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Climate justice in urban public space adaptation: Developing and testing a collective assessment tool in Hunters Point, New York City

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ABSTRACT

Public spaces play a crucial role in climate action as the main setting of many urban adaptation interventions, while also critical for public life and social resilience. Public space is often contested since it can help develop justice-based urban climate adaptation, but can also drive different forms of injustice and maladaptation. Examining public space adaptation processes through the lens of climate justice is essential to identifying, learning from, and preventing maladaptation outcomes. However, there are currently no frameworks to facilitate the understanding of the relationship between climate justice and the design of public spaces or evaluation tools to assess its outcomes. To fill this gap, we developed and pilot-tested a new evaluation tool for the collective assessment of climate justice in already implemented public space design projects through a case study in Hunters Point South Park, New York City. While examining the particularities of this case, we also critically explore the potential and applicability of this assessment tool in other contexts and for broader justice assessments of urban adaptation interventions.

1. Introduction

The urgency of climate adaptation in urban environments is unequivocal. In this context, adapting public spaces emerges as a key strategy adopted by numerous cities worldwide to enhance resilience, either through natural or grey solutions (Solecki et al., 2017; Collier et al., 2013). Public space design is critical for the resilience to climate change, due to its potential to minimize climate impacts through their physical, functional, or ecological elements (Dhar and Khirfan, 2017; Graça et al., 2022; Kántor et al., 2018; Santos Nouri et al., 2018). Unlike engineering solutions like dikes, or nature-based solutions such as green facades, public space plays a central role

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in social and political life, crucially influencing the creation (or prevention) of a more just city (Fainstein, 2005; Gehl, 2013; Low, 2013; Lynch, 1981; Mitchell, 2003). Moreover, public space design can also be considered as a ‘first line of defense’ to adapt buildings to climate change, as they can reduce or eliminate impacts before they affect buildings and people (e.g. filtering stormwater runoff or lowering outdoor temperatures to reduce energy demand in buildings). The transformation of public spaces as resilient urban commons could help rethink urban futures around the criteria of climate justice (McPhearson et al., 2021).

Yet, amidst the imperative to prepare cities against future climate impacts, there is also ample evidence of the uneven progress of climate action and the unjust outcomes it might cause (Anguelovski et al., 2016; Grabowski et al., 2023; Long and Rice, 2019; Magnan et al., 2016; Robin and Broto, 2021). Monitoring and evaluating (M&E) adaptation progress is key to tracking progress and understanding how and to what extent adaptation actions are working and for whom. However, beyond normative suggestions and critiques, up to now specific indicators for climate justice have been rarely defined. Debates on just climate adaptation have hardly focused on urban design, and while M&E is an essential step in project management and climate adaptation planning, it is not common in design practice (Ahern et al., 2014). Hence, there is a persistent gap in available frameworks or guidelines to illuminate the complex interplay between climate justice imperatives and the design and implementation of public space, as well as to delineate specific evaluation parameters for such assessments.

Here we present and test the Climate Justice Assessment in Public Space (CJAPS) tool, designed to collectively examine the planning, design and implementation process of public space adaptation projects under climate justice criteria. The CJAPS tool was applied to Hunters Point South Park in New York City (NYC) through a combination of secondary data analysis conducted by the authors and structured engagement with a diverse range of stakeholders. Stakeholders provided scores assessing both the park’s performance in meeting climate justice objectives and the adequacy and usability of the CJAPS tool itself. The experience suggests that there is a need to balance complexity in monitoring and evaluation tools for adaptation, especially to integrate place-based histories alongside performance considerations.

2. Literature background

2.1. Assessing just climate adaptation

In the last decade, there has been a growing interest both from academia and from public institutions to assess progress in climate adaptation, since it is crucial to determine the effectiveness of the actions, adjust strategies, improve accountability, and prevent maladaptation. The task of evaluating adaptation progress faces several challenges, including the complexity arising from the overlapping dynamics of climate impacts, socio-ecological systems, and urban systems (which makes it difficult to attribute specific changes to adaptation measures); the lack of baseline data; or the uncertainty about future scenarios (Adaptation Committee, 2021; Berrang-Ford et al., 2019; Dilling et al., 2019). Moreover, narrow or utilitarian definitions of what constitutes effective and successful adaptation emphasize the balance of costs versus benefits, at the expense of a more integrated and nuanced understanding of the procedures and values that make adaptation successful. Beyond costs and benefits, adaptation depends on its ability to advance social transformation and climate justice, seeking material, subjective, and relational wellbeing goals (Amorim-Maia et al., 2022; Singh et al., 2022).

The development and application of adaptation progress indicators by academics, institutions and governmental bodies have proliferated recently. While diverse approaches exist, indicator-based frameworks have gained substantial traction within both public and private governance domains (e.g. Adaptation Committee, 2021; C40, 2019). However, these frameworks pose particular challenges, including their conceptual foundations, the interpretation needed to make them relevant for policy or management decisions, and the need to validate their social and contextual relevance beyond ecological or economic robustness (Arnott et al., 2016; Barré, 2010). The constraints of quantitative metrics suggest that they should be combined with qualitative approaches based on narratives and stakeholder feedback. Therefore, shifting toward collective assessment processes incorporating scientific, practitioner and subaltern knowledge is crucial to ensure a more comprehensive and legitimate evaluation (Feldmeyer et al., 2019; Meerow and Stults, 2016; Olazabal et al., 2021; Venable et al., 2022).

