastal and natural resource protection (1)

plans - polygons

- infrastructure projects (7)
- prevention and policy (2)
- property protection (16)
- high risk CTs

1 Mi

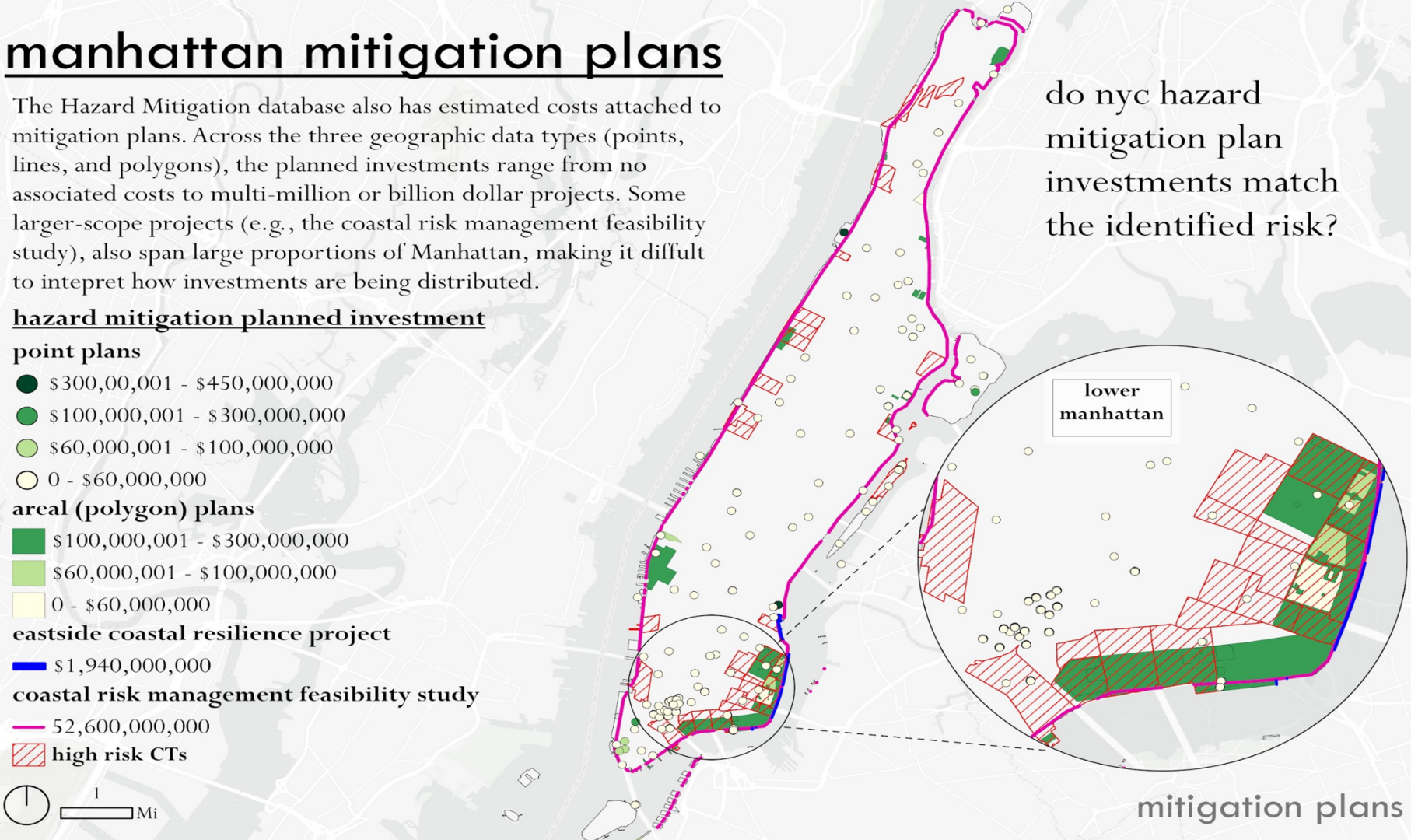
what types of hazard mitigation planning is underway across manhattan?



manhattan mitigation plans

The Hazard Mitigation database also has estimated costs attached to mitigation plans. Across the three geographic data types (points, lines, and polygons), the planned investments range from no associated costs to multi-million or billion dollar projects. Some larger-scope projects (e.g., the coastal risk management feasibility study), also span large proportions of Manhattan, making it diffult to intepret how investments are being distributed.

do nyc hazard mitigation plan investments match the identified risk?



