Participatory climate adaptation planning in New York City: Analyzing the role of community-based organizations

Kieren Rudge

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Abstract

Climate change is posing significant threats to cities around the world and many local governments are creating adaptation plans to prepare for these challenges. In recognition of the importance of climate justice, municipal planning has increasingly included participatory planning processes that engage communities. However, while climate adaptation planning has become more open to public input, these processes still do not ensure equitable outcomes. This study examined the inclusivity and equity of climate adaptation planning processes in New York City. Specifically, this study focused on the relationship between community-based organizations and participatory planning for sea level rise. 57 community-based organizations responded to a survey investigating awareness of, participation in, and barriers to engagement with various planning processes in New York City. These variables were compared to characteristics of each organization such as the primary issues they work on and the demographics of their local community board. The results of this study reveal both quantitative and qualitative data demonstrating the roles that community-based organizations have played in climate adaptation planning in New York City. Notable barriers to engagement were elicited such as, the absence of clarity of the process, low understanding of how a climate adaptation plan may benefit an organization and the community it represents, and an organizations' lack of capacity to participate in planning. This study should be seen primarily as an exploratory inquiry rather than one that establishes generalizable findings. However, this study has demonstrated that climate change adaptation planning processes should be revised in multiple ways to increase participatory justice. These changes are urgently needed because without bottom-up inclusion and processes that are rooted in equity, there will be significant gaps in any cities' climate resilience.

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1. Introduction

1.1 Climate Change Impacts

The impacts of climate change continue to grow in magnitude as global temperatures increase and efforts to reduce emissions fail to keep up with warming trends [1]. While mitigation is a necessary step for cities, nations, and the world, adaptation to the present and inevitable future effects of climate change is equally important. Cities face a specific set of compounding stressors that are either caused by or exacerbated by climate change. These phenomena, such as the urban heat island effect, increasingly extreme storms damaging infrastructure, and sea level rise reclaiming densely populated areas, all pose significant threats to people and the environments they depend on [1].

As climate change worsens, the global urban population is expected to dramatically increase over the next decade, reaching 5 billion urban dwellers by 2030 [2]. This growth will lead to 60% of the world's population residing in cities, as compared to the current urban population, which is 55% of the global total [2,3]. The urban population is expected to keep increasing beyond 2030 as people across the globe continue to move to growing cities [3]. This projected growth is important to research and praxis related to climate adaptation because it demonstrates that municipalities will have a significant responsibility to protect large proportions of the global population from threats associated with climate change. Additionally, while the impacts that the global pandemic will have on long-term urbanization dynamics are still unknown, it is clear that stressors like this public health emergency and similar future disasters are a major threat to increasingly densely populated cities [4,5]. Therefore, the COVID-19 pandemic and other prevalent co-stressors further demonstrate the importance of adaptating to the impacts of climate change and the problems they intersect with.

New York City (NYC) has its own unique set of stressors related to climate change that must be addressed through robust adaptation planning and action. This study focuses specifically on sea level rise, one of many issues that have been raised by researchers and community-based assessments. This is clearly a pertinent issue as evidenced by a recently completed planning process targeting sea level rise (the Zoning for Coastal Flood Resiliency Plan) [6]. Further, along with countless other municipalities, sea level rise is already having an impact on NYC. These impacts manifest in multiple ways including extended floodplains that intersect with heavily polluted brownfields, inundated coastal wetlands and low-lying natural areas, greater intensity of storm surges, and others [7,8]. Additionally, sea level rise poses challenges that require the integration of physical infrastructural adaptations and social interventions to support climate resilience.

The environmental justice implications of sea level rise are also important to consider as many at-risk communities already have a high degree of social vulnerability. This vulnerability is due in large part to historical and present-day discriminatory systems of planning and policy that have harmed low-income communities and communities of color. These practices include redlining, inequitable siting of public housing, and many other discriminatory actions [7,9]. Additionally, systemic issues like the lack of access to political power and poor funding for local infrastructure projects can leave communities in a state of precarity where their general welfare is always at risk [10]. These underlying problems are important to consider when assessing risk and creating adaptation strategies as climate change impacts like sea level rise can cause significant harm to already marginalized groups [7]. With these challenges in mind, the development of climate-resilient communities and cities must go beyond addressing environmental concerns. Instead, resiliency planning needs to incorporate additional measures that address the pervasive problems of inequitable distribution of harms of benefits, exclusion of marginalized groups from decision-making, and other systemic injustices.

1.2 Participatory Planning

With the acknowledgment that climate change and sea level rise will deeply impact urban populations, it is necessary to develop solutions that address the needs of those communities. Importantly, an equitable prioritization of community needs should be achieved by addressing both distributive and procedural justice.[1] Traditional urban planning, from which local climate adaptation planning has developed, has repeatedly resulted in the antithesis of both these forms of justice [10,11]. Historically, marginalized communities have had virtually no say in the traditional top-down process, which has resulted in residents' goals being trumped by the decisions of technical experts, and politically powerfully individuals [10,11]. A system such as this one can be problematic as it enables technical experts, large businesses, and government officials to make decisions based primarily on their priorities and puts communities in a situation where the environment they live in is shaped by political interests that are often directly opposed to their own needs.

In response to the procedural problems and inequitable outcomes that top-down planning produces, participatory planning has been developed and implemented as a potential solution. An ideal model of participatory planning significantly improves outcomes for citizens by elucidating actions that would

[1] For this study, distributive justice is defined as a state where resources, benefits, and harms are distributed fairly across different communities and within communities; procedural justice is defined as a state where decision-making processes are democratic and fair to all participants.

mutually benefit a diverse array of people, and by promoting an equitable distribution of resources [11]. While this form of planning has existed for decades in both scholarship and practice, there have been significant flaws with implementing participatory planning. For example, multiple studies have shown that participatory planning often seeks community input without giving residents any formal decision-making power [12,13,14]. This problem demonstrates one way in which participatory planning can be largely performative instead of giving citizens true agency over their environment.

Researchers have also investigated the unique challenges related to climate adaptation planning, equity, and participation. Studies have shown that while many cities have acknowledged the importance of equity as a component of climate adaptation, the practical implementation of adaptation plans continually fails to uphold equity as defined by those plans [15,16]. Additionally, studies have demonstrated that in multiple U.S. cities, including NYC, climate adaptation plans that have listed equity as a goal of the project assign lesser value to it as compared to priorities of economic development and environmental protection [16,17]. Researchers have suggested that one reason that equity is still not as heavily prioritized as other climate adaptation goals is due to low levels of community participation in both policymaking and the assessment of potential harms [18,19]. Additionally, even when participation rates are improved, community input does not necessarily translate into democratized decision-making. For example, many cities have implemented participatory planning processes that have been able to engage community members through working groups and steering committees, but even with this level of engagement, professional planners and powerful economic interests still largely dictate decision-making [12].

To generate stronger community decision-making processes, scholars and community-based organizations have argued for the inclusion of explicit mechanisms that empower the communities that participate in climate adaptation planning. These mechanisms involve changing the planning paradigm from one with limited public participation through comments and public consultation, to one grounded in the co-production of knowledge and methods that make community members partners in decision-making [13,20,21,22,23]. Previous research has demonstrated that the procedures associated with climate adaptation planning and participatory planning more broadly must be improved to achieve equity to an extent that is consistent with the theoretical ideal of participatory planning. Importantly, the procedural inequities present under current planning processes continue to produce distributive inequities by leaving out diverse voices and their concerns.