Apart from tracking adaptation progress over time (monitoring) and judging its success against specific benchmarks (evaluation), assessing if and how adaptation is being deployed in a just way has become imperative. In this context, ‘assessment’ refers to the broader process that encompasses both monitoring and evaluation, integrating objective criteria for comparability with subjective, context-specific criteria that reflect place-based experiences of justice. Climate justice builds upon four decades of discourse and activism in the field of environmental justice, and today encompasses aspects of intergenerational justice and power dynamics, linking to debates around just sustainability or socio-spatial justice (Castán Broto and Westman, 2019; Fraser, 1996; Gould and Lewis, 2016; Schlosberg and Collins, 2014). While the concept remains subject to debate, contemporary approaches often emphasize three core dimensions of climate justice, namely ‘distribution’, ‘procedure’, and ‘recognition’. These dimensions pertain to the fair allocation of rights and responsibilities regarding climate action, to questions of inclusion and exclusion in decision-making processes, and the acknowledgment of diverse stakeholders and their experiences, values and preferences, respectively (Anguelovski et al., 2016; Bulkeley, 2013; Bulkeley et al., 2014; Holland, 2017; Schlosberg, 2007; Shi et al., 2016). Scholars in the Global South discussing urban climate justice emphasize the key importance of recognizing how colonialism and racism have influenced climate policy and action. They call for acknowledging the history and legacy of colonialism in climate action and promoting cultural change within institutions, which includes questioning current inclusion practices and accepting multiple realities when planning, implementing and measuring climate action beyond the Global North’s perspectives (e.g. Abimbola et al., 2021; Ajibade, 2017; Allen et al., 2017; IPCC, 2022).

Although climate justice considerations should be essential in any adaptation M&E system, recent reviews found no explicit

assessment metrics for just and equitable adaptation frameworks (Singh et al., 2022). Some academic studies propose conceptual frameworks of what climate justice implies in urban climate adaptation responses, but do not provide specific indicators or metrics (Anguelovski et al., 2016; Bulkeley et al., 2014). Other climate justice assessment frameworks rely on narrative content analysis of planning documents, while they recognize that it is essential to also examine the injustices that may emerge in adaptation implementation (Chu and Cannon, 2021; Juhola et al., 2022). Hence, despite the growing debates around urban climate justice, its practical operationalization and application to assess and learn from implemented adaptation interventions has been scarce. This reveals a fundamental tension: on one hand, the convenience for defining specific indicators and metrics to enable benchmarking, comparability, and generalization across contexts; on the other, the necessity of acknowledging and incorporating the complexity, situated knowledge, and place-specific experiences that shape climate justice in each unique project. The assessment tool proposed in this research aims to address this duality, as we will explain later.

2.2. Climate justice in the urban arena

With regard to climate justice concerns about urban adaptation implementation, there is a growing concern from the most critical sectors of academia about forms of climate urbanism that prioritize market-based investments, such as green bonds, carbon control, and large-scale, capital-intensive resilient infrastructure projects. These approaches often emphasize technological fixes and private-public partnerships, which focus on the economic generative capacity of cities while neglecting social dimensions and perpetuating vulnerability and inequality (Castán Broto and Robin, 2020; Long and Rice, 2020; Shi, 2020; Sultana, 2021). However, addressing the recognition and restoration of urban power dynamics is not the dominant trend. Instead, much of the climate justice literature focuses on the spatial arrangement of climate hazards or vulnerability indicators in the city (distributive justice) or assesses the degree of transparency and participation in the urban adaptation process (procedural justice).

Among the diverse type of urban adaptation interventions applicable to urban areas, those that are implemented through the transformation of public space take on special relevance. Public space is a critical urban setting where spatial, social and climate (in) justice are articulated and made visible. Here, we understand public space as “all places publicly owned or of public use, accessible and enjoyable by all for free and without a profit motive” including parks, gardens, playgrounds, public beaches, riverbanks and waterfronts (UN Habitat, 2015). Along with being a key point for the integration of natural solutions in the urban fabric, it is an expression of the cultural, social and political life of the city. However, public space adaptation, either through natural, structural, or combined solutions, can also instigate exclusivity and market-driven developmental trajectories (Doherty et al., 2008; Kohn, 2004; Németh and Schmidt, 2011; Owens, 2002). Green solutions often increase urban attractiveness, and resilient structural solutions, in addition to this, usually require larger investments compared to traditional construction. Consequently, they often trigger an increase in land and property values, displacing lower-income and minority residents while drawing higher-income individuals or businesses to previously undesirable areas. This phenomenon, known as green, climate, or resilience gentrification, has garnered considerable scholarly scrutiny, and is a key part of current debates on urban climate justice (Anguelovski et al., 2018; Curran and Hamilton, 2012; Gould and Lewis, 2016; Keenan et al., 2018; Rigolon and Németh, 2020).

As for the scope of public space design interventions, a recent study found a dearth of urban design discussions on climate justice, an overemphasis on normative suggestions and critiques, and a deficit of empirical studies that operationalize and evaluate the climate justice dimensions (Mohtat and Khirfan, 2021). Urban studies researchers have proposed indicators and assessment frameworks to assess public space in terms of justice (Gehl Studio NY, 2015; Jian et al., 2020; Low and Iveson, 2016), in terms of its climatic resilience capacity (Orsetti et al., 2022; Peinhardt, 2021; Santos Nouri and Costa, 2017) or in terms of its general quality (Mehta, 2014; Praliya and Garg, 2019), but not specifically in terms of climate justice. These frameworks are generally limited to the area of the project intervention, without inquiring about the socioeconomic dynamics that may be triggered across the neighbourhood following its implementation. Additionally, they are often formulated and applied by academics or urban decision makers. Similar to the challenges in evaluating climate adaptation progress, there's a need for collaborative assessment methods involving diverse stakeholders and knowledge bases, which would facilitate collective learning processes.

Building a common framework to operationalize the concept of justice through guiding metrics and indicators can support decision-makers in adopting justice-oriented approaches. However, to effectively track and promote climate justice, assessment frameworks must also integrate diverse stakeholders and knowledge systems. Striking a balance between structured metrics and inclusive, context-sensitive approaches is essential, and is what the proposed assessment tool aims to achieve. To explore how decision-makers can track and promote climate justice in public space adaptation initiatives—while integrating place-based histories and lived experiences into monitoring and evaluation frameworks—the central research question guiding this study is: *Can context-sensitive indicators be defined to evaluate climate justice performance in already implemented public space adaptation projects?*

This paper contributes to addressing this question by developing and pilot-testing a collective climate justice assessment framework designed specifically for evaluating completed public space adaptation projects. Our research builds on existing work by defining and applying a set of climate justice performance metrics relevant across all phases of adaptation—from planning to design and implementation. While the pilot test is exploratory in nature and limited in scope, it offers preliminary insights into the framework's usability and the challenges of integrating multiple forms of knowledge into a single evaluative structure. Rather than providing definitive conclusions, the pilot highlights areas for further development and refinement, and suggests that such tools may support broader efforts to articulate and assess diverse understandings of climate justice in the context of urban adaptation.