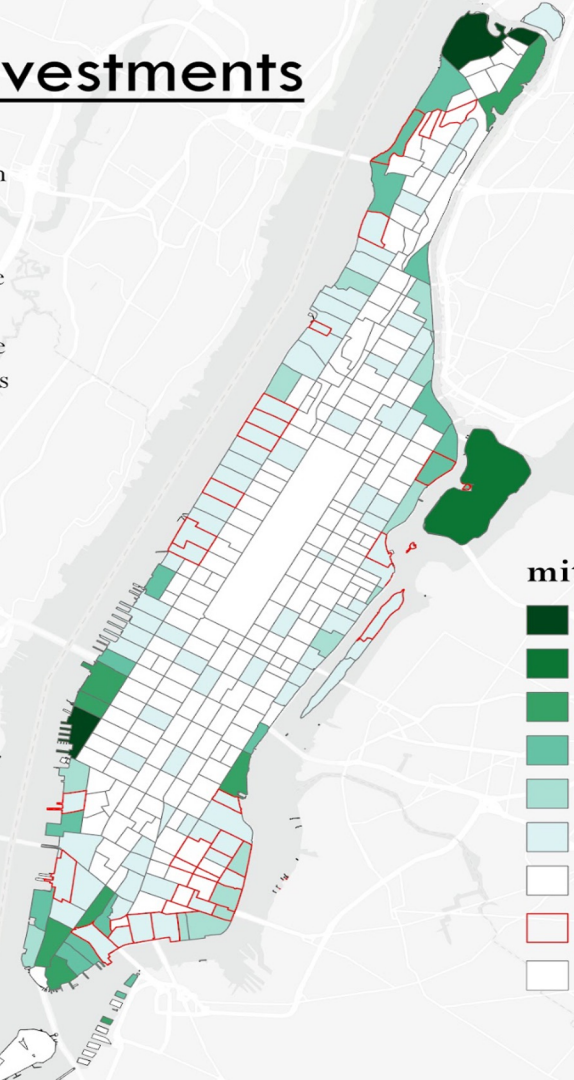
manhattan mitigation investments

In order to better assess how investments are being distributed across Manhattan, the associated investments with each mitigation plan were combined to each census tract. Mitigation plans that were filed as points were aggregated to the census tract in which they were contained, and then these valued were summed. Polygon and line mitigation plans that transgressed multiple census tracts boundaries required more extensive work to estimate how much of each investment was being allocated to each census tracts. This was managed through using the apportion split technique, in order to estimate these estimates. After this, these tables were exported and combined together aspatially in order to combine the different geometry types to produce a total estimate of investment per census tract.

The estimated investments ranged greatly, from no investments to nearly three billion dollars per census tract. Because this project is concerned with investments in older adults, the total investments were rated by the count of older adults per census tract and mapped this way. On average, $40,000 per 65 adult was being invested per census tract.

Some high risk census tracts had no hazard mitigation plans documented in the database, requiring further exploration.

how do investments vary across census tracts, and do they match to high-risk zones?



mitigation investments by 65+

- $200,000.01 - $10,763,527.21
- $60,000.01 - $200,000.00
- $22,000.01 - $60,000.00
- $12,000.01 - $22,000.00
- $6,000.01 - $12,000.00
- $0.01 - $6,000.00
- $0.00
- high risk CTs
- CT boundaries

1 Mi

mitigation investments

high risk CTs with no investment

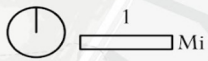
Do mitigation investments match risk for older adults?