1.3 The Role of Community-based Organizations

Community-based organizations (CBO's) can serve many important roles in climate adaptation planning. These range from sharing information to increase residents' awareness of current issues to advocating for community-generated priorities when interacting with local government. Research has shown that partnerships between CBO's and local government can achieve stronger levels of engagement with a diverse array of stakeholders and help to integrate community input into government policy [24]. Previous case studies demonstrated that CBO's have played an important role by promoting the spread of knowledge and building grassroots coalitions [24,25]. For example, in 2011 the Nepalese government developed their Local Adaptation Plans of Action in coordination with CBO's that served as an interface between local bottom-up knowledge and government adoption of plans [24]. In this case, existing natural resource management plans run by local communities were used as blueprints for the new national strategy, which showed that the government recognized the value of established community practices [24]. Similar work is being done in NYC where CBO's have been involved with the city government in the identification of vulnerabilities and the proposal of solutions [20]. However, research has not yet investigated CBO participation and remaining barriers to engagement with ongoing climate adaptation planning in NYC.

By advocating for communities during planning processes with local governments a CBO often fills the role of a "bridge organization". These bridge organizations can connect groups of stakeholders to external resources and pathways to action, such as through involvement in adaptation planning [26]. The work that these organizations do is crucial to fostering inclusive and equitable planning because they can connect people, especially marginalized groups who have been historically ignored by local governments, to political power [26]. Importantly, these organizations have been involved in climate adaptation and resilience planning for social-ecological systems in many municipalities, including NYC [26,27].

While CBO's can play an important role as bridge organizations that link communities to local government agencies, these organizations are often only involved in the early stages of planning, if they are involved at all [19]. Additionally, in a similar way to how residents are treated, CBO's have little to no decision-making power in participatory planning [19]. This gap in participation reveals the need for further research into how CBO's can be more engaged with decision-making and granted more agency in the planning process to advocate for diverse stakeholders. CBO's are an integral part of climate adaptation planning, and improving their engagement with governmental organizations is a crucial

component to strengthening the inclusivity of participatory processes [25]. Importantly, further research on what barriers are limiting engagement and what solutions can address those problems would greatly support the development of more equitable planning processes.

1.4 Climate Adaptation Plans in NYC

In NYC multiple comprehensive plans have been produced to tackle both climate change mitigation and adaptation. These plans have continually evolved following the creation of the 2007 PlaNYC Strategy for a Greener, Greater New York that sought to address the cities' growth while accounting for sustainability and many other issues [28]. This plan was succeeded by revisions in 2011 and 2013, which started to integrate greater consideration of climate change and resilience with major changes being made following the impacts of Super Storm Sandy [29, 30].

The current comprehensive resilience plan for the city is OneNYC, which was released in April 2015 following months of community engagement [31]. Public outreach for this plan consisted of multiple modes of communication including online surveys, telephone surveys, public community meetings, meetings between CBO's and elected officials, working groups, and community advisory boards [31]. This plan serves as a comprehensive document presenting goals and broad strategies to tackle the multitude of urban development and resilience issues facing NYC. The main principles of this document are growth, equity, sustainability, and resiliency [31]. These principles and the strategies that are discussed in the document are intended to guide all other plans that relate to development in NYC.

An additional plan that is relevant to this study is the Zoning for Coastal Flood Resiliency Plan (ZCFR), which focuses on coastal flooding, sea level rise, and extreme weather [6]. ZCFR was completed in May 2021 following extensive public engagement that started in 2016 [6]. These processes mainly focused on meetings between the city council and CBO's, presentations and meetings with community boards, and public workshops to co-produce zoning solutions [6]. This plan has created enforceable ordinances and zoning amendments for certain infrastructural projects that are grounded in the overarching goals and strategies of OneNYC. These policies include resiliency measures like expanding existing floodplain regulations to 2050 floodplains, allowing buildings with nonconforming uses to increase their height, and enabling property owners to change the vertical location of commercial uses in mixed-use zones to avoid severe water damage [6].

Together ZCFR and OneNYC provide a focused, actionable plan and a comprehensive plan that guides long-term strategies for resilience. Understanding what public engagement has looked like for each of

these two plans can help to provide insights into how these processes can be improved for two contrasting types of plans.

1.5 Study Overview

In New York City, significant research has been conducted into sea level rise impacts, inequitable vulnerabilities and planning, and mechanisms that improve equity in climate adaptation planning processes [7,8,20]. However, researchers have yet to conduct qualitative studies regarding the inclusion or exclusion of community-based organizations in climate adaptation planning processes. This is a necessary area to investigate as CBO's play a vital role as bridge organizations and equitable planning processes should recognize the value of these groups and empower them as decision-makers. This study aims to fill this gap in current research by focusing on the perspectives of CBO's that are located in areas at risk from flooding and sea level rise. By investigating these research gaps through a combination of quantitative and qualitative methods, the results of this research will be incredibly valuable to decision-makers, CBO's, and at-risk communities in NYC. The results of this study will also provide possible avenues of change for stakeholders in other cities across the world, as the barriers to engagement in planning and possible solutions proposed by CBO's are broadly applicable and should be investigated in other contexts.

Additionally, this study is novel in its application of survey methods to examine how CBO's engage in participatory climate adaptation planning in any research setting. This is the first academic study to investigate the opinions of CBO's regarding barriers to engagement with climate adaptation planning and is unique in its inclusion of a multitude of types of CBO's beyond environmental groups to include groups such as economic development organizations. This study demonstrates the value of this survey methodology to create a dialogue with CBO's and provides a foundation for future studies that may investigate similar phenomena at a variety of geographic scales.

The study will focus on understanding the answers to the following three research questions in the context of the climate adaptation planning processes that have occurred in NYC:

1. How did awareness of climate adaptation planning processes vary between different CBO's?
2. How did participation in climate adaptation planning processes vary between different CBO's?
3. What did different CBO's view as barriers to engaging with planning processes, and what solutions were proposed to overcome these barriers?

These questions were each analyzed in the context of the following five variables:

1. The main issue a CBO works on
2. The size of a CBO
3. The income of the community board where a CBO is located
4. The racial demographics of the community board where a CBO is located
5. The borough where a CBO was located.

The three research questions in the context of these variables enabled this study to examine key issues regarding the current state of climate adaptation planning in NYC. Based on this analysis, informed solutions were proposed to improve the inclusivity and equity of adaptation planning.

2. Methods

2.1 Identifying Community-based Organizations

This study focused on community-based organizations (CBO's) because they play a crucial role as bridge organizations between local stakeholders and municipal planners and policymakers. Since this research was focused on understanding engagement with two climate adaptation plans, (OneNYC and ZCFR) the study aimed to include CBO's working on issues closely related to those covered in the plans. The first group of CBO's selected was environmental groups, which have a direct connection to many of the sub-issues raised in the climate adaptation plans as climate change is first and foremost perceived as an environmental issue. The second group of CBO's selected was organizations that work on economic or community development (ECD) issues. This group is slightly broader but closely tied to climate adaptation as the plans revolve around building economic and social resilience. Lastly, when identifying relevant groups, it was necessary to use a limited definition of CBO's, which for this paper are nonprofit groups that are engaged in work to generate improvements within a community in the local area they are based in. These exclusion criteria ensured that entities like large nationwide nonprofits were not included in the analysis.

Once the criteria were decided upon, the GuideStar Nonprofit Profiles database was used to search for CBO's matching specific search terms [32]. Certain search terms that organizations are categorized into by the database were selected and geographical limits were indicated to only include organizations based in New York City (NYC). The two major issue areas and sub-issue search terms are shown in table 1. These sub-issues are also umbrella terms that capture multiple smaller issues. This search yielded a result of 530 environmental organizations and 1,000 ECD organizations, with some organizations being listed more than once.