3. Methodological approach

The conceptual and operational development of the tool presented in this paper builds on previous literature review and qualitative analysis that identified and categorized potential climate justice evaluation parameters applicable to urban public space adaptation projects (Ruiz de Gopegui et al., 2024). The methodology for the development and testing of the CJAPS tool consists of three main stages: 1. Tool development; 2. Case study selection; and 3. Data collection and analysis (see Fig. 1). Here, we discuss the results obtained from the third stage, where the tool was tested through its application to a specific case study.

The CJAPS tool consists of a set of evaluation parameters, which operationalize the three dimensions of justice and are assessed both quantitatively and qualitatively by a diverse range of stakeholders. The first dimension refers to “Project impact distribution” (distributive justice); the second to “Project governance, communication and transparency” (procedural justice); and the third to the “Recognition of perceptions and structural drivers of climate vulnerability” (recognition justice).

3.1. Tool development

Stage 1a refers to a previous study that involved a literature review followed by the identification and characterization of potential evaluation parameters for assessing climate justice in public space adaptation (Ruiz de Gopegui et al., 2024). Through thematic analysis, five overarching themes were distilled, reflecting the diversity of evaluative approaches found in the literature: (a) distribution of project impacts; (b) governance and knowledge inclusion; (c) communication and transparency; (d) space perception and use; and (e) recognition and repair of structural vulnerabilities. For each theme, we identified sub-themes and their relationship to both climate justice dimensions and public space dimensions (see Table A1 in Supplementary Information), as well as specific evaluation parameters associated with each (see Appendixes in the cited study). These themes illustrate a rapidly evolving yet fragmented body of knowledge. While no existing framework was found to specifically monitor or evaluate public space adaptation projects from a climate justice perspective, the parameters and approaches identified offered valuable insights for future practice. Notably, our findings revealed strong interdependencies among the three core dimensions of climate justice—distributional, procedural, and recognition justice—as well as their overlap with key aspects of public space design, governance, and usage.

Stage 1b involved the operationalization of the parameters into a coherent set of metrics and a scoring system. The evaluation parameters identified in the literature were reviewed and synthesized to eliminate redundancies and enhance coherence. They were then transformed into distinct metrics, and, where necessary, further disaggregated into sub-metrics. Metrics were grouped into components, which were in turn organized under the three main justice dimensions. To test the tool with local stakeholders and explore differences in perception across groups, we developed a mixed-methods evaluation system combining structured Likert-scale surveys and semi-structured interviews. Likert scales on a scale of 0 to 3 would be employed first to assign a score to each metric, and then to weight it according to respondents’ views. “Scores” represent the performance of the case study project in terms of a specific metric, while “weights” represent the importance of each metric for their overall understanding of climate justice in the context of the case study. Weights will also be used to calculate component scores (multiplying each metric score by its assigned weight, then adding them and dividing by the number of metrics within a component). To increase clarity and facilitate score assignment by participants, a scoring guide was developed, indicating what a value of 0, 1, 2 or 3 would mean for each of the metrics (or sub-metrics). Then, interviews inquiring about the reasons behind the assigned scorings allow participants to express ideas and opinions beyond the pre-defined options, leading to a more comprehensive understanding of the diverse perspectives at play. While it is true that allowing respondents to assign their own weights to metrics can introduce complexities in comparison and aggregation, this approach significantly enhances the relevance and responsiveness of project assessments to the specific needs and values of diverse stakeholders. The subjective nature of weighting reflects real community priorities, fostering greater ownership of the results. Moreover, through careful facilitation and guided methodologies, it is possible to establish frameworks that balance flexibility with structured interpretation, ensuring that the tool remains both adaptable and analytically rigorous.

Likert scales are suitable for assessing the perceptions and experiences of diverse respondents, and have been widely applied across various academic fields, from psychology to sociology to environmental studies. They have also been frequently used in public space assessment tools either independently or combined with other types of data collection methods to capture user satisfaction, risk perception, accessibility or inclusivity (Gardner et al., 2018; Mehta, 2014; Tawfik Mohamed et al., 2023; UN-Habitat, 2020). Combining Likert scales (quantitative data) with interviews (qualitative data) in a mixed methods research design helps compensate for the limitations of each method, providing comprehensive understanding and contextualization and also strengthening the validity of the research findings (Creswell and Clark, 2017). This methodology also enables broader applicability of the tool, as it delegates the

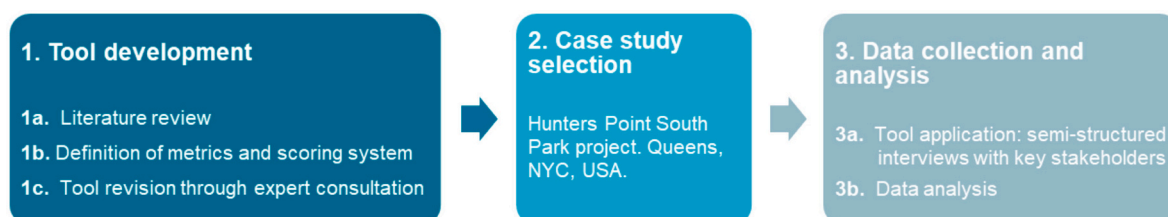


Fig. 1. Key methodological stages of the study.

analysis to the relevant local stakeholder groups for each case, rather than relying on researchers or municipal bodies.