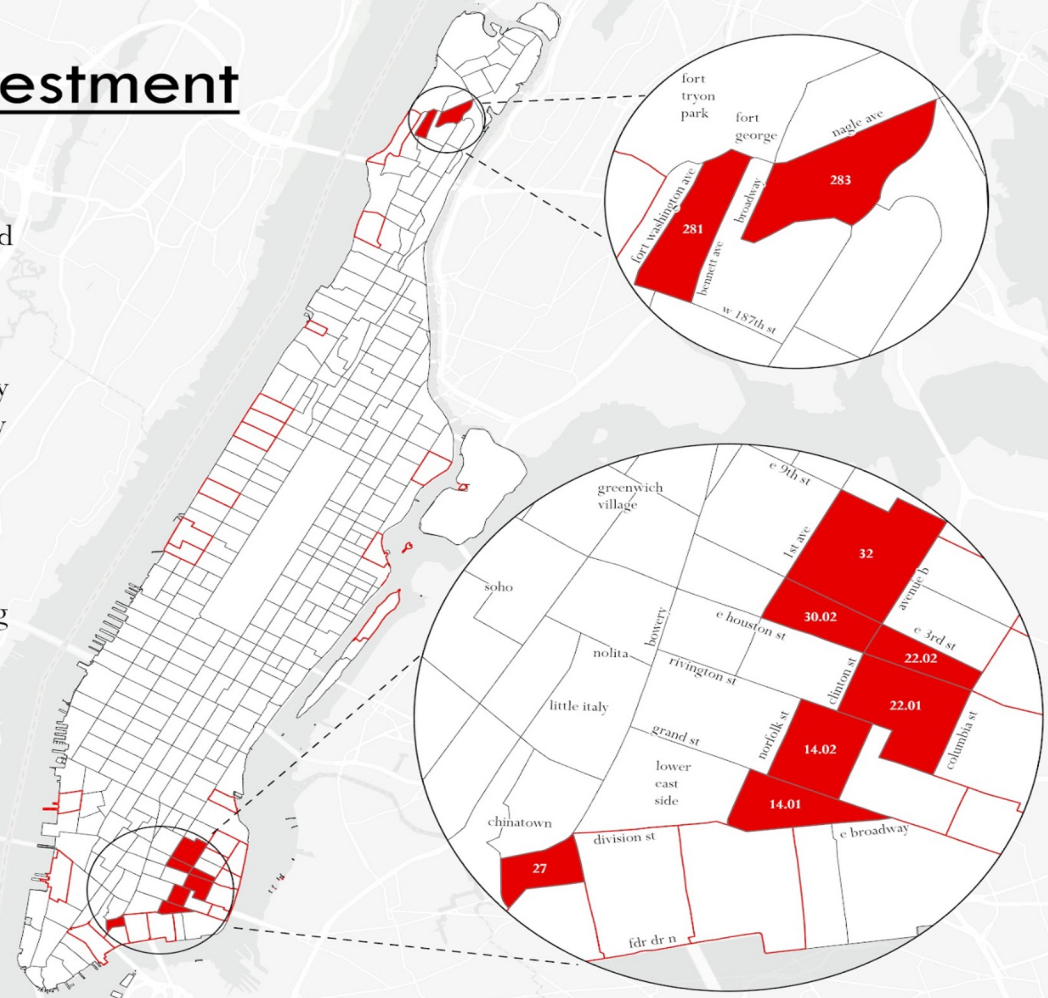
Currently, as indicated on the right, nine of the identified high risk census tracts have no investments documented in the NYC Hazard Mitigation database. The respective CT number is labelled for the nine CTs. This highlights that NYC's current mitigation strategy in Manhattan may not be prioritizing the older adult population sufficiently in their investments strategy, an oversight which may be costly for the city and its residents in the future.

Fortunately, however, this also presents an important opportunity for disaster preparedness planners. Focusing efforts across a small group of census tracts could yield large results, shrinking the size of problem of climate change in Manhattan. Further, characterizing communities reveals what types of planning is needed.

hazard mitigation planned investments

- high risk CTs with no investments by 65 year olds
- high risk CTs
- MN boundary





mitigation investment

sites for future investment?