Table 1. Organization Search Terms

Environmental		Economic and Community Development (ECD)	
Biodiversity	Climate Change	Business and Industry	Community Organizing
Environmental Education	Environmental Justice	Economic Development	Housing Development
Natural Resources		Neighborhood Associations	Sustainable Development

Following this initial search, additional information was gathered on each organization to understand where they were located within NYC, if they fell within this study's definition of a CBO, whether their work was relevant to the climate adaptation plans, whether they were still active, and what their contact information was. This information was sometimes available on an organization's GuideStar Profile, but for most organizations, the information was gathered from each organization's website. Organizations were excluded for multiple reasons. For example, many organizations are based in NYC but focus on international work. Once organizations were excluded based on their issue areas, or other criteria, the addresses of all organizations were processed using ArcGIS. Geospatial processing was done to only include organizations that were located in community boards that were located in a present-day or future floodplain based on data from the New York City Panel on Climate Change [33]. Community boards were used as the smallest-scale geographic division for this study as they are the primary means through which CBO's and residents engage in local planning in NYC. Once all processing was complete the final amount of relevant CBOs was 134 environmental groups and 235 ECD groups.

2.2 Survey Development

Once the organizations of interest were identified, the survey was designed in alignment with the research questions. The three main areas of inquiry of the survey asked about awareness, participation, and barriers to engagement. These areas were chosen because they provide some level of insight into all steps of the participatory planning process. Questions on awareness revealed valuable information on how successfully the plans and engagement opportunities were being communicated to the public. Questions on participation gained insight into what types of CBO's took part in the process, and how this relates to other variables at play. Finally, questions on barriers to engagement began to explain why there may be deficiencies in the inclusivity of planning processes, and elucidated ideas for how to improve upon the current state of affairs. Questions within these three areas were repeated for both the OneNYC plan and the ZCFR plan, as well as for government planning processes more broadly to see how the climate adaptation planning processes compared to other similar processes.

In addition to the three areas of interest, a variety of information about each organization was collected to understand any correlations between engagement and characteristics of an organization. Five main variables were tracked for use in the final data analysis. These included the organization's size, the major issue area and sub-issues they worked on, the borough they were located in, the racial demographics of their local community board, and the median income status of their local community board. The information on community boards was gathered using geospatial analysis and data from the 2020 Census, while all other factors were gathered using survey questions [34]. The final survey containing 31 questions can be found in the supplemental materials section.

2.3 Survey Distribution and Data Collection

Once the survey was completed, CBO's were recruited via an email sent to a contact listed on their websites. The recruitment email was sent out two times in March 2021 to better ensure that representatives of all CBO's had a chance to learn about the study. The survey was designed to be completed by one member of each organization. Survey questions asked respondents to provide information about their CBO rather than their personal opinions. Survey responses were collected throughout March 2021 and April 2021. Following the collection of survey responses, data was processed using Microsoft Excel to evaluate correlations and other pertinent information regarding awareness, participation, and barriers to engagement. A secondary geospatial analysis was done in ArcGIS to understand any spatial factors related to the CBO's that completed the survey.

3. Results

3.1 Respondents Overview

Of the 369 total organizations of interest, 56 responded to the entire survey and 57 responded to all questions except the ZCFR section. As a sample of all relevant organizations, the 57 organizations represent a response rate of 12.1%, which has a margin of error of 11% given a 90% confidence interval. Additionally, the sampling process deliberately intended to sample a significant number of organizations from each issue area. Out of 134 environmental CBO's, there were 28 responses (20.9% of CBO's), a sample that has a margin of error of 14% with a confidence interval of 90%. Out of the 235 ECD CBO's, there were 32 responses (13.6% of CBO's), a sample that has a margin of error of 14% with a confidence interval of 90%. These high margins of errors demonstrate that this study does not provide a comprehensive statistically significant representation of all relevant CBO's. However, the results of this study are still relevant for elucidating trends that require further investigation, exploring issues that are raised by the respondents, and gaining insight through qualitative, exploratory data.

The respondents worked on a variety of sub-issues within the broader categories of environment or ECD, and most organizations worked on more than one sub-issue. The environmental CBO's worked on the following sub-issues in order of decreasing frequency listed: parks and green space, ecosystem conservation, climate change, environmental justice, water pollution, air pollution, and other issues. The ECD CBO's worked on the following sub-issues: general community organizing, business development, sustainable development, social services, workforce development, economic justice, and other issues.

There was also great diversity amongst organizations regarding the other four main variables. Organization staff sizes included 18(32.6%) all-volunteer, 18(32.6%) with 1 to 10 employees, 7(12.3%) with 11 to 20 employees, and 14(24.6%) with greater than 20 employees. The boroughs listed were 24(42.1%) from Manhattan, 6(10.5%) from the Bronx, 10(17.5%) from Queens, 10(17.5%) from Brooklyn, and 6(10.5%) from Staten Island. The income ranges of community boards were 28(49.1%) low-income, 17(29.8%) moderate-income, and 12(21.1%) high-income. The racial demographics of the community boards were 21(36.8%) majority non-White, and 36(63.2%) majority White. Figure 1 shows the location of all CBO's that completed the survey overlayed on top of the NYC community boards.

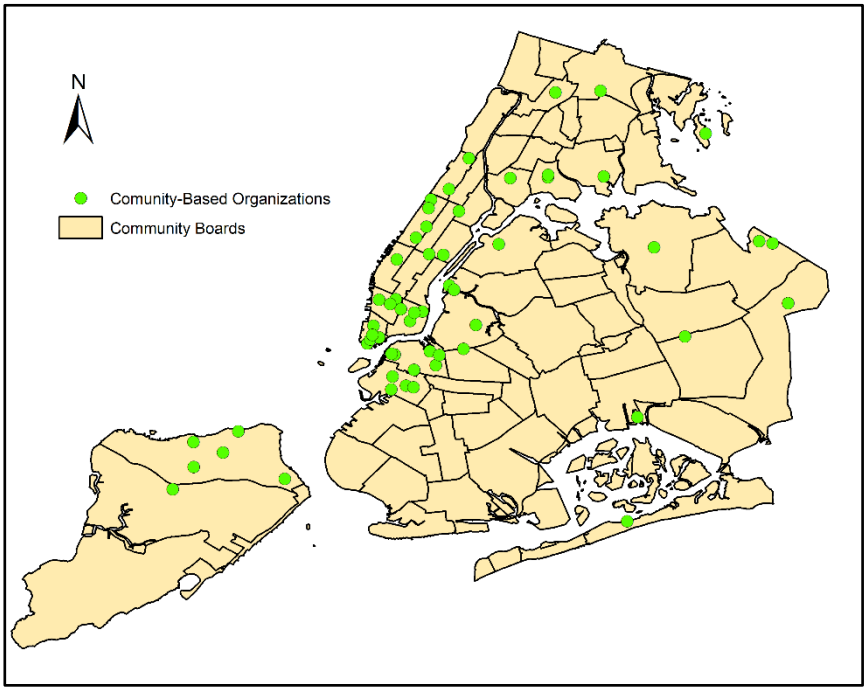

Fig. 1: Map of Community-Based Organization Survey Respondents

3.2 Awareness

The first area of analysis was focused on understanding organizations' awareness of the two climate adaptation plans. Overall, 31(54.5%) CBO's were aware of the OneNYC plan and 18(67.9%) CBO's were aware of the ZCFR plan. As shown in figure 2, 22(39.3%) CBO's were aware of both plans, 8(14.3%) were aware of OneNYC only, 16(28.6%) were aware of ZCFR only, 46(82.1%) were aware of at least one plan, and 10(17.9%) were aware of neither plan.

Organizations were also asked if they would have participated in a planning process if they had been aware of its existence. Of the 26 CBO's unaware of the OneNYC plan 8(30.8%) said they would have participated, 16(61.5%) said maybe, and only 2(7.7%) said no. Of the 18 CBO's unaware of the ZCFR plan 3(16.7%) said they would have participated, 15(83.3%) said maybe, and 0(0%) said no. Figure 3 shows whether CBO's that were aware of either plan would have participated in at least one of the plans.

