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Think Globally, Act Locally? Evaluating Boston Climate Projects' Community Engagement

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Abstract
Successful climate change mitigation, adaptation, and transformation will require a balance of bottom-up, community-led planning and engagement with top-down resource deployment. While many non-governmental organizations (NGOs), civil society groups, and local agencies argue that they work closely with residents, especially on plans to manage extreme weather events and climate change, the degree to which local, urban-based climate projects engage with coastal communities remains an open question. Using interviews with nearly 20 project managers, local planners, and decision makers along with site visits to and archival research on three core projects in Boston, we evaluate the degree to which residents participate, plan, and engage. Despite being heralded by some observers as truly participatory, we found that none of the projects achieved the highest levels of participation possible seen in other community led projects. Further, none of the projects achieved consistent scores on the three evaluation criteria: equity, efficacy, and efficiency. This gap between rhetoric and reality must be closed if Boston and other vulnerable, coastal cities wish to build more equitable ways of managing challenges like climate change.

Keywords Resident engagement · Climate change · Qualitative methods · Community ownership · Eesilience · Coastal cities · Boston · United States

Introduction

Like cities across the world, Boston faces extreme weather impacts, including life-threatening heat waves and property damaging floods, from a changing climate. Sea level rise around Boston of one inch every eight years is accelerating (Moran, 2021a). Estimates show that a Category 2 hurricane would flood nearly one in four hospital beds in the city. Communities of color and low-income communities are especially vulnerable to these climate changes (Dooling, 2017). Affordable housing is more at risk of flooding with more than 3,000 units likely to be inundated (Horn-Muller, 2021). Further, scientists predict that Boston could see 41 days annually of 90 °F or higher temperatures by the 2030s, a major problem for under resourced communities of color that lack air conditioning and cooling infrastructure (Harmon, 2021).

It is vital that residents, especially those most vulnerable to climate impacts, play a core role in designing solutions. Communities thrive when they can use their expertise to design solutions that best fit local priorities (Pyles et al., 2017), and investment programs function most effectively when rooted in the lived experience of communities (Jaskulowska, 2019). Residents understand the needs of their community and are familiar with the touchpoints in their neighborhoods (Hamideh, 2020). When community residents are engaged from the beginning of a planning process, their trust and confidence in the outcomes are increased (Douglas et al., 2011). The importance of citizen engagement during non-emergency times holds true during crises as well (Nakagawa & Shaw, 2004). Societies where residents engage with each other and with regional and national authorities can mitigate harm before and accelerate recovery after shocks (Aldrich, 2019). Poorly informed planning due to lack of local participation can displace or negatively impact poorer residents and benefit elites at the expense of vulnerable groups (Anguelovski et al., 2016).

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It is also true that public participation often has unintended impacts, such as excluding groups from targeted communities (Glimmerveen et al., 2022). However, extensive citizen participation provides no guarantee that a project will succeed or be widely seen as wanted or necessary by the community. Many scholars have argued that meaningful participatory development planning and therefore broader participation require both top down state support and bottom up civic engagement (Mansuri & Rao, 2013).

Our research evaluates multiple recent and current climate mitigation projects in the city of Boston on the quality of their public engagement strategies in design, implementation, and assessment phases. We selected Boston for several reasons. City authorities and outsiders alike have pointed to Boston as a paradigm of a progressive city (Shi, 2021) as one of the first cities with a 2020 Green New Deal focused on climate adaptation which built on its 2017 report focused on equity and connectivity. Yet critics have argued that a variety of climate adaptation and green infrastructure projects deprioritize the needs of racial and ethnic minorities. Many new projects, for example in East Boston, exclude long term residents and exacerbate racial injustice (Anguelovski et al, 2019). Additionally, it has been argued that Boston's climate response programs failed to recognize the priorities and lived experiences of residents (Malloy et al., 2022). We recognize that the findings from our cases may not generalize to smaller or less resourced cites.

We interviewed facilitators, designers, and participants, and conducted a literature review on how engagement strategies were deployed and received. While observers have argued that these projects deeply engaged citizens, and that Boston has led the way in bottom-up climate change response, we fou nd that none of the projects achieved the highest levels of participation possible. These findings have strong implications for Boston and other coastal cities on the front lines of extreme weather events.