Demographic analysis of the older community can help inform census tracts to invest in, and how to match plans with needs.

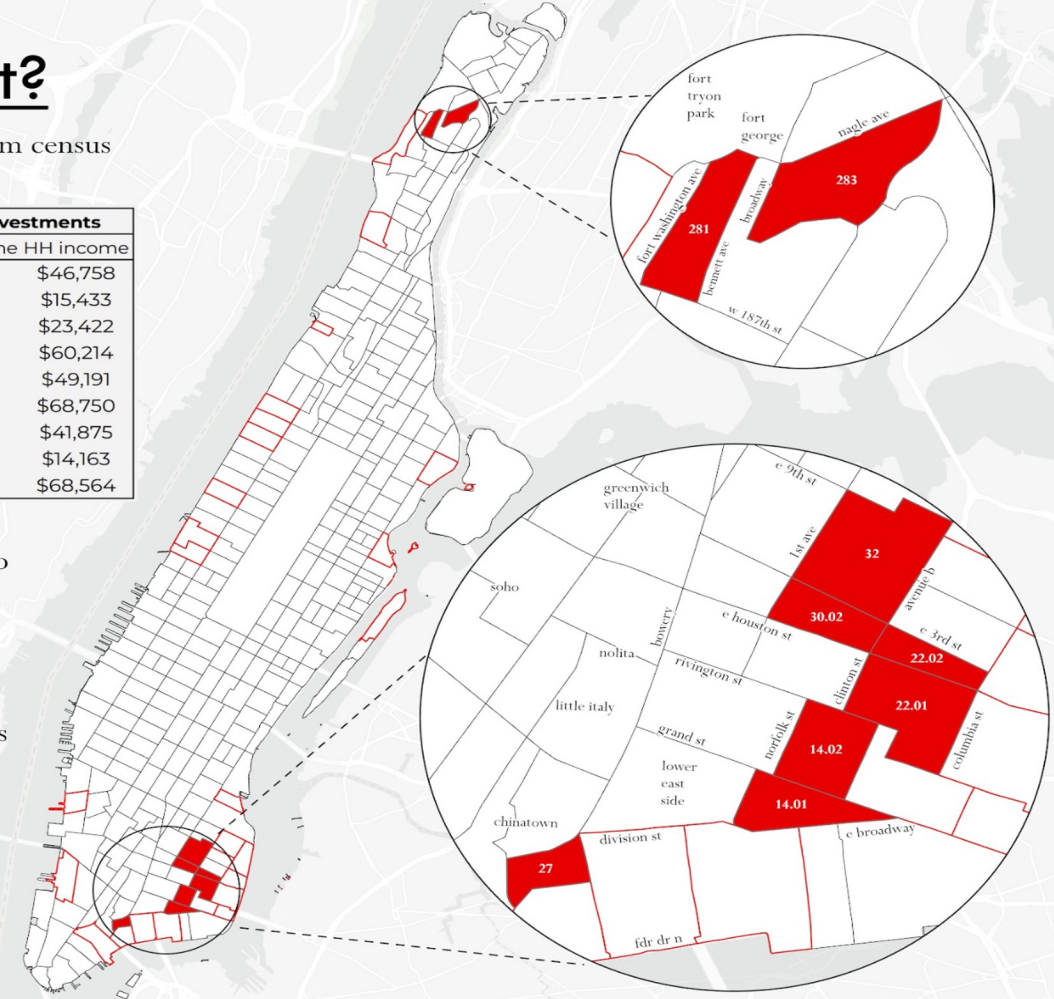
characterizing the nine high risk CTs with no current hazard mitigation investments								
CT name	%65+	%85+	%disability	%no vehicle	%no english	%alone	%group home	HH income
14.01	36%	8%	41%	76%	0%	46%	3%	$46,758
14.02	26%	5%	59%	95%	61%	63%	0%	$15,433
22.01	19%	2%	37%	77%	5%	67%	2%	$23,422
22.02	8%	3%	64%	88%	25%	46%	18%	$60,214
27	35%	5%	19%	63%	17%	33%	2%	$49,191
281	17%	2%	22%	61%	8%	56%	26%	$68,750
283	23%	2%	33%	67%	8%	48%	0%	$41,875
30.02	19%	3%	43%	90%	18%	63%	0%	$14,163
32	21%	4%	44%	77%	0%	59%	0%	$68,564