Some trends between the variables of inquiry and levels of awareness were observed. Organization size played the most obvious role in predicting whether CBO's were aware of these plans or not. When examining awareness of OneNYC or ZCFR independently and when examining awareness of either plan, a relationship existed where larger organizations were more likely to be aware of plans. Linear regressions of these trends, shown in figure 4, were statistically significant with all R^2 values being greater than or equal to 0.7.

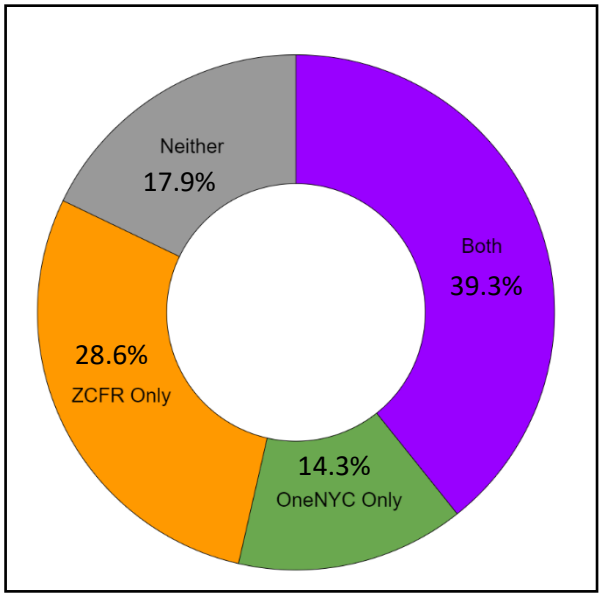

Fig. 2: Pie Chart of Awareness of Different Plans

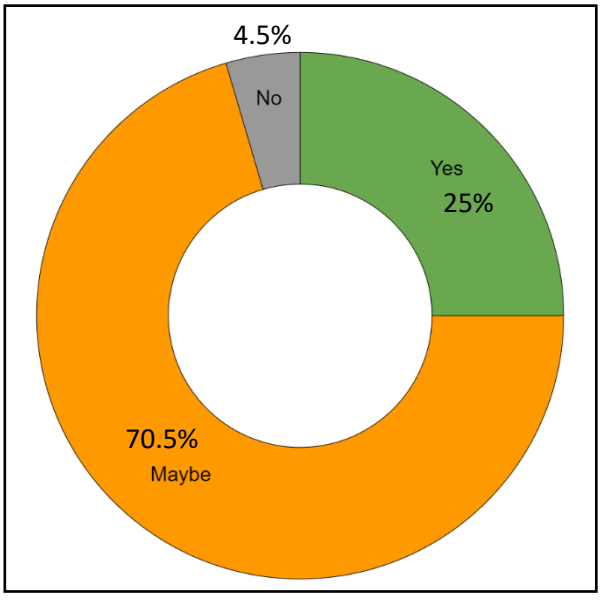

Fig. 3: Pie Chart: Would an Organization Participate in Either Plan if They Had Been Aware of it?

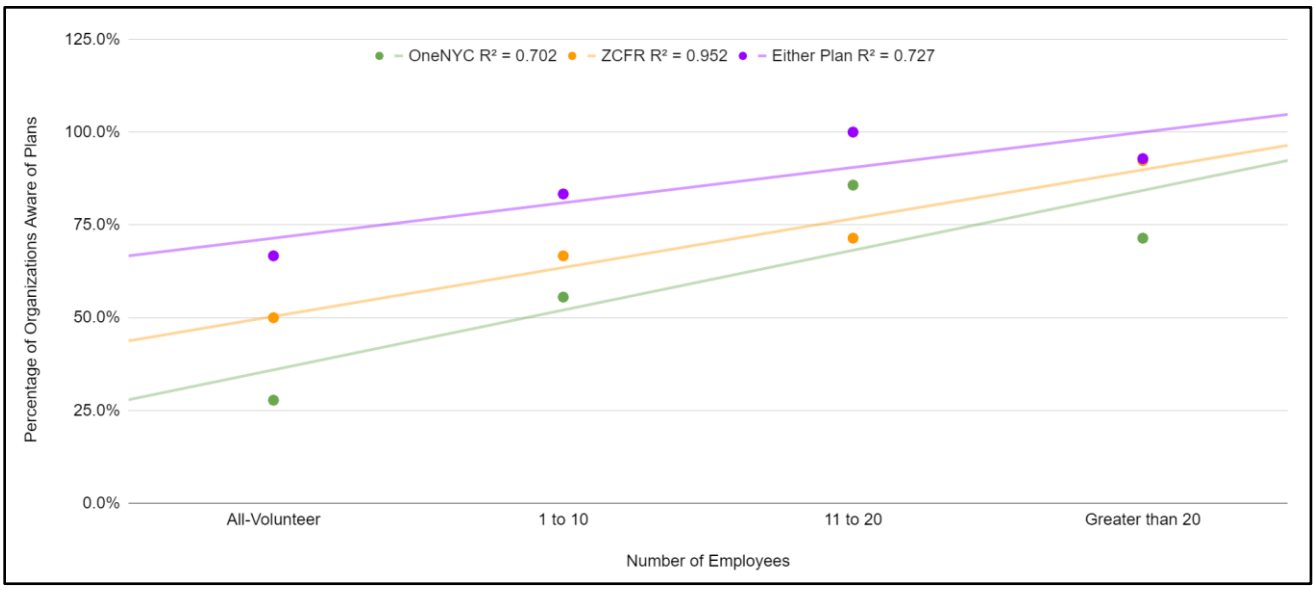

Fig. 4: Scatter Plot of Awareness Versus Organization Size

There were also some significant relationships between organizational issue areas and awareness. For ZCFR 24(85.7%) environmental CBO's were aware of the plan compared to 14(50%) ECD CBO's, this dynamic had a significant relationship with a chi-squared p-value less than 0.05. When examining either plan 26(92.9%) environmental CBO's were aware of at least one plan compared to 20(71.4%) ECD CBO's, resulting in a significant relationship with a chi-squared p-value less than 0.05. There was no significant trend between issue area and awareness of the OneNYC plan with 16(57.1%) environmental CBO's being aware compared to 15(51.7%) ECD CBO's.

There was also a slightly significant trend when examining organizations by the borough location either in Manhattan or outside of Manhattan. A slightly significant trend with a chi-squared p-value equal to 0.1 was visible for the ZCFR with 24(75%) Manhattan-based CBO's being aware of the plan compared to 13(54.2%) of CBO's from other boroughs. No trends were apparent when examining OneNYC or either plan compared to the borough variable. Additionally, no trends were visible between either race of a community board or income of a community board and an organization's awareness of any plan.

3.3 Participation

The second area of analysis was the level of participation in the climate adaptation planning processes. For this analysis, the number of organizations that participated in a plan was compared to the number of organizations aware of that plan, thereby gaining an understanding of the proportion of organizations that chose to participate knowing that the process existed. Overall, out of 31 CBO's aware of the OneNYC plan 11(35.5%) participated and 20(64.5%) did not. Of the 28 CBO's aware of the ZCFR plan 15(39.5%) participated and 23(60.5%) did not. 46 CBO's were aware of at least one plan; 7(15.2%) of those CBO's participated in both planning processes, 12(26.1%) participated in only one, and 27(58.7%) participated in neither, as shown in figure 5.

There were multiple modes of participation across the two plans. Multiple organizations listed more than one mode of participation. For the ZCFR planning process, organizations participated through two methods, 13(86.7%) CBO's did so through public hearings or formal meetings, and 10(66.7%) CBO's engaged through conversations with government officials. For the OneNYC plan, organizations participated via four methods, 8(72.7%) had conversations with government officials, 5(45.5%) attended public meetings or formal meetings, 1(9.1%) took an online survey, and 1(9.1%) took a phone survey.