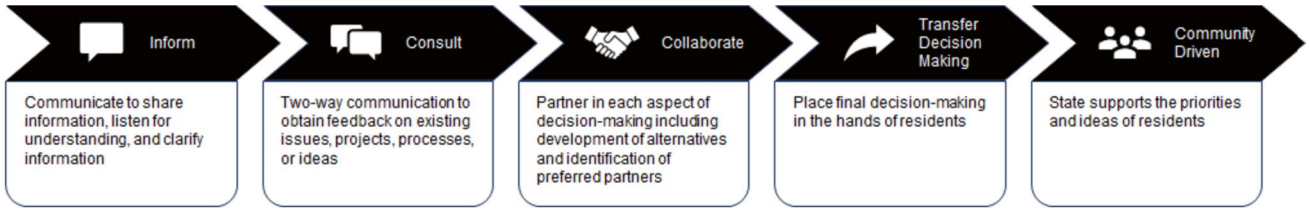
Our research is among the first to directly tie theoretical measures of participation into empirical observation of ongoing Boston civil society organizations involved in citizen science and climate mitigation projects. Where previous studies have addressed only a single public participation project in Boston, we use a comparative approach to capture data on multiple projects (Rubin et al., 2014; Augsberger et al., 2017; Malloy, 2021; Sittenfeld et al., 2022) in order to better locate the projects along various participatory spectra. We conclude with policy recommendations for local actors, NGOs, academic advisers, and city decision makers to enhance urban planning strategies to reach goals of equitable and engaged participation (Argyris, 1996).

Theories of Participation

Over the past decades, shared understanding of the concepts of public engagement and participation has evolved from one-way, top-down communication with citizens to local, public-led policy planning and participatory budget decision making. From the era of large scale projects in the 1930s, such as the Tennessee Valley Authority and other public works infrastructure, through the 1980s, participation meant passively receiving information or being consulted on decisions made by governmental authorities (Aldrich, 2008). For example, the Army Corps of Engineers controlled flood mitigation and land reclamation in the Gulf Coast since the 1920s, often constructing dam, levee, and water direction projects without consulting residents impacted by the facilities' negative externalities. In the early twenty-first century, however, residents expect to be fully informed of projects that can significantly impact their environment (Rowe & Frewer, 2005). For example, in 2018, the Water Institute of the Gulf convened an Environmental Competency Group in Lafourche Port made up of residents to co-design a wetland restoration project (Water Institute of the Gulf, 2018) that allowed for a high degree of local engagement in a climate-related project.

Devolution of power and decentralization of decision-making to impacted local populations has not been easy, especially for developing nations, but they remain the goal to ensure transparency and accountability (Arkorful et al., 2021). Many progressive U.S. cities, including New York, San Francisco, and Boston have moved from envisioning engagement as another form of outreach or education (Clark & Guzman, 2017) to a two-way process of interaction. City authorities recognize that engagement in everyday local governance, city planning and zoning, and urban design, among other decision-making processes, creates stronger outcomes, higher satisfaction in those processes, and deeper trust between authorities and community members. Observers have called participation, especially in environmental matters, "indispensable" because it brings "benefits both for administrators and for citizens" (Kasymova & Gaynor, 2014: 138, 143). Experimental evidence has shown that public participation in the formulation of environmental politics increases their influence on the process (Centofanti & Murugesan, 2022).

Importantly, front-line responses to climate change consequences such as flooding and extreme heat, including 'citizen science,' zoning, and development of mitigative physical and social infrastructure, are at the hyperlocal level and depend on the cooperation and trust of residents of vulnerable communities. Local residents are experts on how climate change impacts their communities and what solutions are feasible to mitigate those impacts. Whereas



Note: Scale developed using Boston Public Health Commission (2016)

Fig. 1 Levels of engagement

technocratic, expert-controlled decision making policy in fields such as waste disposal only peripherally involves citizens (McAvoy, 1999), climate responses in urban environments rest directly on them. Nonetheless many experts continue to believe that: "There is public input, but much climate work is highly centralized and technical" (Interview 1), implying that without proper training, residents are unable to truly engage in projects such as the siting of a nuclear plant or a bridge designed to relieve traffic congestion. We use three ongoing climate change mitigation and adaptation projects in Boston as case studies of participation in the field.

Evaluation Criteria

We use two sets of criteria to evaluate engagement and participation for our three case studies. The first uses three main categories: *equity*, *efficacy*, and *efficiency* (Germain et al., 2001). Equity captures the accessibility of engagement opportunities offered by the NGOs and planning organizations, for example, whether historically excluded, vulnerable and underserved communities—including people with disabilities, communities of color, and non-English speakers – were encouraged to participate when the projects were initially proposed and whether they did at that time or at a later stage. Too often these groups, especially Black, Latinx, and Indigenxous residents, have been marginalized by mainstream environmental movements, and have eschewed membership driven (and historically white) groups such as Greenpeace. On the other hand, many are motivated to engage when multinational companies and government decision makers disproportionately burden their communities with noxious and toxic development projects (Bullard, 1990). As one interviewee argued, ensuring equity requires "constant input and coalition building with grassroots organizations, focused on building social capital to increase resilience, looping in social justice organizers" (Interview 2). Given Boston's long history of environmental injustice through redlining and other institutionalized racist practices, it remains critical to involve communities facing high climate vulnerability as a result (Moran, 2021b).