The CJAPS tool is designed to involve local stakeholders who assign values guided by an interviewer. Four stakeholder categories were established: a) Designers and municipal officers; b) Local associations; c) Current residents; and d) Former residents. This range of actors is considered to cover the groups most directly involved or affected by the project, either by directing or participating in its design or implementation, or by being influenced now or in the past by the development, use and maintenance of the project. The consideration of the group of former residents aims to also encompass the experiences of those who, in light of the transformations that occurred in the place, decided or were forced to move to other parts of the city (Gardner et al., 2018; Mehta, 2014; UN-Habitat, 2020). While the case study focuses on a new development in a former industrial area, some residents, mainly from artistic backgrounds, continued to live in small studios and workshops. The term “former residents” includes this group and those from nearby Long Island City neighbourhoods, all of whom have directly experienced the area’s transformation over the past decades.

In Stage 1c, the draft version of the CJAPS tool was validated through expert review, who were asked to assess it following the widely known framework for shareable and usable metrics SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) (Doran, 1981). The panel consisted of 13 participants who are recognized researchers in the conceptualization and operationalization of urban climate justice, or have researched equity and justice issues in the public space. Their recommendations were collected through email, and a revised version of the tool was delivered according to their suggestions. This final version of the tool was composed of 36 metrics (some including sub-metrics), classified into 11 components corresponding to distributional aspects of project design and implementation (5 components); project governance (3 components); and recognition justice aspects (3 components) (see Tables 1 and 2). As the CJAPS tool covers the project in all its phases and from different perspectives, not all metrics are meant to be responded to by all stakeholders. Thus, it was also established which group or groups of stakeholders would value each of the metrics (see Table 2). Then, the average score for each metric would be calculated based on the data provided by the stakeholder categories that responded to each metric. The full set of metrics, sub-metrics, guiding questions, and the scoring scale can be found in Table A2 of the Supplementary Information section.

3.2. Case study: Hunters point south park

Stage 2 refers to the case study selected. Hunters Point South Park is a climate-resilient waterfront park located at the southern edge of Long Island City (LIC), a neighbourhood in the borough of Queens, New York City. Spanning 4.5 ha (11 acres) of formerly industrial land along the East River, this park is a key component of a larger masterplan to revitalize 30 ha (74 acres) of derelict land. The park is designed not only as a recreational space but also as a resilient buffer against coastal flooding and erosion, incorporating diverse resilient design solutions, from tidal wetlands to bioswales, passive infiltration areas, and a retaining basin that allows for 550,000-gal stormwater temporary storage in the event of storm surges or major flood events. The park also forms a continuous public green corridor with the adjacent Gantry Plaza State Park to the north, enhancing access to the waterfront and contributing to neighbourhood climate resilience.

Historically, the area now occupied by Hunters Point South was a dynamic estuarine environment of marshes and wetlands located between the East River and Newtown Creek. Through the 19th and early 20th centuries, the land was incrementally filled and industrialized, hosting operations such as the National Sugar Refinery and the Daily News printing plant. With the decline of industrial activity in the latter half of the 20th century, the site was left with derelict warehouses, vacant lots, and contaminated brownfields. Over time, unmanaged vegetation began to reclaim these neglected spaces, even as city officials and planners started to envision new redevelopment opportunities for the site (Fig. 2a).

Table 1

Summary of the CJAPS tool elements and stakeholder category groups.



Dimensions	Components	Metrics	Sub-metrics	Scores (0-3)	Weights (0-3)
Project impact distribution	5 components	16 metrics	41 sub-metrics		
Project governance, communication and transparency	3 components	10 metrics	17 sub-metrics		
Recognition of structural drivers of climate vulnerability and perceptions	3 components	10 metrics	15 sub-metrics		
Total	11 components	36 metrics	73 sub-metrics		

Table 2

Summary of the climate justice dimensions, components and metrics proposed to assess public space adaptation projects, defining which stakeholder groups are meant to assess each of the metrics (DM = Designers and municipal officers; AS = Local associations; CR = Current residents; FR = Former residents).

Dimensions	Components	M#	Metrics	DM	AS	CR	FR
Project impact distribution	#1. Benefit and cost distribution from climate adaptation	1	Redistribution of climate risks and benefits	0	-	-	-
		2	Consideration of future scenarios	0	-	-	-
		3	Distribution of adaptation costs	0	0	-	-
	#2. Indirect socioeconomic benefits from project implementation and use	4	Provision of essential services needed by marginalized communities	0	0	0	0
		5	Promotion of diverse activities and experiences through spatial design	0	0	0	0
		6	Provision of socioeconomic co-benefits for vulnerable communities	0	0	0	0
		7	Presence of social diversity	0	0	0	0
	#3. Accessibility	8	Pedestrian accessibility	0	0	0	0
		9	Public transport accessibility	0	0	0	0
		10	Operations-related accessibility	0	0	0	0
	#4. Displacement prevention	11	Gentrification processes in the surrounding area	-	0	0	0
		12	Measures to avoid future displacement and gentrification	0	0	0	0
	#5. Non-human costs and benefits (In case the project includes natural elements)	13	Consideration of future climate scenarios for plant species selection	0	-	-	-
		14	Biodiversity increase	0	0	-	-
		15	Tree age and health	0	0	-	-
		16	Water quality	0	0	-	-
Project governance, communication and transparency	#6. Participation and agency	17	Meaningful community engagement in the different phases of the project	0	0	-	0
		18	Representation of a diversity of stakeholders in decision-making	0	0	-	0
		19	Resources accessibility	0	0	-	0
	#7. Knowledge inclusion	20	Definition of project goals and actions based on local framings and realities	0	0	-	0
		21	Definition of adaptation measures based on community-based preparedness	0	0	-	0
	#8. Communication and transparency	22	Easily accessible information about the project on all stages	0	0	-	0
		23	Employment of user-friendly participation techniques	0	0	-	0
		24	Oral and written communication	0	0	-	0
		25	Graphic communication materials	0	0	-	0
		26	Access to information about project progress	0	-	-	0
Recognition of structural drivers of climate vulnerability and perceptions	#9. Recognition and inclusion of a diversity of needs and interests	27	Recognition of differential adaptation needs to guide project objectives	0	0	-	0
		28	Consideration of historical structures of urban development in the area	0	0	-	0
		29	Subjective perceptions of safety and accessibility	0	0	-	-
		30	Valuation of local cultural system	0	0	0	0
	#10. Space perceptions and lived experiences	31	Community perceptions on reduced climate risks after project implementation	-	0	0	0
		32	Current perceptions of safety and accessibility	-	0	0	-
		33	Promotion of place ownership	0	0	0	0
		34	Promotion of social awareness of climate-related hazards	0	0	0	0
	#11. Recognition of nature's intrinsic value, needs and capacity to adapt	35	Non-instrumental value of nonhuman life and ecosystems	0	0	-	0
		36	Promotion of environmental education and stewardship	0	0	0	0