Correlations were observed between rates of participation and three different variables: participation in previous government planning process related to any issues, organization size, and participation in one climate adaptation planning process increasing likelihood of participation in the other.

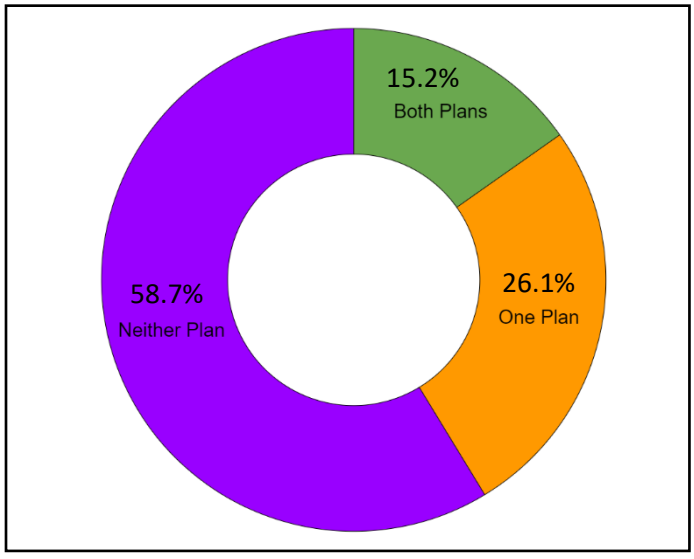

Fig. 5: Pie Chart: Did Organizations that Were Aware of at Least One Plan Participate in the Process for any Plan?

Organizations that participated in this survey had a range of previous participation experience in government planning processes. Respondents were grouped into categories of how often they had previously engaged with planning processes with categories of “never”, “less than once a year”, “1 to 5 times a year”, “6 to 12 times a year”, and “more than once a month”. The rates of participation as a percentage of awareness of the relevant plan are shown in figure 6. Linear regressions for participation with OneNYC independently, ZCFR independently, and with either plan, all show some significance with R^2 values above 0.5.

Like the observed trends with awareness, participation generally increased as organization size increased. Linear regressions of organization size versus participation had statistical significance for OneNYC and for either plan with R^2 values of 0.86 and 0.83 respectively. There was not a significant correlation between organization size and participation in the ZCFR process; this relationship had an R^2 of 0.28.

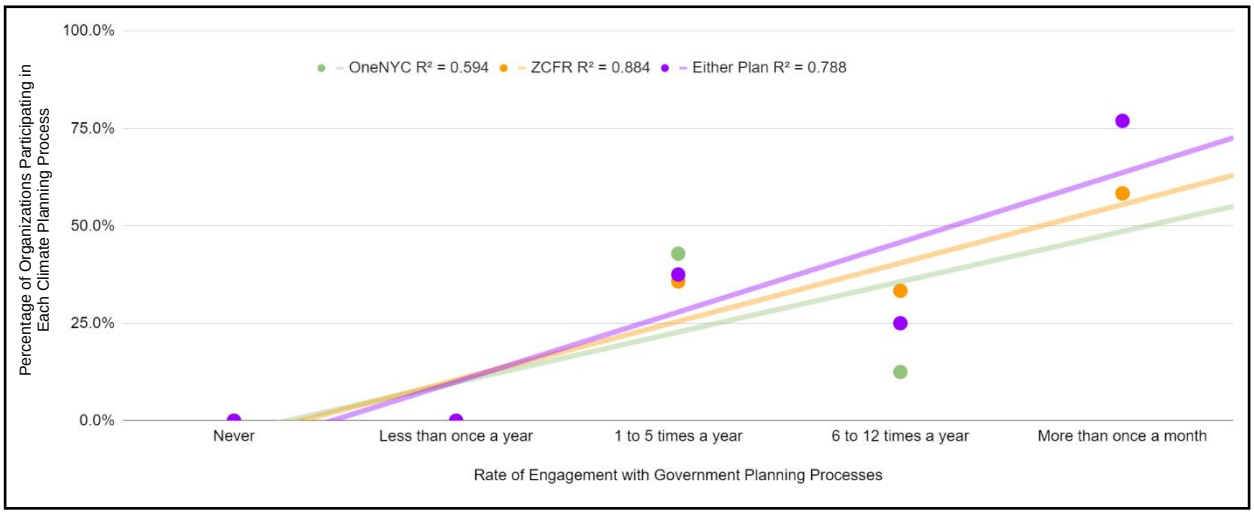

Fig. 6: Participation in Climate Adaptation Planning Processes Versus Previous Participation in any Government Planning

Participation in either climate adaptation planning process was a strong indicator of participation in the other. 11 CBO's participated in the OneNYC planning process, amounting to 35.5% of CBO's that were aware of this plan. 10 of those 11 CBO's that participated in the OneNYC process were also aware of ZCFR. Of those 10 CBO's, 7(70%) also participated in the ZCFR process. This demonstrates that organizations that participated in the OneNYC process and were aware of the ZCFR plan were more likely to participate in the ZCFR process than the pool of all organizations aware of the ZCFR plan were. This relationship is statistically significant with a chi-squared p-value less than 0.1. A similarly strong trend is visible when the order is reversed in that participation in the ZCFR process is correlated with higher participation in the OneNYC process, when awareness of the OneNYC plan is considered. 15 CBO's participated in the ZCFR planning process, equivalent to 39.5% of CBO's aware of this plan. 9 of those 15 CBO's were also aware of the OneNYC plan. Of those 9 CBO's, 7(77.8%) participated in the OneNYC plan. This correlation has a chi-squared p-value less than 0.05.

There were no trends related to participation and any of the other main variables (organization issue area, race of the community board, income of the community board, or borough where the organization is located).

3.4 Barriers to Engagement

Respondents identified multiple barriers to engagement that followed similar trends for OneNYC, ZCFR, and government planning in general. Table 2 shows the number of organizations that listed each barrier to engagement with the percentage in respect to all respondents listed in parentheses. The barriers to engagement are listed in order of the most common to the least common ones identified when an average is taken between OneNYC and ZCFR answers. Notably, most organizations stated that barriers did exist or that they "maybe" existed for all plans. For OneNYC 15(26.3%) CBO's said yes barriers exist, 25(61.4%) said maybe, and 7(12.3%) said no. For ZCFR 14(25%) said yes barriers exist, 33(58.9%) said maybe, and 9(16.1%) said no. For planning in general 29(50.1%) said yes barriers exist, 17(29.9%) said maybe, and 11(19.3%) said no barriers existed. Importantly, almost all respondents that answered "maybe barriers exist" for each plan listed a specific barrier in the following questions.

Table 2. List of Barriers to Engagement

Barrier	Both Climate Plans (Mean Value)	OneNYC	ZCFR	Government Planning in General
Lack of Awareness	29(51.8)	31(54.4)	27(48.2)	31(54.4)
Lack of Time	23(41.1)	21(36.8)	25(44.6)	29(50.9)
Inconvenient Meeting Times	22.5(40.2)	20(35.1)	25(44.6)	20(35.1)
Lack of Clarity of Process	16.5(29.5)	16(28.1)	17(30.4)	35(61.4)
Inconvenient Meeting Locations	10.5(18.8)	8(14.0)	13(23.2)	21(36.8)
Planning Does Not Benefit Communities	9.5(17.0)	9(15.8)	10(17.9)	26(45.6)
Language Barriers	8.5(15.2)	8(14.0)	9(16.1)	13(22.8)
Distrust of Government	8(14.3)	9(15.8)	7(12.5)	18(31.6)
Lack of Interest in Issues	8(14.3)	8(14.0)	8(14.3)	14(24.6)
Cultural Barriers	7.5(13.4)	7(12.3)	8(14.3)	18(31.6)

In addition to the identification of pre-chosen barriers, space was given to respondents to discuss any additional barriers by providing an open-ended answer. These open-ended answers were qualitatively coded into seven categories that were able to encompass all the themes that were described. While only 13 CBO's provided open-ended answers, this qualitative analysis provides important insights into more detailed issues with the planning processes. This open-ended feedback enables this study to investigate more complex dynamics than those elicited from the quantitative survey answers. Deeper questions can be explored, such as why participatory planning may be flawed and how improvements can be made. Table 3 shows the different themes in order of how often they were mentioned, as well as an excerpt from one quote in each category.