Efficacy evaluates if community feedback played a role in influencing the ultimate outcome of the project, i.e., whether community feedback was effectively incorporated into the initial proposal, and if residents' recommendations changed the trajectory of the project.[1] Finally, efficiency analyzes if engagement strategies were timely and effectively completed goals within a reasonable period, and whether they were appropriately designed to encourage residents to attend and participate as well as scheduled in ways that made maximum attendance possible.

Our second set of evaluation criteria are based on the eight rungs of citizen participation proposed by Arnstein (1969) and used by the Boston Public Health Commission on their Community Engagement Spectrum to analyze community ownership over the three different climate related projects. Arnstein's scale began with manipulation and moved through therapy, informing, consultation, placation, partnership, and delegated power to citizen control. We draw on updated levels of engagement: inform, consult, collaborate, transfer decision making, and community driven/led (Boston Public Health Commission, 2016) (Fig. 1). This is a monotonically.

increasing scale, so that each criterion increases the community and resident ownership of a project or facility. Should city or regional authorities simply inform residents of their intentions – as the infamous "decide, announce, defend" framework used by governments when siting controversial facilities (Aldrich, 2008: 109) – there is a one-way flow of information and residents have no influence on the project. Informing therefore entails the lowest form of community ownership with the facilitator entity letting the public know only about the intended project. This updated version drops away the non-participation of manipulation and therapy identified by Arnstein as ways to substitute education for genuine participation. Consultation and collaboration involve two-way communication and even

[1] Following Japan's 11 March 2011 triple nuclear and climate disasters, for example, many citizens took to the streets to protest proposed nuclear power restarts because of the Fukushima nuclear accident (Aldrich & Fraser, 2017). Nonetheless as time has passed, successive ruling political parties have pushed harder for full restarts and even for new nuclear power plants despite broad opposition.

some decision- making sharing between authorities and residents. Should planning and subject matters experts or outside authorities conceive of a plan that they turn over to locals, we label that as transfer decision making. Community driven/led on the other end of the spectrum involves full autonomy in the hands of the affected community. That is, local experts alongside residents would create, manage, and control a project to be truly community driven. For Arnstein, community driven events fell under "citizen control" and meant that "participants or residents can govern a program or institution, be in full charge of policy and managerial aspects, and be able to negotiate the conditions under which 'outsiders' may change them" (Arnstein, 1969: 223).

Projects

We selected three climate resilience projects for analysis.[2] Project 1- structured by the City of Boston to map out future strategies for climate resilience in the neighborhoods across the city. The reporting project we analyzed was not the first of these attempts, but came after a series of similar reports in other neighborhoods. Boston city officials worked with outside engineering, city planning, and equity consultants when carrying out this project in a low-income community of color.

Project 2 was an ongoing project led by a community development corporation deeply embedded in a Boston neighborhood. Two staff members led conversations over several years on how residents could make their neighborhood eco-friendlier and climate conscious. Small projects were taken on over this time as funding and interest became available. This project took place in the same neighborhood as Project 1.

Project 3 was led by a museum and research institution in the Boston-area and was funded by the National Oceanic and Atmospheric Association (NOAA), a federal government department that has recently turned its attention to community resilience to climate change. Its purpose was to use citizen science to identify places in the Boston-area that were most affected by extreme heat. Volunteers drove around on extremely hot days to measure temperatures and to map the exceptionally hot and relatively cooler areas.

Methodology

Our primary source of information was structured interviews with participants, facilitators, and observers of our three climate projects based in Boston (IRB designation IRB #: 21–03-32). We interviewed eight relevant actors between May and August 2021 and an additional 12 individuals over three weeks in September 2021. Interview times averaged 45 min and were all conducted over Zoom due to COVID19 restrictions.

We compiled a standard set of questions adapted from Germain et al. (2001) that we edited slightly for participants or facilitators and provided opportunities for follow-up questions (Appendix 2). We recorded and transcribed all interviews for analysis. We interviewed five facilitators and one participant for Project 1, two facilitators for Project 2, and one facilitator, two intermediaries (see below), and one participant for Project 3. Most interviewees were selected because of an initial stakeholder assessment of each project, and we contacted a list of 50 individuals in first round outreach. We conducted a dditional outreach through the snowball technique by gathering recommendations from interviewees; interviewees were offered compensation for their time. Because of a lack of consistent social media outputs across these three projects and a lack of resources, we did not use social media data as part of our analysis.

Analysis

As we described above, we analyzed each project using two sets of criteria: the degree to which the project reflected the values of equity, efficacy, and efficiency (Germain et al., 2001) and the project's location along the spectrum of community engagement of inform, consult, collaborate, transfer decision making, and community driven/led (cf. Boston Public Health Commission, 2016).

Project 1

Equity

Respondents noted high levels of equity in terms of the ability to participate in engagement for Project 1. Within the three phases of community engagement (understanding risk and priorities, educating and design sharing, final feedback) respondents noted ample opportunities for interaction with city agencies, access to translation services for residents using English as a second or third language, and contact with project stakeholders at community meetings.