In parallel, the broader neighbourhood of Long Island City (LIC) has experienced a sweeping transformation over the past two decades. A pivotal moment came with the 2001 rezoning initiative, which reclassified large portions of LIC from industrial to residential and mixed-use zoning. This change enabled high-density construction and accelerated the conversion of LIC into one of the fastest-growing neighbourhoods in New York City. While the park and the broader Hunters Point South (HPS) site were formerly part of an industrial zone, the adjacent areas already exhibited a more varied mix of commercial, industrial, and residential uses. Over time, this broader section of LIC has seen a surge in luxury developments, demographic shifts, and the displacement of longstanding communities and small businesses—trends in which HPS has played a reinforcing role.

The park is embedded within the Hunters Point South development, a master-planned, mixed-use project initiated by the Bloomberg administration in 2008 to respond to the city's deepening housing affordability crisis. After New York City's unsuccessful bid to host the 2012 Summer Olympics—in which the site had been designated for the Olympic Village—the city seized the opportunity to redevelop the publicly owned land into a large-scale housing and infrastructure initiative. The plan envisioned 5000 dwelling units, 60 % of which would be permanently affordable to low-, moderate-, and middle-income families. This made it the largest new affordable housing project launched in the city since the 1970s. The masterplan also contemplated several infrastructure improvements, retail and community facility spaces, and a new 11-acre waterfront park along the East River shoreline (what would become Hunters Point South Park) (Fig. 2b).

Hunter's Point South Park project was developed with public funding through a collaborative effort between two renowned



Fig. 2. (a) Hunters Point South (2008). Source: Google Earth. (b) Hunters Point South development plan (2009). Source: SWA/Balsley / WM. Modifications by the authors (labels added to indicate East River and Newtown Creek).

landscape design firms and an infrastructure consultant, overseen by the NYCEDC (Economic Development Corporation). Construction commenced in 2008, with the first phase opening to the public in 2013 and the second one in 2018, which lured developers to bid on available plots. The park design sought to reclaim the site's marshland identity, provide passive and active recreational opportunities, and protect it from coastal flooding and erosion.

The project received several international landscape and urban design awards, as well as the highest WEDG (Waterfront Alliance's Waterfront Edge Design Guidelines) certification of all NYC parks (ASLA, 2019; Waterfront Alliance, 2015). Today, it is considered a pioneer and global model for urban design in the age of climate crisis, integrating social, cultural, and ecological resiliency at the urban waterfront (Brown, 2019). However, the development plan for the whole Hunters Point area did not come without contestation. From the inception of the plan, local NGOs expressed opposition due to concerns about the project's extensive scale and density, fearing overcrowding of the LIC waterfront and further stress to the waterfront and the floodplain (CityLand., 2008; Cogan, 2012). Requests to increase open space and to limit buildings heights at 20 stories were dismissed by the municipality due to the urgent demand for affordable housing and concerns over the project's financial viability. Today, two of the original seven parcels remain undeveloped, sparking calls from local associations to designate one of these parcels as public space. Advocates argue that Hunters Point South Park can no longer accommodate the recreational needs of the area's growing population and that creating additional public space would help offset the proliferation of high-rise residential developments in recent decades (Murray, 2021) (Fig. 3).



Fig. 3. Current status of urban development and waterfront park in Hunters Point South, Queens, NYC. (Source: David Lloyd, n.d.)

3.3. Data collection and analysis

Stage 3a, tool application, consisted of data collection through Likert scale surveys and interviews for the case study of Hunters Point South Park. The sample was composed of 20 respondents selected through purposive sampling. Five were grouped in the category of designers and municipal officers (including NYC Parks and New York City Economic Development Corporation and the landscape design offices SWA/Balsley and Weiss-Manfredi); seven representatives of local associations (such as Hunters Point Parks Conservancy or the Queens Community Board 2, but also independent local activists, many of them currently living in the area); five current residents; and three former residents. Interviews typically lasted about an hour, and respondents were asked to assign scores and weights to each metric (or sub-metric), and to explain the reasoning behind the scores given. The project was approved by an institutional ethical review.

In Stage 3b, data analysis, average metric scores across respondents were calculated and classified by stakeholder categories. Component scores were calculated from weighted averages of sets of metrics. The mean scores of the three dimensions were also calculated from the weighted averages of their respective components. Interviews were transcribed verbatim by an administrative assistant (Descript software) and each written transcript was compared with the audio recording by a study team member to ensure transcript accuracy. The interviews were then qualitatively analysed to contextualize the scores obtained, and to test the potential and applicability of the proposed tool.

4. Application and validation of the CJAPS tool

This section is structured into two subsections. The first one outlines the average scores provided by distinct stakeholder groups for specific metrics, in order to assess the performance of Hunters Point South Park in terms of climate justice. The second subsection underscores the weights that respondents assigned to these metrics, unveiling the diverse interpretations of climate justice across stakeholder groups for the context of the case study. Both sections combine numerical survey results and interview data, in order to contextualize and gain a deeper understanding of the responses collected.