Table 3. Qualitative Themes Regarding Barriers to Engagement

Number of Occurrences	Theme	Excerpt
5	Planning processes are poor or government is unorganized	"Public input is a formality. City agencies go through the motions and continue with their pre-fabricated, designs"
4	Communities have no decision-making power	"Community Boards have no authority, and they are the primary way communities engage in planning processes"
4	Lack of clarity and transparency	"The process itself needs to be more transparent with more specific details and broad outreach across the city"
3	Business interests or top-down technocracy dominate decision-making	"NYC is dominated by the real estate industry and is Manhattan-centric. This has a direct and strong influence on any planning"
2	Better of more resources are needed	"There is little clarity on which NYC agency is responsible for a specific plan and whether they have the appropriate resources and expertise"
1	Justice should be a priority	"Environmental justice principles need to guide decision-making from the onset of the project"

4. Discussion

4.1 Awareness and Participation

The results of this study reveal a great deal about the relationship between CBO's and the climate adaptation planning processes that are led by the NYC government. Firstly, the rates of awareness of the climate adaptation plans were high with 82.1% of CBO's being aware of at least one plan. While this still leaves about one in five CBO's unaware of either planning process, the awareness component is certainly at a strong level. Previous studies have demonstrated that a link exists between individuals' awareness of the threats of climate change and their engagement in adaptation planning processes, but an analysis of how awareness of an adaptation planning process compares to engagement in that process has not been studied [35]. While similar data on adaptation plan awareness comparable to that found in this study is not available, the rates of awareness in this study can be compared to data on public awareness of and knowledge about climate change [35]. Three measures of public awareness about climate change and its impacts in the NYC Metropolitan Area provide relevant comparisons. These are the rate of residents who think global warming is happening (72%), those who think global warming will harm people in the US (61%), and those who think local officials should do more to address global warming (54%) [36]. While these statistics demonstrate awareness of climate change more broadly rather than awareness of adaptation plans, they still provide a valuable comparison of individuals' awareness, represented by rates between 54% and 72%, compared to the rate of awareness of either

plan found in this study of 82.1%. These findings demonstrate that CBO's may be better informed about climate change and adaptation planning than the general public, and therefore can play a significant role in spreading awareness and further connecting individuals to planning. Partnerships between local government and CBO's should be developed specifically to make the public aware of adaptation planning processes and thereby expand outreach to more diverse audiences. This could include actions such as planning agencies creating partnerships with CBO's to utilize their communication networks for notification of planning processes. Many of these partnerships do exist and the findings of this study help to stress the importance of maintaining and improving such programs.

In addition to awareness alone, the link between awareness and participation is important to investigate. Rates of awareness were significantly higher than rates of participation with 82.1% of CBO's being aware of either plan and only 41.3% of those groups participating in at least one planning process. While lack of awareness was the most cited barrier to engagement with 51.8% of CBO's listing it, there are multiple reasons why organizations may have chosen not to participate even when they were aware of a plan. Two notable barriers that can limit the translation of awareness to participation is the lack of clarity of the process and how the plan may benefit a CBO and the community it represents. These issues provide an explanation for the gap between awareness and participation and are additionally supported by the data presented in figure 3. This figure demonstrates that of the organizations that were unaware of either plan only 4.5% stated they would not participate in that planning process had they been aware. In contrast, 25% of respondents said they would have participated had they been aware of the plan and the vast majority (70.5%) stated they would "maybe" participate if they have been aware of the plan. This large uncertainty demonstrates that awareness that a planning process is happening is not enough to guarantee participation from CBO's. This supports the idea that once awareness is achieved, further work is needed to demonstrate key criteria such as, why a plan is valuable to the goals of specific CBO's, how exactly CBO's can engage in the process, and how involvement in planning can benefit CBO's and the communities they support. The findings in this study support the idea that without thorough explanation and clearly communicated details about an adaptation plan, awareness does not do enough to improve engagement.

Another finding from this study that may elicit solutions to relatively low levels of participation is the prevalence of sustained participation. In this study, CBO's that had previously engaged in any public planning processes with the local government were far more likely to engage with either of the climate adaptation plans. Figure 6 demonstrates that organizations that participated in government planning

more than once a month were the most likely to participate in one of the climate adaptation planning processes, followed by organizations that participate 1 to 5 times a year, and then those that participate 6 to 12 times a year. There is some variation between the level of past engagement and the likelihood of future engagement in adaptation planning. However, even CBO's with minimal past participation (1 to 5 times a year) were engaged in climate adaptation planning at a rate of 37.5% while CBO's that had never participated in planning or did so less than once a year had an adaptation planning participation rate of 0%. This is notable as municipalities can leverage engagement in past participatory processes to build relationships with a diverse array of CBO's and help them establish themselves as bridge organizations. Importantly, a few very successful awareness and explanation campaigns to include CBO's in even one planning process could result in sustained engagement in future planning. Notably, municipalities can use this knowledge to do targeted outreach to CBO's they have not engaged with previously to encourage their ongoing participation in planning.

4.2 Organization Size and Engagement

While important insights can be gleaned from this study with regards to awareness, participation, and barriers to engagement concerning climate adaptation planning, few correlations between CBO characteristics and measures of engagement were observed. The most indicative of the five characteristic variables tested was organization size, which yielded statistically significant results when compared to either awareness or participation. Awareness of either climate adaptation plan increased as the size of an organization increased, as evidenced by a linear regression with an R^2 value of 0.73. Participation in either plan followed a similar trend with larger organizations participating at a higher rate with an R^2 of 0.83.

One explanation for the increased awareness larger organizations had is that more individuals in a group naturally lead to more information access due to each person's exposure to different sources of knowledge. This scenario makes sense especially when staff members are actively working on issues related to adaptation planning, and therefore are seeking out information pertinent to their organization's initiatives. Some CBO's with little to no formal staff may have large volunteer bases, but this possibility did not skew the trends of awareness. An explanation that may account for the difference between staff awareness and volunteer awareness, is that formal employees of CBO's may be more familiar with government planning processes, and ongoing local projects in general. This would support the results of this study as greater staff power resulted in greater awareness.

Larger organizations also had higher rates of participation in adaptation planning which could likely tie into the second-most and third-most selected barriers to engagement: lack of time and inconvenient meeting times. While these barriers were listed by organizations across all sizes, there was a slightly significant positive trend linking smaller organizations to more frequent reporting of a lack of time or inconvenient meeting times (linear regression R^2=0.65). This trend makes sense as greater staff resources can enable an organization to pay their employees for the time dedicated to planning participation, and therefore decrease the barrier posed by time constraints. Additionally, larger staff sizes can allow for a greater range of availability between all relevant employees, improving the chances that someone from a CBO can attend a planning meeting of interest.

This disproportionate barrier to small organizations should be addressed by changes in policy that make engagement more inclusive. One such measure is to provide financial compensation to any community members attending a formal planning meeting. This can help improve turnout and enable volunteers to be paid for their work. While funded programs like this one may be more difficult to implement this represents an important step to valuing the time and effort of community members. Additional measures should also be implemented to make planning meetings more accessible for individuals with other obligations. For example, agencies that host planning events should provide some form of childcare to enable parents with young children to take part. Lastly, mechanisms like asynchronous and/or virtual participation can allow individuals to engage on their own schedule. Actions to support this may include raising greater awareness for surveys and platforms to submit comments via email, website portals, social media, and other methods.