Facilitators attended existing meetings throughout the community and hosted their own events. They also held targeted one-on-one meetings with key community stakeholders whom they identified from a deep community analysis. A facilitator from local government noted that a "roadshow" of community engagement to different meetings and organizations was added to the plan after additional engagement was deemed necessary.

[2] We refer to them as Projects 1,2, and 3 only to protect their identities.

> "I think even though the roadshow wasn't originally built into our engagement plan, it's something that had to happen to make sure that we were really connecting and following up, making sure that we were integrating thoughts. Whenever we have the opportunity to connect with our community it's always good." (Respondent 9, Facilitator)

Facilitators deliberately provided an array of engagement opportunities that met the needs of the community and adapted their strategies as needed to reach as many stakeholders as possible. Based on a variety of metrics, including the wide range of residents engaged by meetings, attempts to make sure that cross-linguistic communication included a broad variety of people for whom English was a second language, and the willingness of agencies to create additional opportunities through a roadshow on the project, we evaluated Project 1 very high in terms of its equity.

Efficacy

Respondents noted that the engagement process was extensive and iterative. Plans were presented to the community during the meetings, facilitators captured feedback, and accordingly updated plans. Rather than a single burst of initial work, Project 1 repeated this cycle several times. A facilitator from the private sector noted:

> "In terms of shaping where it went, it was very iterative, where initially through the process there were a lot of strategies working back and forth with city, in terms of what to present to the public, you know, ultimately what you have just looking at a plan, this isn't gonna be palatable to the public at all. They're not going to want this, yeah just throw that out. And you're ultimately getting it down to something that was a little bit more digestible, to show a couple of options and ultimately getting refined and moving forward. So, it was a very long iterative process in that report." (Respondent 10, Facilitator)

Both facilitators and participants noted changes to the report because of the community engagement process. One notable shift was the addition of more social components to the plan whereas the original themes of the report were centered around physical infrastructure. A local government facilitator commented on this phenomenon:

> "Yeah, so I think historically, the focus for coastal resilience projects has been more infrastructural. But something unique about [community X] that came up in conversations a lot was a feeling of being disconnected from the coastline for the communities that lived more inland … making sure that there's still public access to the coast line and to coastal parks and increasing access as we plan to build the necessary infrastructure was a critical part of this conversation around social cohesion. And so I think integrating a more human aspect of things was a bit more core to the [community X] process than what we had seen in previous resilience planning projects." (Respondent 9, Facilitator)

Social cohesion and public access to the waterfront became keystone components of the final plan directly because of community input. Because community voices came through clearly in the final report, and due to the willingness of city administrators to extend the project as additional feedback altered the plans for the project, we rated Project 1 as high in terms of its efficacy.

Efficiency

The community engagement process for Project 1 was extensive and took place over several months. Respondents generally indicated that the time was needed to achieve higher levels of engagement and feedback within the community. However, one respondent noted that there was noticeable meeting fatigue amongst the community members in community X due to several different planning processes ongoing at the same time through different organizations or entities. We evaluate the efficiency of the project as medium due to the challenges of maintaining flagging interest and limited time availability.

Community Engagement Spectrum

Based on our interviews, Project 1 would fall into the *consult* level of the Boston Public Health Commission Community Engagement Spectrum. This level has a goal of providing "two-way communication to obtain feedback on existing issue(s), projects, processes, or ideas," and promises to the community that "we will inform communities of public health issue(s) or decisions that need to be made, obtain their feedback, and report back on how their input influenced decision(s)" (Boston Public Health Commission, 2016).

Although respondents remarked favorably on the equity, efficacy, and efficiency of the community engagement strategies of the Project 1 report, there was not true community ownership of the process or the outcome. A private sector facilitator noted this,

> "I would say this project fell in the middle of engagement at more than just inform. Alright so we have the public community meetings where folks provided their input and data was collected and used to inform the next community meeting where folks

> will provide additional info so it was definitely beyond informed but it was not full ownership. The community did not have full ownership over this." (Respondent 11, Facilitator)

Reports carried out later of this series of engagements in different neighborhoods made progress on this regard by adding in community advisory boards. These councils consist of members of the community being researched and made part of the community engagement design process from the beginning. This new development would place the report into a different engagement category, but with the lack of community ownership in the Project 1 process, it remains in the Consult category.