Within the nine no investment, high risk regions, plans should consider the characteristics of the aging community to produce high impact hazard plans. For example, CT 12.02 has 61% of older adults speaking no english, and roughly the same proportion living alone. Consequently, emergency alerts or response personnel should be prepared to serve no-english speaking older adults. Other factors, such as the types of homes older adults are living in within CTs, also matters. Exploring parcel data can help provide further detail on this.

hazard mitigation planned investments

- high risk CTs with no investments by 65 year olds
- high risk CTs
- MN boundary

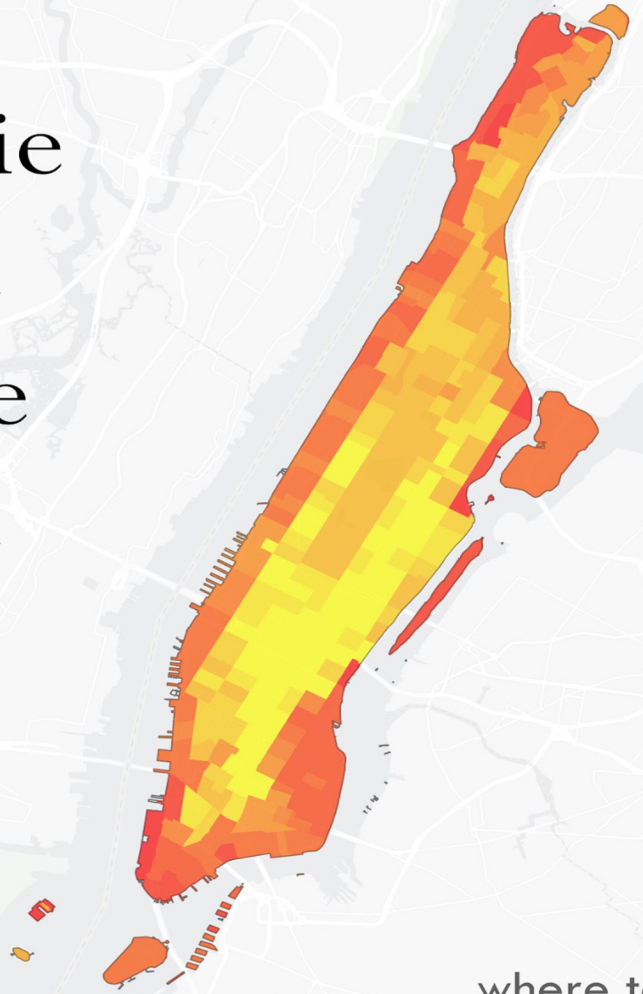
1 Mi



mitigation investment

"people don't die because it is hot outside; they die because it is hot inside."

- Dr. Henderson, Scientific Director at British Columbia Centre for Disease Control, 2022