4.1. Metric scoring: Overall climate justice performance in Hunters Point South Park

Overall and per dimension category, the project scored 2.0 (out of three) in the category of “Project impact distribution” (distributive justice); 1.7 in “Project governance, communication and transparency” (procedural justice); and 1.9 in “Recognition of structural drivers of climate vulnerability and perceptions” (recognitional justice). The weighted average scores for each of the 11 components and stakeholder categories are depicted in Fig. 4. The highest scores were generally given by the designers and municipal officers group (represented by a blue dotted line in the radar diagram), followed by the local associations. Table 3 displays the scores given by each stakeholder group to the 36 metrics proposed.

While the small sample size may limit the robustness of the quantitative results, the primary aim of this study is to demonstrate the

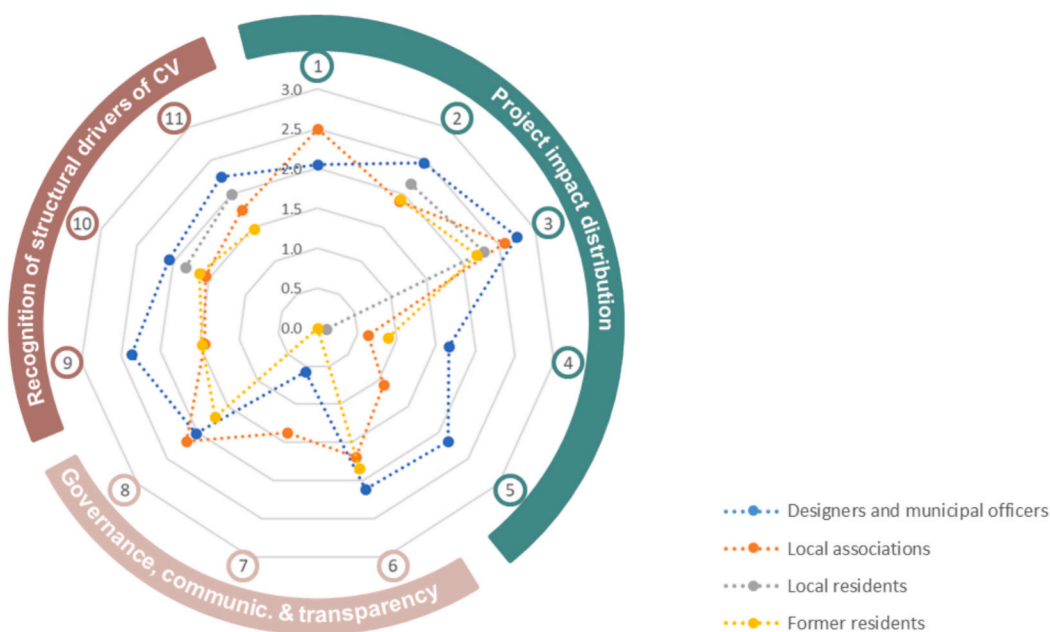


Fig. 4. Project performance on the 11 components considered, according to the different stakeholder groups consulted. The scores in the radar diagram range from 0 (lowest performance, centre of the radar) to 3 (highest performance, outer edge of the radar).

Table 3

Average scores assigned by different stakeholder groups to climate justice metrics for Hunters Point South Park, on a scale from 0 (low performance) to 3 (high performance). (#D=Dimension; #C=Component; #M = Metric; DM = Designers and municipal officers; AS = Local associations; CR = Current residents; FR = Former residents).

#D	Project impact distribution																Project governance, communication and transparency								Recognition of structural drivers of climate vulnerability and perceptions																			
#C	1				2				3				4				5				6				7				8				9				10				11			
#M	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36								
DM	1.3	1.7	3.0	2.4	2.9	0.8	3.0	2.9	2.5	2.8		1.7	2.0	2.8	2.3	1.5	1.8	2.3	2.2	1.0	0.0	2.7	2.7	2.2	1.5	0.3	2.0	2.7	2.5	2.3			3.0	1.0	3.0	1.5								
AS			2.5	2.1	2.4	0.5	2.3	2.7	2.5	2.5	0.3	0.8		1.7	2.0	0.0	1.4	1.5	2.2	2.0	0.8	1.7	3.0	2.8	1.5		1.5	1.0	2.5	0.7	1.5	1.5	1.8	1.3	1.3	2.2								
CR				1.9	2.3	1.2	2.7	2.7	2.2	2.0	0.2	0.0																			3.0	1.5	2.0	2.8	0.6		2.0							
FR				2.1	2.7	0.0	3.0	3.0	2.0	1.3	0.6	1.3					1.0	3.0	2.5	0.0	0.0	1.0	3.0	2.5	1.5	0.0	2.0	0.0		2.7	2.0	2.5	2.0	0.7	1.5	1.4								

feasibility of using the proposed tool to compare how different stakeholder groups assess the same project. Moreover, the limitations of relying solely on quantitative scoring are addressed through semi-structured interviews to explore respondents' reasoning and perceptions. These qualitative insights contextualize and enrich the quantitative findings and play a central role in interpreting the results.

Broadly speaking, respondents applaud the design choices taken to make Hunters Point South Park an inclusive and diverse space. This is evident in the high ratings for metrics #5 *Promotion of diverse activities and experiences through spatial design*, #7 *Presence of social diversity*, or #8 *Pedestrian accessibility*. Most agree that universal design features and controlled pedestrian crossings facilitate easy and safe access for all users. There's consensus on the park's ability to bring together individuals of varying age, gender, and nationality. It serves as a recreational hub for local kindergartens, offering amenities for seniors as well. The park also hosts gatherings and celebrations for a range of communities, drawing visitors from Brooklyn and Manhattan. However, the project earned low scores in several indicators that require special attention.

4.2. Lack of evidence on actual adaptation contribution

Metrics assessing the project's impact actually reducing climate risks to vulnerable populations (especially #1 *Redistribution of climate risks and benefits* and #2 *Consideration of future scenarios*) were rated poorly. Metric 1 was divided into three sub-metrics, i.e. Development of a climate risk and vulnerability assessment; Spatial level of the climate risk assessment; and Updated evidence of the adaptation benefits derived to vulnerable populations. Park designers and Municipal officers, who were the only ones with official information in this regard, mentioned that they relied on the Federal Emergency Management Agency (FEMA)'s NYC flood maps, without doing context-specific vulnerability analysis, or considering the intersectional dimension of climate vulnerability. Furthermore, interviewees stated that FEMA maps available in the early 2000s were highly inaccurate as they had not been modernized since the 1980s, and were only updated months after the unexpected and devastating impacts of Hurricane Sandy in 2012.