Project 2

Equity

Project 2 consisted of a different community engagement process than the other two projects and lacked a formalized plan for engaging the community. Therefore, it is more challenging to evaluate the equity in access to engagement opportunities when they occurred on an ad hoc basis. I mpromptu engagement may seem to be inevitability linked to a lack of accessibility. However, because the facilitator organization was already deeply embedded into the community, opportunities for engagement were more organic and were accessible constantly outside of any specific forum. The leader of Project 2 noted:

> "They [community members] have regular monthly meetings. For years I would just go to their meetings every, you know, every month, and talk to the leadership team, or present ideas to the neighborhood." (Respondent 12, Grassroots NGO Facilitator)

There were no standard accessibility components to the engagement, but because Project 2 is an evolving series of projects, communication with the public was ongoing and organic as new issues or ideas surfaced from public meetings. Another staff member of the facilitator organization noted the various methods of receiving feedback:

> "We collect as much feedback as possible in different ways. When we had the meetings in person everybody was welcome to speak, but also we had around the room in the meetings notes where people can write about different issues or solutions for how they see things. So we provide different tools and ways to give us feedback in a more accessible and easy way. And also people can send follow up emails and all of that. These are strategies that we use to try to use different channels of communication in person or via phone." (Respondent 13, Grassroots NGO Facilitator)

Because of the irregular but intense meetings between project organizers and the community, and the variety of tools used for collaboration, we rate Project 2 as medium on equity.

Efficacy

There was an exchange of ideas between the facilitator organization staff and the community members that had been an ongoing conversation for several years. The facilitators presented ideas for projects derived from their own staff or from grant opportunities to the community at standard public meetings and received feedback from residents. On the flip side, community members presented ideas to staff, and they provided feedback on logistical or financial feasibility for their community. Residents steered the conversation and decided upon what projects were ultimately pursued. For example, residents indicated that an issue facing their community was high energy bills, and facilitator staff sourced existing loans and rebates for energy efficiency measures and solar panels.

A respondent from the facilitator organization noted a time when they wanted to champion acquiring LEED (Leadership in Energy and Environmental Design) certification for the buildings in the neighborhood. Over time, residents did not see the benefits of this project and did not want to continue pursuing it, so the project stopped. It is evident that community input was effective in steering the direction of Project 2. We rate this project as high in terms of efficacy because of the ability of the project organizers to elevate the goals and visions of the community and take their voices seriously.

Efficiency

Engagement opportunities for projects in this field were held on an "as needed" basis, and feedback could be provided in a myriad of ways directly to the facilitators, often anonymously. This allowed residents to engage with staff on their own time. It also ensured that engagement opportunities were held only when necessary. Another component a respondent described as increasing efficiency was to remain connected with community organizations in the area to ensure work was not being repeated and time was being used most effectively.

Respondents referred more than once to the importance of relying on programs and funding sources that already existed and connecting their residents with them to address their concerns rather than trying to "reinvent the wheel." One respondent noted that the facilitator organization used to have a door-to-door program to educate residents on existing energy efficiency programs. Due to mounting time and

resource pressures, that organizer passed that work on to another partner better suited for it. The facilitator organization worked to avoid inefficiencies by not repeating work already done and highlighting existing programs and funds. We rated the efficiency of Project 2 as high.

Community Engagement Spectrum

Project 2 falls in between the Collaborate and Transfer Decision Making categories of the Boston Public Health Commission Community Engagement Spectrum. The Collaborate level entails, "partner[ing] in each aspect of decision making including the development of alternatives and identification of preferred solutions" and "establish[ing] shared decision-making roles with communities and commit[ing] to working together to identify public health issue(s), joint projects, and solutions" (Boston Public Health Commission, 2016).

The Transfer Decision Making level entails, "Plac[ing] final decision making in the hands of communities" and "guide[s] and provide[s] sufficient resources to communities so they can lead the development and implementation of public health strategies, projects, and public policies" (Boston Public Health Commission, 2016). One respondent highlighted the collaborative relationship between the staff and the community:

> "They have their own ideas as well, certainly...it was kind of a give and take process, you know, we would float things. They would float things, and they would flip things. We've kind of figured out what we could do." (Respondent 12, Grassroots NGO Facilitator)

However, community members had clear decision-making power over the direction of Project 2 and could veto a project if desired, as exhibited in the LEED example. Residents also took active roles in the implementation and logistic details of the projects. One example revolves around a grant provided to plant more trees in the community:

> "So we brought together all the residents who are interested in planting trees, and provided this technical assistance that they were giving us, and then the residents decided what kind of tree they wanted to plant. Some people like fruit trees.... Some people thought 'these fruits are going to bring rats to my yard. I don't want that.' So people decided what kind of trees they want." (Respondent 13, Grassroots NGO Facilitator)

Another example involved air quality monitoring:

> "We had quality monitors. We have two types, ones that are indoors and fixed and the other ones... that are mobile, so you can have it with you, you can have it wherever you want. People can keep track of the conditions of the air, so they decide what they want or they don't want.... Yeah, and they decided in the end." (Respondent 13, Grassroots NGO Facilitator)

Although there was much collaboration between the facilitator organization and the community members that consisted of almost a decade of ongoing conversations, residents had general decision-making powers in what projects were pursued and how they were implemented.