4.3 Trends with Organization Issue Areas

While organization size was the most significant marker of engagement, analysis of other variables yielded valuable insights. The main issue area CBO's worked on had a significant bearing on their awareness of ZCFR and of either plan, but no statistical significance existed for OneNYC awareness alone. Additionally, organization issue areas did not have any effect on participation rates. This trend of environmental CBO's having greater awareness of adaptation planning compared to ECD CBO's demonstrates that climate adaptation may still be perceived as primarily an environmental issue. Lower awareness rates among economic-focused CBO's may be a result of the groups being less interested in learning about plans related to climate change. However, this hypothesis is contradicted by the fact that almost all CBO's that completed the survey agreed that climate change should be a priority for the NYC government and that community engagement should be prioritized in adaptation planning. This would

indicate that both ECD and environmental CBO's are interested in seeing local climate change action and would like to engage in planning. This study shows that CBO's have demonstrated an interest in seeing problems addressed in a way that utilizes bottom-up knowledge and includes the voice of communities. With that in mind, another explanation for lower awareness by economic CBO's is that the local government does more targeted outreach to environmental groups because they feel climate adaptation aligns best with those groups. Further studies would need to examine this phenomenon explicitly to understand whether the local government has a significant bias in outreach to different types of CBO's. If this is the case, agencies leading climate adaptation planning should develop broader outreach strategies to include CBO's with a more diverse set of priorities, such as economic development, public housing, public health, and criminal justice reform to name a few.

4.4 Race, Income, and Borough

Aside from the trends associated with organization size or issue area the only other trend found from the initial variables of interest was that CBO's based in Manhattan had a slightly higher rate of awareness of the ZCFR, but not the OneNYC plan, than CBO's in other boroughs. This decision to distinguish Manhattan from the other four boroughs was done to understand whether Manhattan and the powerful financial interests that are based there, dominate planning. This theme came up in three qualitative survey responses and fits with previous research demonstrating the heavy influence of technical experts and corporate interests [10,11]. While there was some indication that CBO's in Manhattan had greater levels of awareness for one of the two plans, there was no trend for participation. This result leads to the conclusion that the interests of CBO's in Manhattan have not had a greater influence than those of CBO's in other boroughs. However, while the communities in Manhattan that are represented by these groups may not have greater power, these findings do not refute previous research showing how financial and political centers often dominate planning.

It is also important to analyze the lack of any trend relating either income or racial demographics of a community board to the engagement that CBO's in those locations have had in planning. While a significant body of research has shown that communities of color and low-income communities have consistently been left out of domestic urban planning and environmental planning processes, the findings of this study do not demonstrate that trend for CBO's in NYC [9,10]. This may indicate that in recent years the NYC government's efforts to uphold equity have resulted in planning processes engaging a racially and socioeconomically diverse range of CBO's. Additionally, this may further demonstrate the value of CBO's as bridge organizations if their interaction with local government

translates to solutions that target community priorities. If CBO's across all demographics can engage equitably and represent their surrounding areas properly, climate adaptation planning will be able to move to a much more just state. While awareness and rates of participation did not vary during this study because of demographic characteristics, additional measures of procedural and distributive justice need to be further investigated. These considerations, such as the allocation of financial resources, ongoing governmental staff support, and the implementation of community goals must be further researched in the context of income and race, and climate change adaptation.

4.5 Study Limitations

This study provides a multitude of information regarding CBO engagement with climate adaptation processes in NYC but has limitations related to its scope. This study should be seen primarily as an exploratory inquiry rather than one that establishes generalizable findings. This lack of generalizability is mainly due to the small sample size and localized study area. An additional limitation to investigating engagement with CBO's is that almost all organizations that took this survey already felt that climate change adaptation and community engagement in planning should be priorities. A study surveying a broader range of CBO's that were not necessarily interested in climate change adaptation may have yielded different results. Investigating the organizations that are more detached from adaptation planning would provide valuable insights into how outreach and awareness campaigns can be improved, as well as how adaptation planning can tackle more issues. Additionally, analyses of how individuals are engaging with the organizations based in their communities should be done to further evaluate the role of these bridge organizations. This could be done with in-depth interviews that seek to better understand the intersecting relationships between individuals, CBO's, and the NYC government regarding comprehensive adaptation planning.

While the data presented in this study should be seen as a significant resource for municipal governments, and NYC especially, further large-scale research is needed to achieve broader knowledge on these phenomena across different cities. This study does however provide valuable insights on how gaps in CBO engagement can be addressed by policy solutions that could be implemented through project-specific pilot programs or citywide planning reforms. Importantly, the results of this study should be applied by the NYC government to continue investigating ways that their participatory planning processes can be improved by bringing in a more diverse set of voices and empowering CBO's and communities.

4.6 Conclusion

This study received responses from 57 community-based organizations across New York City with varying sizes, issue area focuses, demographic backgrounds, and perspectives. The results of this research are valuable for understanding inclusion and equity regarding climate change adaptation planning processes in New York City and can be applied to other municipalities. Specifically, important trends were found about the levels of awareness and participation amongst different CBO's, and the shared barriers to engagement they have faced. Based on this study, planners should examine their outreach and awareness campaigns and develop solutions that target a more diverse array of CBO's and specifically aim to include groups that have not previously participated in planning or have not even been aware of opportunities to participate. In addition to making efforts to increase the number of CBO's made aware of plans, planners should also make an effort to directly support CBO's with priorities that may not traditionally align with climate change adaptation planning. Lastly, planners need to address the barriers to engagement detailed in this study by piloting and implementing more accessible solutions and inclusive formats of participation in planning processes.

Municipal agencies must make concrete steps to give communities greater decision-making power rather than enabling performative forms of engagement. By enabling CBO’s to be more powerful actors, local governments can draw on organizations that already understand community priorities and can advocate for necessary, contextual solutions. To do so, a new paradigm for the co-production of knowledge around climate adaptation planning is required that integrates bottom-up participation and a reversal of conventional thinking about the role of planners as the main designers of cities. This study has demonstrated that climate change adaptation planning processes need to be revised in multiple ways to increase participatory justice. These changes are urgently needed because without bottom-up inclusion and processes that are rooted in equity, there will be significant gaps in any cities' resilience.