Regarding the evidence of actual adaptation contribution, respondents asserted that assessing the performance of public space, including this park, isn't standard practice in NYC:

"New York City doesn't typically monitor things once they're constructed. They build them and then they're used (...) If it isn't working, we're gonna hear about it because people will complain... Evaluating outcomes, I feel like that's just not in New York City's DNA to do that. They just make sure that there's public open space within 10 minutes of every community. It's at a much broader level" (interview with NYC Municipal officer, February 2023).

A representative from the NYC Parks Department showed a similar perception:

"I don't know, in terms of the landscape functioning as designed to solve larger climate problems. I don't know if anyone's monitoring those bioswales. I don't actually believe that they capture very much water, to be honest (...) to me, it seems like the wetland is functioning properly, but I don't know if anyone external to the parks department is monitoring that" (interview with NYC Parks department officer, February 2023).

4.3. Project implementation and population displacement trends

Respondents across the board also expressed concern about #11 *Gentrification processes in the surrounding area* and #12 *Measures to avoid future displacement and gentrification*. There was consensus that insufficient measures were in place to counteract gentrification caused by the new park and masterplan, leading to increased land values and displacement of the initial population. Interviewees emphasized the high cost of housing, even in subsidized plans, and noted significant socioeconomic shifts:

"Even if it's public housing, it's super expensive in this area. If you see the market rate for the buildings and the low-income and middle-income, the rent for them should be 25% less, it's too much (...) A lot of the older community has gone. They just sold part of Queens to the highest taker" (interview with a long-time local resident, February 2023).

This is in line with the claims posed by Queens-based non-profits and advocacy organizations like Queens for Affordable Housing and Queens Community House, which argue that the majority of so-called affordable units actually catered to moderate- to middle-income households, making them financially out of reach for most Queens residents. For example, of the 925 affordable units built in 2015, only 187 were reserved for individuals earning less than 50 % of the Area Median Income (AMI), with the remaining 738 units

designated for moderate-income families earning between 130 % and 205 % of the AMI (Jen, 2014). A critical issue is that AMI is calculated across the broader New York City metropolitan region, which includes higher-income suburban counties in New York, New Jersey, and Connecticut. As a result, income thresholds used to determine affordable housing eligibility frequently exceed what is genuinely affordable for residents of lower-income boroughs such as Queens and the Bronx. For instance, while the median household income in Queens County is \$84,961, the median for the overall New York City metropolitan region is \$98,900 (U.S. Census Bureau, 2023), exacerbating the affordability gap in neighbourhoods like Hunters Point. The limitations of AMI-based affordability metrics in New York City have been widely documented in reports by local policy organizations, including the Association for Neighbourhood and Housing Development (ANHD) and the Community Service Society of New York (CSS) (Association for Neighborhood and Housing Development, 2022; Community Service Society of New York, 2024). When asked about the fate of small businesses in the area, residents also noted a significant transformation:

“Mostly gone. Now they are more upscale. More expensive. What we had on the main street was bodegas. Nice, little, you could get every little thing. Now we have fancy ramen, sushi, fruit... (...) This neighbourhood was Italian and Irish. There were Irish pubs. You could get a brunch steak for \$7. That’s gone. The Sandwich Shop, \$5 meatball sandwich. That’s gone. The Mexican bodegas had tamales for \$1, \$2. That’s the three of them gone. It has changed because of the rise of property values. The taxes. They cannot afford to stay” (interview with local resident, February 2023).

The shift in local demographics led to a change in patterns of behaviour and utilization of the public space, with exclusionary impacts for some social groups. As a former resident mentioned,

“all of a sudden, the streets were filled with people walking their dogs... an older man, I just run over, pushed off the sidewalks. Cause people walked around looking at their phones... I liked to go to the water. And then I went down there through it becoming a park full of a bunch of obnoxious young people that moved into the buildings” (interview with former resident, February 2023).

4.4. Metric weighting: Climate justice assessment tool potential and applicability

The CJAPS tool pilot test in Hunter Point South Park served as a community validation process after its revision by academic experts. The method of metric scoring and weighting through interviews enables the assessment of the adequacy of the proposed metrics and provides the opportunity to assess the potential and applicability of the proposed evaluation framework. Table 4 represents the weights assigned by different stakeholder groups. Overall, most metrics received medium-high weighting or “importance,” between 1.5 and 3 on a scale of 0 to 3, revealing that they are considered somehow representative of climate justice for the context of the case study. However, the weighting results per metric showed varying degrees of agreement between different types of respondents.

The study revealed significant consensus across stakeholder categories giving high weights to various metrics, such as #7 Presence of social diversity, #8 Pedestrian accessibility, #18 Representation of a diversity of stakeholders in decision-making; #20 Definition of project goals and actions based on local framings and realities; #24 Oral and written communication; #25 Graphic communication materials; #35 Non-instrumental value of nonhuman life and ecosystems; #36 Promotion of environmental education and stewardship. It could be inferred then that this set of metrics is unanimously recognized by the diverse stakeholders consulted as indispensable to understanding climate justice in the context of Hunter Point South Park.

On the contrary, no metric received average low weights from all stakeholder categories. Instead, disagreements were rather common, when some groups considered specific metrics to be important for the understanding of climate justice, while others did not. For example, current residents, designers, and municipal officers considered some metrics (#10 Operations-related accessibility, #14 Biodiversity increase, and #32 Perceptions of safety and accessibility) to be important to represent climate justice, whereas local associations did not and assigned them low weights. While this might seem surprising, it might be due to a misunderstanding or lack of clarity in the meaning of the metric itself. For #14 Biodiversity increase, which included the sub-metrics “Increase in vegetation structure variation”, “Presence of early successional communities”, and “Absence of invasive non-native species”, a representative from a local environmental group justified the low weighting given by arguing that.

