The City College of New York
Office of Research

CCNY College-wide Research Vision (CRV) Initiative Concept White Paper

Climate Change, Urban Inequality, and Housing Justice

Project Team:

Principal Investigator: Dr. Yana Kucheva
Department: Sociology, The Colin Powell School, The City College of New York
Other Key Personnel: Dr. Prathap Ramamurthy (ME/GSOE); Dr. Katherine Chen (Sociology/CPS)

Project Concept Description: (Maximum 2 pages)

Keywords: Climate Change, Housing, Social Justice, Environmental Justice, Urban Inequity.

Objective: We aim to develop solutions to current and future vulnerability to climate change related to affordable housing and social inequality in New York City. We will build predictive models of urban climate, neighborhood mobility, and disaster displacement that will shape urban coastal responses to the equitable distribution of disaster recovery funds and the preservation of affordable housing in vulnerable communities. The climate crisis facing coastal urban areas is intimately related to the housing crisis facing low-income communities of color. In fact, when urban areas get hit by natural disasters, affordable housing is not only lost but disaster recovery money flows to already advantaged neighborhoods. In the wake of natural disasters, low-income communities experience an increase in eviction filings. The displacement that follows also leads to higher rent burdens, overcrowding, and mobility into inadequate housing. Building for an equitable and resilient climate future means addressing long standing disparities in the housing market which push vulnerable populations to the most dangerous housing and which produce unequal recovery through urban policies focused on returning to a pre-disaster status quo rather than reimagining a resilient future through systematic investment in affordable housing and democratic processes of equitable development.

Approach: We propose to couple physics based urban climate models, microscale measures of building climate risk, demographic analysis of climate migration and displacement, and ethnographic research of current responses to climate displacement to develop a new framework for affordable housing resilience in the face of climate change.

Project 1: Urban Climate Models

We will use physics based urban climate models to simulate the impact of disasters related to climate change such as heat waves, extreme precipitation, and flooding due to sea level rise and storm surges. We will then produce maps of the distribution of climate risk in New York City under different climate change projections.

Project 2: Affordable housing and climate change risks

We will develop a database of New York City buildings vulnerable to climate-induced disasters and model the impact of climate change on affordable housing under the simulated scenarios from Project 1. We will merge administrative data on the location of buildings subsidized through either a federal or local affordable housing program and a dataset of all buildings in New York City, including homeowner housing and rent stabilized units. We will then overlay this dataset with FEMA flood zone designations that inform the National Flood Insurance Program and with our own climate projection maps to create a novel database of climate risk to affordable housing in New York City.

Project 3: Community vulnerability and climate displacement

We will develop demographic projections of New York City neighborhood change due to the simulated impacts of climate risk on housing. We will estimate the potential for direct displacement of vulnerable communities by race, income, and immigration status under

the counterfactual scenarios from Project 1. We will also simulate the impacts of indirect displacement on all neighborhoods in New York City due to the geographic mobility of higher income populations away from climate-impacted communities.

Project 4: Public policy and climate displacement

As we integrate our climate, housing, and demographic models, we will examine grassroots and governmental organizational practices as models for collaborative adaptive responses to climate displacement and ask under what conditions current climate policy practices can shift from sustaining the status quo to facilitating change through democratic practices. We will conduct in-depth interviews with stakeholders at the community and municipal levels and incorporate what we learn back into our climate and housing modeling framework.

Outcomes: The project will produce a socio-physical modeling platform that will serve as a way to identify vulnerable housing infrastructure and communities at-risk for climate displacement. We will publish our findings in reputable journals and share our climate and demographic projections with community stakeholders. Our proposed modeling platform will easily adapt to serve the needs of other vulnerable coastal urban areas.

Expected Products: A minimum of four publications will result from the project. We will also develop a publicly available visualization of climate risks to housing in NYC. The outcomes will be shared widely with stakeholders and the public. Dr. Ramamurthy is part of the New York Panel on Climate Change and works with the New York City Mayors Office of Resiliency and the Department of Health and Mental Hygiene. These avenues will be used to further the impact of our work on local housing policy in New York City.