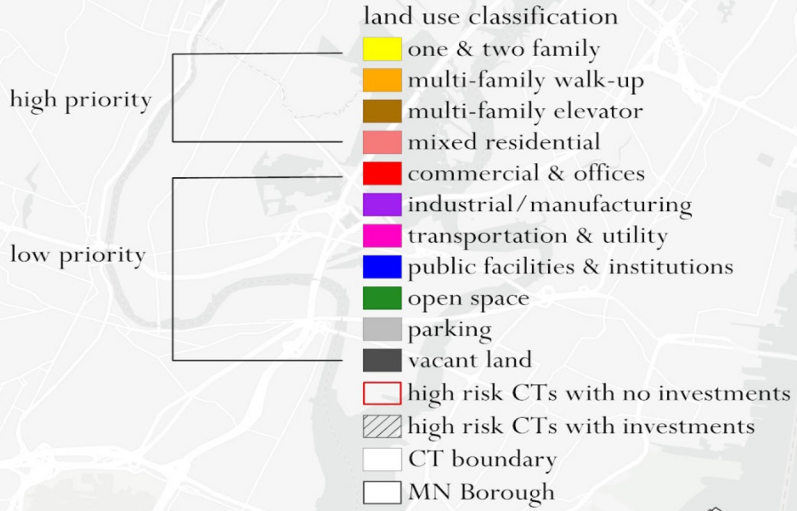


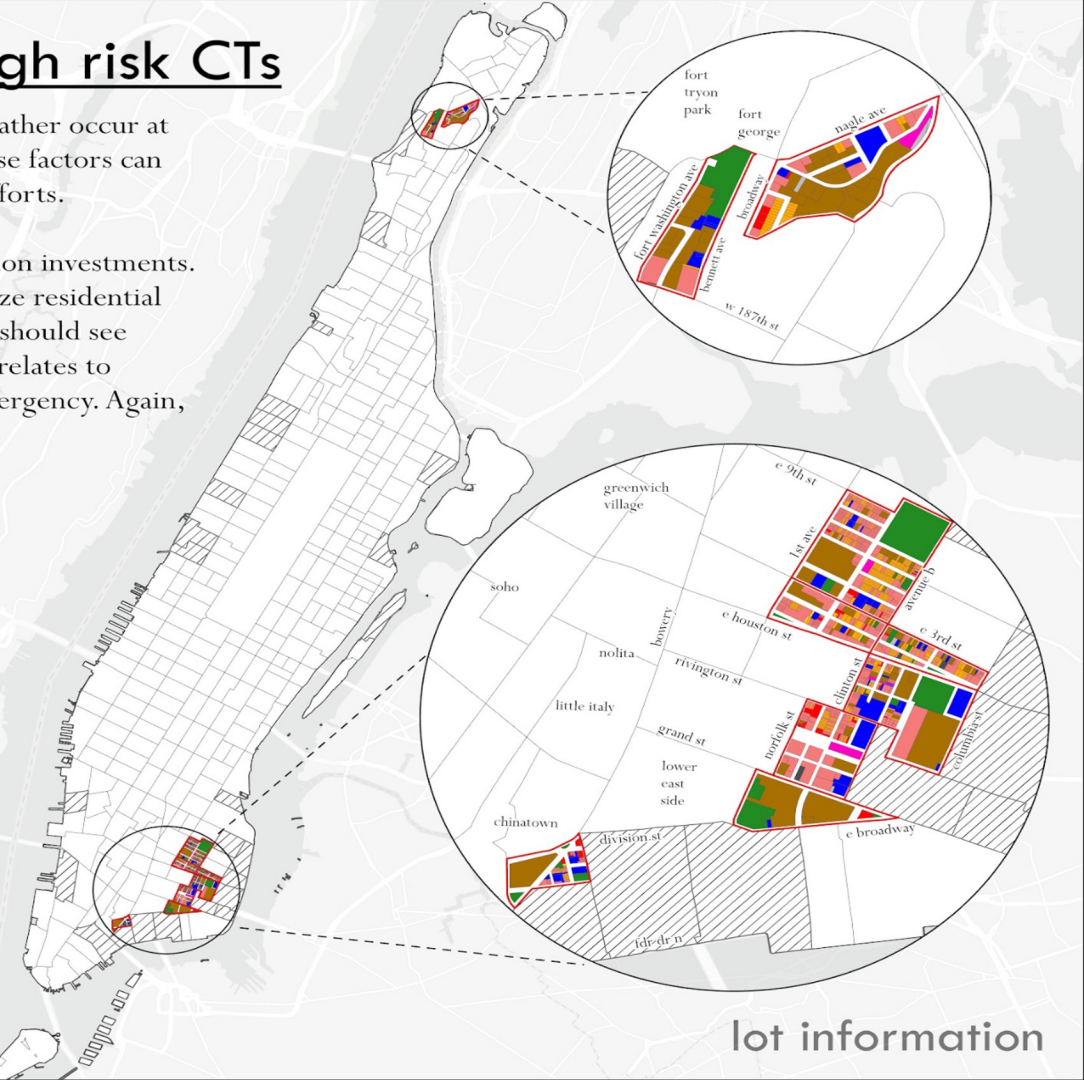
where to target efforts?