Project 3

Equity

Facilitators in Project 3 made efforts to ensure that opportunities for engagement were accessible; however, various obstacles limited this goal. According to interviewees there were three stages of engagement: 1) initial information spreading about the project at farmer's markets, festivals, meetings, webinars, and other public sites, 2) recruiting citizen scientists by reaching out to community groups and city officials to inform their members; and 3) holding open meetings to share back data and the project's effects on community members.

Concerns about equity for phases 2 and 3 arose from our interview respondents. Initially in phase 2, city officials provided "community" feedback on proposed plans rather than receiving the information directly from the public. Two local government respondents played the role of intermediaries and facilitated outreach and mapping in their jurisdictions. This created a filter point, streamlining the feedback gathering process, and avoiding direct engagement with the broader public for these decisions. Nonetheless, the public did have opportunities to provide some input into the mapping process as a staff member at the main facilitator organization notes:

> "Every single recruitment event that we did, we had maps out, and we had people put x's or dots where they thought would be the hottest, make sure that we're listening to the community and what they felt was because, I mean none of us live in all of these places, so we don't know the community members area best. We really wanted to make sure that we're creating all of these maps ... that the community thought was the hottest." (Respondent 14, Museum Facilitator)

Some equity concerns also arose concerning the inflexibility with participation in the mapping process, a fact that was challenging to overcome. Due to the nature of the heat mapping required, participants needed to own a car with a navigational device to be able to join the temperature mapping project with only last-minute notice if the day would be

over 90 degrees and needed to be available to drive around at 6am, 3 pm, and 7 pm on that day. These challenges were fixed and could not be altered, impairing the accessibility of participating in the study.

For the phase 3 portion of engagement, the open meeting was held at the facilitator organization's primary location and was free for anyone to enter. But the main organization facilitator noted that there are still barriers to attending an event at night with babysitting costs and the distance of the meeting location from different neighborhoods in Boston. One other respondent noted:

> "My visual read of the room, rightly or wrongly, was that most of the people that were there were people that were already Project 3 'groupies' ... Sustainability advocates, but more so from people that aren't usually involved at the local government level but are maybe volunteering their time with you know a certain national nonprofit group, or on the data science side, an engineering organization advocacy group." (Respondent 16, Local Government Intermediary)

There were concerted efforts to make this event accessible to the public at large, but the overall effect was that communities most affected by extreme heat were generally not in attendance at the open meeting. Due to the challenges in engaging a broader audience, the rigidity of the requirements for participation, and the use of government respondents as filters for community voices, we rated project 3 as low in terms of equity.

Efficacy

As discussed above, community members did have some say in the designing the routes of the mapping process by highlighting areas in their communities that they felt were the hottest. However, there is some discrepancy amongst interviewees about the impact that had on the outcome of the routes chosen. The city leader from Cambridge noted,

> "Also, I think it's not like you want to drive the route that's popular. You want to drive the route that makes sense from a data point. You know, you capture areas that are likely to be hotter and areas where there are probably our vulnerable populations. And we know where those are. So, I don't see a big value in putting it up for a democratic process... I guess in my experience with things like that, people don't actually really have that much to say about it." (Respondent 1, Local Government Intermediary)

Additionally, the idea for a project looking at extreme heat in Boston and other cities was not a community-driven idea. The main facilitator organization received a grant from NOAA for an environmental literacy program specifically for extreme heat. The main facilitator respondent commented:

> "So the very first step for us was talking with, in this case you could probably argue cause the planners aren't quite community but they do live in these areas, so it was more like what project or what can we do to help the community as a whole. So after talking with them and finding this opportunity, we were like, we need to do this heat mapping process." (Respondent 14, Museum Facilitator)

It is unclear how community input impacted the decision to pursue a citizen science heat mapping project or the final route decisions. Given this uncertainty and the difficulty in community voices being represented in outcomes such as mapping routes, we evaluated project 2 as medium in terms of efficacy.

Efficiency

Interviewees remarked favorably on the degree of interaction and effective use of tools to convey information during engagement activities particularly at the final open meeting. Local government respondent 16 noted the various interactive activities at the final meeting which included: panels, booths for people to ask questions, role playing games, etc. Additionally, by attending already existing fairs, events, and meetings for initial engagement, facilitator staff maximized community presence at a location for engagement. In addition to the final meeting, facilitator staff were available by request to come to community or organization meetings to present the final data and even went to a community group Christmas party to report back data. This strategy ensured that engagement was happening as requested and in places where residents would already be, reducing the extra amount of time needed for community participation. Based on this data, which showed that little time was wasted for residents and those who sought to engage with the project, we evaluated Project 3 as high in terms of efficiency.

Community Engagement Spectrum

Project 3 falls into the Inform category of the Boston Public Health Commission Community Engagement Spectrum. This entails "Communicat[ing] to share information, listen for understanding, and clarify information" and "provid[ing] communities with balanced and objective information to assist them in understanding public health, city issue(s), opportunities, alternatives, and potential solutions" (Boston Public Health Commission, 2016).