Merits: Urban coastal areas have yet to grapple with the threat of climate change which necessities that we answer two questions: 1) how can we preserve and rebuild vulnerable housing in an equitable way; and 2) how do we manage the expected climate displacement of low-income, minoritized, and immigrant communities. The answers to these questions necessitate an interdisciplinary team which is committed to democratic and collaborative approaches to coastal risk and urban policy. Dr. Kucheva is an expert in housing policy and community demographic analysis, including simulation models of urban migration. Dr. Ramamurthy has vast experience running urban climate models. Dr. Chen research has examined how organizations manage uncertainty wrought by policy changes and unexpected exogenous shocks such as natural disasters.

Impact: Housing in general, and affordable housing in particular, is usually not seen as “infrastructure” by policy makers. However, for working class families, housing is the most valuable infrastructure because it provides the needed security and stability for families and children to thrive. According to current estimates, as much as a third of the housing stock in the U.S. is at risk from disasters related to climate change. By 2050, the number of affordable housing units vulnerable to regular flooding will triple. Coastal areas employ a patchwork of expensive structures such as sea walls to protect buildings, but as storms intensify, housing away from the coastlines previously assumed safe is already experiencing catastrophic consequences as evidenced by the number of New Yorkers who drowned in basement apartments during Hurricane Ida. As the costs to adapt current infrastructure to climate change are already prohibitively high, cities such as New York continue to focus their disaster response on short-term solutions, such as how to deliver better evacuation orders at the expense of socially equitable long-term planning that addresses the slow-moving crisis of unaffordable and unsafe housing. As climate change exacerbates existing systemic social inequalities, our work will create a framework that addresses the grand challenge of pairing short-term recovery efforts with long-term plans for affordable and decent decarbonized housing infrastructure.

Milestones:

Months 1-6: *Run urban climate models to simulate multiple extreme events – heatwaves, flooding, extreme precipitation. Use the results to identify vulnerable neighborhoods. Dr. Ramamurthy has already set up the climate modeling environment for New York City. (Dr. Ramamurthy and post-doctoral researcher in Mechanical Engineering)*
Put together the NYC affordable housing database and overlay with FEMA insurance maps (Dr. Kucheva and post-doctoral researcher in Sociology)
Identify stakeholders at the intersection of climate and affordable housing policy (e.g. municipal officials and grassroots groups) and conduct interviews with them (Drs. Chen and Kucheva)

Months 7-9: *Couple the demographic data on neighborhood migration with the climate model output to develop predictions of climate displacement. (Drs. Ramamurthy and Kucheva with post-doctoral researchers in Mechanical Engineering and Sociology)*
Incorporate feedback from stakeholders into climate models and affordable housing database (Drs. Kucheva and Chen with post-doctoral researcher in Sociology)
Develop a publicly available visualization of at-risk affordable housing (entire team)

Months 10-12: *Write and submit papers for publication in Sociology and Environmental Science journals (entire team)*
Organize a workshop to disseminate the results from the socio-physical modeling platform of climate change in New York City (entire team)
Prepare and submit proposal for outside funding (entire team)

Budget (Maximum Budget $200K):

Personnel Costs:

- Key Personnel (PI, Co-PI, senior personnel):
  - Prof. Kucheva (.5 summer salary) $4,700
  - Prof. Ramamurthy (.5 summer salary) $5,800
  - Prof. Chen (.5 summer salary) $5,800
  - Fringe rate (26.7%) $4,352
- Research staff:
  - Post-doctoral researcher, Mechanical Engineering (full-time) $60,000
    - Will serve as a coordinator for the project and will set-up climate models
  - Post-doctoral researcher, Sociology (full-time) $60,000
    - Will set-up affordable housing database and help with demographic projection models of neighborhood migration and climate displacement
  - Fringe rate (36.5%) $43,800
- Students:
  - MA $5,000
    - Will assist with the visualization of the affordable housing database coupled with urban climate scenarios
  - Fringe rate (8%) $400

OTPS Costs:

- In-depth interviews participant compensation $2,000
- Open access publishing costs $3,000
- Storage and computing costs $2,500
- Office supplies $500
- Workshop to disseminate results $2,000

Total $199,852