land use in no investment, high risk CTs

As Dr. Henderson points out, many deaths from extreme weather occur at home. Thus, considering the built environment, and how these factors can produce risk, is essential to effective disaster preparedness efforts.

Land use information is useful for strategizing future mitigation investments. Within these high risk zones, mitigation plans should prioritize residential parcels. Further, walk-up versus elevator-operated buildings should see differences in disaster response management, especially as it relates to disability and the ability to leave one's home in case of an emergency. Again, this shrinks the area planners on which planners can focus.





lot information

residential density in high risk, no investment zones

Another key consideration for mitigation planning should include residential density. While land use classification gives some estimate of this, the number of residential units per parcel is better. It is clear there are several parcels in the no investment census tracts that have a very high density. Planners can then use these to assess risk levels and what types of disaster planning is needed.

For example, the Masaryk Towers are one of the sites with the highest units per parcel. This is part of the Mitchell-Lama program provides affordable rental and cooperative housing. More data on the percentage of older adults living in this building could be collected to determine if this may be a site in need of mitigation planning.

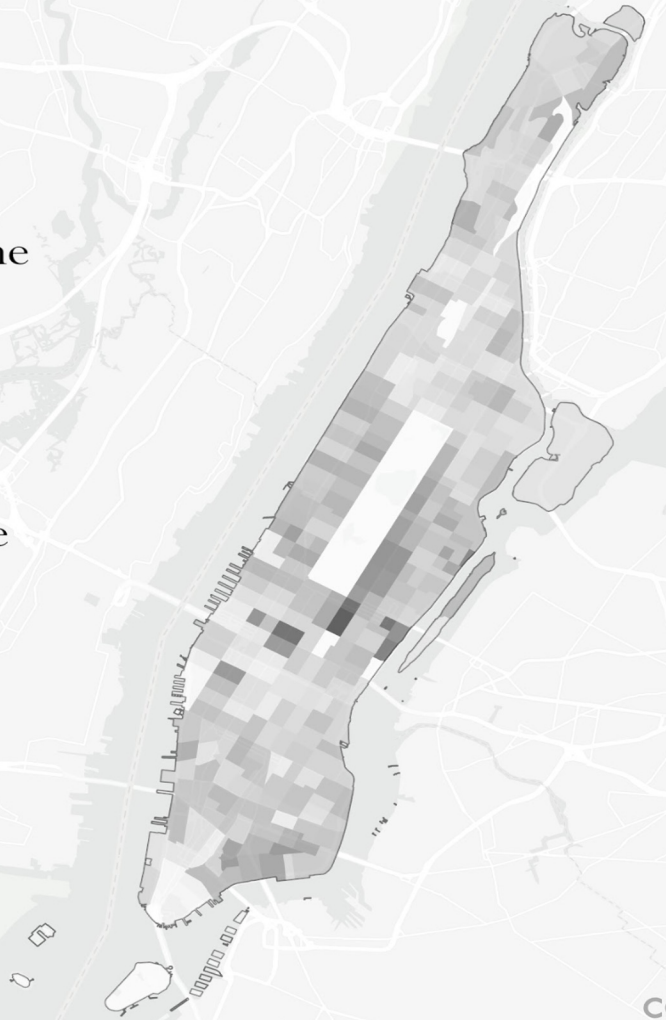
lot information

implications

1) current mitigation plans may overlook the specific needs of aging communities.

2) pairing census demographic factors and built environment data is important in targeted disaster preparedness and response strategies.

3) localized efforts in a handful of communities across Manhattan could produce high-impact results.



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