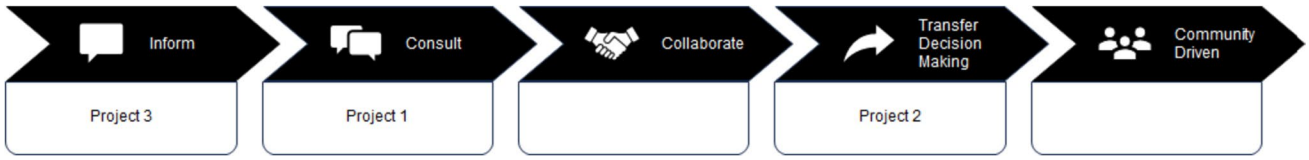


Fig. 2 Degree of engagement for each project. Note: Scale developed using Boston Public Health Commission (2016)

The facilitators communicated heat mapping information back to the community with thorough and engaging strategies. They presented data, highlighted the community contexts, and demonstrated how different neighborhoods would be impacted by extreme heat. These data are publicly available and accessible for any organization or individual's needs.

However, communities did not have ownership over this project, did not choose the topic, did not design its implementation, and did not have decision making power. Community members were invited to participate in the mapping process (although as noted above that was somewhat inaccessible), could provide some input into what areas they wanted to map, and were presented the information once completed. The main facilitator organization held ownership of the project almost entirely.

Discussion

While NGOs, residents, and government decision makers alike push for greater engagement, local resident engagement is no panacea in the policy sphere (Clark & Guzman, 2017). It is also clear from these three projects that "it can be a challenge to get the community involved" (Interview 4). Nevertheless equitable, efficient, and efficacious participation measurably improves residents' satisfaction and trust. We evaluate the degree to which these three projects engaged the community and rank them in terms of equity, efficacy, and efficiency (Fig. 2).

Project 1 took a methodical approach to include as many community stakeholders as possible, adding engagement opportunities after the initial plan presentation to ensure that all perspectives were included in the planning process. Community feedback did in fact change the outcome of the report to include more social concerns. However, there was not true community ownership of the report, although this may change with future iterations.

Project 2 is an almost decade-long, ongoing engagement process where ideas are free flowing between facilitator organization staff and community members over time. Engagement strategies are more organic, and residents can contact staff members at any time. Projects without community support were not pursued or not completed, indicating strong community ownership and participation in the projects chosen.

Project 3 engaged the public to participate as citizen scientists in their extreme heat mapping study and offered opportunities for community members to suggest areas to map. They held an interactive event open to the public to report back the data that were collected and were available to present the data to any community group that asked. However, the topic of the project was not sourced from community concerns, and residents did not have decision making power over the project.

Project 2 clearly provides the highest level of community ownership out of the three study projects but operates on a hyperlocal scale. Whether this level of community ownership and organic community engagement is feasible on a broader scale, such as the city level, remains unclear. Future studies should examine how neighborhood decision making power can be scaled up to a city level. Along with ranking the projects in terms of their community engagement, we also rank them in terms of our three criteria: equity, efficacy, and efficiency (Fig. 3).

We note that none of the projects achieves a high ranking across the three categories, and that some, despite their reputation to the contrary, rank as low in terms of equity. For NGOs, local government agencies, and community organizations, we found what seemed to be a trade-off across these measures. Ensuring high levels of equity required far more intensive sets of meetings and time, meaning the efficiency diminished.

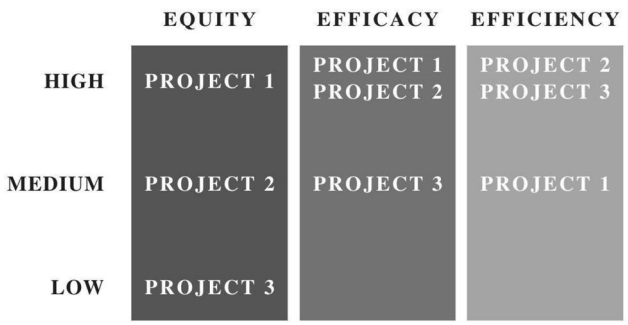


Fig. 3 Ranking the projects in terms of equity, efficacy, and efficiency. Note: Scale based on Boston Public Health Commission (2016)

Limitations

Our geographically scoped, qualitative study faces several limitations. First, additional interviewees from each project would have provided a richer understanding of perspectives on community engagement strategies. Project 2 especially lacked perspectives with only two interviewees involved in the project. We used a variety of channels to reach out to potential informants but found that, perhaps because of COVID19, Zoom fatigue, and concerns about their reputations, additional informants (and interviews) were not forthcoming. Our overall response rate, then, was limited by researcher capacity and individual preferences during a pandemic.