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Sources

1. *Special Report: Global Warming of 1.5 ºC*. Report. Intergovernmental Panel of Climate Change. 2019.
2. Seto, K. C., B. Guneralp, and L. R. Hutyra. "Global Forecasts of Urban Expansion to 2030 and Direct Impacts on Biodiversity and Carbon Pools." *Proceedings of the National Academy of Sciences* 109, no. 40 (2012): 16083-6088. doi:10.1073/pnas.1211658109.
3. *World Urbanization Prospects: The 2018 Revision (ST/ESA/SER.A/420)*. Report. Department of Economic and Social Affairs, Population Division, United Nations. New York, 2019.
4. Desai, Dhaval. *Urban Densities and the Covid-19 Pandemic: Upending the Sustainability Myth of Global Megacities*. Report. Observer Research Foundation. Mumbai, 2020.
5. Connolly, Creighton, S. Harris Ali, and Roger Keil. "On the Relationships between COVID-19 and Extended Urbanization." *Dialogues in Human Geography* 10, no. 2 (2020): 213-16. doi:10.1177/2043820620934209.
6. *Zoning for Coastal Flood Resiliency*. N 210095 ZRY (Pre. L.U. No. 765). Land Use Division, The Council of The City of New York. 2021.
7. Gornitz, Vivien, Stephen Couch, and Ellen K Hartig. “Impacts of Sea Level Rise in the New York City Metropolitan Area.” *Global and Planetary Change, Global and Regional Sea-level Changes and the Hydrological Cycle*, 32 (1) (2001): 61–88. https://doi.org/10.1016/S0921-8181(01)00150-3.
8. Herreros-Cantis, Pablo, Veronica Olivotto, Zbigniew J. Grabowski, and Timon Mcphearson. "Shifting Landscapes of Coastal Flood Risk: Environmental (in)justice of Urban Change, Sea Level Rise, and Differential Vulnerability in New York City." *Urban Transformations* 2, no. 1 (2020). doi:10.1186/s42854-020-00014-w.
9. Taylor, Dorceta E. *Toxic Communities: Environmental Racism, Industrial Pollution, and Residential Mobility*. New York: New York University Press, 2014.
10. Goetz, Edward G., Rashad A. Williams, and Anthony Damiano. "Whiteness and Urban Planning." *Journal of the American Planning Association* 86, no. 2 (2020): 142-56. doi:10.1080/01944363.2019.1693907.
11. Smith, Richard Warren. "A Theoretical Basis for Participatory Planning." *Policy Sciences* 4, no. 3 (1973): 275-95. doi:10.1007/bf01435125.
12. Bassett, Ellen, and Vivek Shandas. 2010. “Innovation and Climate Action Planning: Perspectives from Municipal Plans.” Journal of the American Planning Association 76 (4): 435–50.
13. Chu, Eric, Isabelle Anguelovski, and Debra Roberts. "Climate Adaptation as Strategic Urbanism: Assessing Opportunities and Uncertainties for Equity and Inclusive Development in Cities." *Cities* 60 (2017): 378-87. doi:10.1016/j.cities.2016.10.016
14. Mosse, David, and B. Cooke. *Peoples Knowledge, Participation and Patronage: Operations and Representations in Rural Development*. 2014
15. Anguelovski, I., Shi, L., Chu, E., Gallagher, D., Goh, K., Lamb, Z., Reeve, K., Teicher, H. Equity Impacts of Urban Land Use Planning for Climate Adaptation Critical Perspectives from the Global North and South. *Journal of Planning Education and Research*, 36(3) (2016): 333–348. https://doi.org/10.1177/0739456X16645166
16. Schrock, Greg, Ellen M. Bassett, and Jamaal Green. “Pursuing Equity and Justice in a Changing Climate: Assessing Equity in Local Climate and Sustainability Plans in U.S. Cities.” *Journal of*

Planning Education and Research 35 (3) (2015): 282–95. https://doi.org/10.1177/0739456X15580022.

17. Finn, Donovan, and Lynn Mccormick. "Urban Climate Change Plans: How Holistic?" *Local Environment* 16, no. 4 (2011): 397-416. doi:10.1080/13549839.2011.579091.
18. Leichenko, Robin, Melanie Mcdermott, and Ekaterina Bezborodko. "Barriers, Limits and Limitations to Resilience." *Towards Coastal Resilience and Sustainability*, (2018): 33-56. doi:10.4324/9780429463723-3.
19. Shi, Linda, Eric Chu, Isabelle Anguelovski, Alexander Aylett, Jessica Debats, Kian Goh, Todd Schenk, Karen C. Seto, David Dodman, Debra Roberts, J. Timmons Roberts, and Stacy D. Vandeveer. "Roadmap towards Justice in Urban Climate Adaptation Research." *Nature Climate Change* 6, no. 2 (2016): 131-37. doi:10.1038/nclimate2841.
20. Foster, S., Leichenko, R., Nguyen, K.H., Blake, R., Kunreuther, H., Madajewicz, M., Petkova, E.P., Zimmerman, R., Corbin-Mark, C., Yeampierre, E., Tovar, A., Herrera, C. and Ravenborg, D. *New York City Panel on Climate Change 2019 Report Chapter 6: Community-Based Assessments of Adaptation and Equity.* Report. Ann. N.Y. Acad. Sci., 1439: 126-173 (2019). doi:10.1111/nyas.14009
21. Sarzynski, Andrea. "Public Participation, Civic Capacity, and Climate Change Adaptation in Cities." *Urban Climate* 14 (2015): 52-67. doi:10.1016/j.uclim.2015.08.002.
22. Lioubimtseva, Elena, and Charlotte Da Cunha. "Local Climate Change Adaptation Plans in the US and France: Comparison and Lessons Learned in 2007-2017." *Urban Climate* 31 (2020): 100577. doi:10.1016/j.uclim.2019.100577.
23. Torres, Pedro Henrique Campello, Pedro Roberto Jacobi, Sandra Momm, and Ana Lia Leonel. "Data and Knowledge Matters: Urban Adaptation Planning in São Paulo, Brazil." *Urban Climate* 36 (2021): 100808. doi:10.1016/j.uclim.2021.100808.
24. Reid, Hannah, and Saleemul Huq. "Mainstreaming Community-based Adaptation into National and Local Planning." *Climate and Development* 6, no. 4 (2014): 291-92. doi:10.1080/17565529.2014.973720.
25. Moser, Susanne C., and Cara Pike. "Community Engagement on Adaptation: Meeting a Growing Capacity Need." *Urban Climate* 14 (2015): 111-15. doi:10.1016/j.uclim.2015.06.006.
26. Connolly, James J., Erika S. Svendsen, Dana R. Fisher, and Lindsay K. Campbell. "Organizing Urban Ecosystem Services through Environmental Stewardship Governance in New York City." *Landscape and Urban Planning* 109, no. 1 (2013): 76-84. doi:10.1016/j.landurbplan.2012.07.001.
27. Seidler, Reinmar, Katie Dietrich, Sarah Schweizer, Kamaljit S. Bawa, Shashikant Chopde, Farrukh Zaman, Anshu Sharma, Sumana Bhattacharya, Laxmi P. Devkota, and Sarala Khaling. "Progress on Integrating Climate Change Adaptation and Disaster Risk Reduction for Sustainable Development Pathways in South Asia: Evidence from Six Research Projects." *International Journal of Disaster Risk Reduction* 31 (2018): 92-101. doi:10.1016/j.ijdrr.2018.04.023.
28. *PlaNYC: A Greater Greener New York*. Report. The Office of the Mayor of the City of New York. 2007.
29. *PlaNYC: A Greater Greener New York, 2011 Update*. Report. The Office of the Mayor of the City of New York. 2011.
30. *PlaNYC: A Greater Greener New York, 2013 Update*. Report. The Office of the Mayor of the City of New York. 2013.

31. *OneNYC: The Plan for a Strong and Just City*. Report. The Office of the Mayor of the City of New York. 2015.
32. "Guidestar by Candid." GuideStar Nonprofit Reports and Forms 990 for Donors, Grantmakers, and Businesses. Accessed March, 2021. https://www.guidestar.org/.
33. Horton, Radley, Christopher Little, Vivien Gornitz, Daniel Bader, and Michael Oppenheimer. "New York City Panel on Climate Change 2015 Report Chapter 2: Sea Level Rise and Coastal Storms." *Annals of the New York Academy of Sciences* 1336, no. 1 (2015): 36-44. doi:10.1111/nyas.12593.
34. United States Census Bureau. "2020 United States Census." Explore Census Data. Accessed March 2021. https://data.census.gov/cedsci/advanced.
35. Khatibi, Farzaneh Shaikh, Aysin Dedekorkut-Howes, Michael Howes, and Elnaz Torabi. "Can Public Awareness, Knowledge and Engagement Improve Climate Change Adaptation Policies?" *Discover Sustainability* 2, no. 1 (2021). doi:10.1007/s43621-021-00024-z.
36. Howe, P., Mildenberger, M., Marlon, J., & Leiserowitz, A. “Geographic variation in opinions on climate change at state and local scales in the USA,” *Nature Climate Change*. (2015) DOI: 10.1038/nclimate2583.