Second, most of the interviewees were facilitators or intermediaries. We lack a true participant perspective from all our analyses of the three projects. Reaching participants was more difficult than reaching out to facilitators, because information on who attended public meetings or other outreach events was not publicly available. Additionally, all these projects began some years before our study, and if a participant only engaged in a few meetings, found it difficult to remember their experience. As a result, it was challenging to get clear opinions on the equity, efficacy, and efficiency of participants experiences.

In future studies, interviews should be conducted closer to the community engagement process so that participants are able to more readily remember their experiences. Accessing participants was also made difficult by limited contact information. For example, Project 1 provides a list of all organizations they consulted during their community engagement process but does not provide names or contact information. Many of these groups are hyperlocal and do not have actively utilized websites or social media. This limited our ability to effectively contact participants. Future studies should seek to use available social media data in evaluations of project participation, with the caution that organizations regularly release information slanted to improve their image. Further, we found it difficult to identify similar levels of social media data across these projects.

Conclusions and Policy Recommendations

Our study focused on three relatively recent climate projects in the city of Boston: Project 1 was led by the city government and consulting agencies, Project 2 was led by a grassroots community organization, and Project 3 was led by an NGO. Boston's reputation as a progressive city with a focus on climate adaptation has not stopped many environmental justice and adaptation projects from reinforcing injustice and inequity (Malloy et al., 2022). Our analysis found that these each of these projects took a very different approach to their community engagement tactics, with the projects rating highly across some of our three core criteria of equity, efficacy, and efficiency, but not all simultaneously. Scholars have argued that ideal types of participation come from the interaction between state agencies that work to induce participation (beyond organic engagement) and bottom-up civil society organizations (Mansuri & Rao, 2013). Such a normative approach would see the case studies we have described – with none completely driven by local interests – as more likely to be effective in delivering necessary outcomes. Should decision makers prioritize activating a broader alliance of participants by deepening participation, Boston (and other cities modeling its approaches) could better tackle environmental justice and equity, which may be accidentally deprioritized by climate projects.

Based on our research, we have three concrete recommendations to increase civic engagement in the climate change space. First, philanthropists and federal, regional, and local agencies should invest additional financial resources in incentives for participation. This follows the research of those who see the need for induced participation as critical to build up a larger core of civil society organizations, residents, non-governmental organizations, and other stakeholders (Mansuri & Rao, 2013). We agree with the suggestion of one of our interviewees, who argued "Creating incentives for them [residents] to put in the time and continue to be involved and hope to make a community so they stay involved in the entire infrastructure project" (Interview 2). Other cities seeking to increase engagement on issues of hazards and risks, such as San Francisco, provide financial incentives to neighborhoods through programs such as Neighborfest (Neighborhood Empowerment Network, 2022).

Second, beyond investing or supporting ad hoc projects (such as heat maps, etc.), we believe that the City of Boston and other coastal communities should co-develop a curriculum on sea level rise with local students and educators (cf. Ahrabi-Nejad et al., 2022). By creating curricula at the middle and high school levels for students living in vulnerable coastal communities, and by creating a corps of 'citizen scientists' with the skills and experience to make informed decisions, Boston and other cities would increase the pool of future participants as well as raise the level of knowledge about this critical issue.

Third, Boston and other cities should invest time and effort in building ties to existing community organizations to build trust and reciprocal information flows. Permanent strategies for ongoing and future engagement with communities can help residents become involved before city hall or NGOs make decisions about investments in new projects. Rather than appearing for specific types of meetings, cities should flip the script on civic engagement and embed with community organizations, faith-based groups, and

volunteer organizations. One organization in New Zealand, the Wellington Regional Emergency Management Organization (WREMO), requires its staff to spend one third of their time in these events and meetings (Aldrich, 2015). By showing community organizations that the city is committed to long term engagement, agencies build trust with residents and encourage the formation of long-term relationships that facilitate cooperation and engagement. Further, as Boston moves to create community councils to help collaborate on Project 1 reports, such participants should be compensated for their involvement.

Research across 160 + U.S. cities has shown that those with more local climate action networks – such as regional or city-based compacts, plans, and partnerships – undertake more adaptation and mitigation strategies than those without (Soni et al., 2022). As the effects of climate change continue to accelerate, the ability of communities to design their own solutions will only become more essential for survival. It is paramount that cities deploy strategies that require community visioning to drive climate policy. When communities engage at all levels of planning and implementation alongside a supportive state and engaged experts, proposals better reflect the lived experience of residents and receive more enthusiastic support from the public, thus contributing to more effective outcomes. The climate crisis is urgent, and community expertise is needed to create plans that allow all neighborhoods in Boston to thrive.

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Declarations

Ethical Approval The primary source of information for this research endeavor came from structured interviews with both participants and facilitators of the multiple climate projects based in Boston. The authors received Institutional Review Board approval for these interviews from the Northeastern University IRB, number 21–03-32.

Competing Interests The authors declare no competing financial or personal interests.

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