“I think it should be what is naturally there. I don’t think you should force species into an area where they never were (...) that’s the most important, getting what should have been there initially, what can grow, the same with whatever birds may fly over. You’re not

Table 4

Average weights assigned by different stakeholder groups to climate justice metrics for the context of Hunters Point South Park, in a scale from 0 (not important) to 3 (very important). (#D=Dimension; #C=Component; #M = Metric; DM = Designers and municipal officers; AS = Local associations; CR = Current residents; FR = Former residents).

#D	Project impact distribution																Project governance, communication and transparency										Recognition of structural drivers of climate vulnerability and perceptions															
#C	1				2				3				4				5				6				7				8				9				10				11	
#M	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36						
DM	2.4	2.7	3.0	3.0	3.0	1.8	3.0	3.0	3.0	2.3		2.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.7	2.0	2.7	2.7	3.0	3.0	1.3	2.3	1.7	3.0	2.3			3.0	2.7	3.0	3.0						
AS			2.0	2.3	3.0	2.2	3.0	3.0	2.5	1.0	1.5	2.3					1.0	3.0	3.0	2.8	3.0	2.8	3.0	3.0	2.5	2.0	3.0	3.0		3.0	3.0	2.5	2.0	2.3	1.5	2.3	2.0	3.0	3.0			
CR				2.1	2.8	1.5	3.0	2.8	2.7	2.8	2.8	2.8																			0.0	3.0	3.0	3.0	2.0			2.6				
FR				3.0	2.5	2.0	3.0	3.0	3.0	2.0	3.0	3.0					3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0	3.0		2.3	3.0		2.3	2.0	3.0	3.0						

gonna introduce a species if it doesn't belong there" (interview with local association representative, February 2023).

On the other hand, the low weight assigned to #32 Current perceptions of safety and accessibility (which covered safety both in terms of climatic risks and in terms of harassment or violence) might respond to a pragmatic perspective of the respondents: *"perceptions aren't as important as the reality (...) the most important thing is that there are things there (...) Reality is a three (high importance for climate justice). Just don't want to be flooded out"* (interview with local association representative, February 2023).

Metrics #4 and #30 were also sources of disagreement among respondents, where current residents assigned the lowest weights while the highest weights were given by former residents, designers and municipal officers. This is the case of #30 *Valuation of local cultural system*, current users assigned a value of 0.0, while local associations assigned 2.0 and non-users, designers and municipal officers 2.3. In general, low scores were provided by new neighbours who did not believe that any type of cultural or historical heritage worth conserving existed at Hunters Point South previously. When asked about the importance of preserving, interpreting or recognizing the past heritage of the place, they stated *"It's not historic. I would say not applicable to this particular area"* (interview with current resident, February 2023). Other respondents, in turn, considered that the site did have a significant legacy, which the new project failed to recognize and value: *"For me it's been a complete erasure of the history, the industrial history. And then also an erasure of the subsequent 50 or 70 years when it was like a wild growing ecosystem that's been erased as well"* (interview with local activist and documentarist, February 2023).

In some cases, although the average weight per category of respondents is neither very high nor very low, there is a great disparity between the weights given by individual respondents. This is the case, for example, of metric #6 *Provision of socioeconomic co-benefits for vulnerable communities*, which comprises three sub-metrics related to prioritizing hiring low-income workers, developing professional skills among vulnerable communities, and promoting uses and practices of the space that ensure the livelihoods of the vulnerable groups. The respondent category of designers and municipal officers assigned an average weight of 1.8, where the two representatives of the design firms assigned a weight of 1.0, while municipal officers assigned weights of 2.0 and 3.0. Interviewed designers remarked that.

"I think your question really can't reside in the hands of designers. It really must reside in the hands of government leaders and public-private partnerships that can situate those imperatives within the project (...) The most obvious economic service to constituencies that are not wealthy is the provision of affordable housing, which is a huge problem in New York. We provided the sort of catalyst to make that housing possible. But obviously that came from an administrative decision" (interview with project designers, February 2023).

Although the small scale of the sample does not allow for generalizations, there may be professional bias influencing perceptions regarding this metric, as designers assigned the lowest weights compared to the scores given by municipal officers. What remains evident is the lack of consensus on the importance and potential of public space adaptation interventions to provide socioeconomic co-benefits for vulnerable communities as a way of building climate justice. Respondents recognize the relevance of integrating this aspect into specific projects, but they also perceive the need for high-level political participation and establishing regulations and policy frameworks to achieve a relevant impact.

5. Implications for climate justice assessments

5.1. Need for evidence on actual adaptation contribution of individual projects

The process of testing the proposed CJAPS tool through the case study of Hunters Point South Park in NYC brought to light a noteworthy gap: the absence of a monitoring system to assess the project's contributions to just climate resilience. Despite its recognition for flood-resilient design, there is no evidence of its actual effectiveness. This reflects a broader issue in NYC, where, despite being considered a leader in resilient urban development, there's no adaptation monitoring system in place as recommended in the 2019 NPCC3 Report (Blake et al., 2019). NPCC3, the third report of the New York City Panel on Climate Change—an advisory body of scientists and policy experts tasked with guiding the city's climate resilience strategies—explicitly called for the development of such monitoring frameworks, highlighting their critical role in evaluating long-term effectiveness and equity outcomes. NYC regularly performs citywide exposure, vulnerability, and resilience assessments, but they lack the capacity to track the performance of specific adaptation interventions or identify their effectiveness. This is consistent with a widespread lack of climate adaptation M&E systems across governance levels and sectors (Goonesekera and Olazabal, 2022). Even when such systems exist, they commonly gauge progress in terms of measurable outputs, like the number of beneficiaries or the expansion of green spaces, assuming their contribution to resilience and risk reduction, instead of assessing actual outcomes (Leiter and Pringle, 2018; UNEP, 2022).

As a result, our study uncovered a notable discrepancy between the project's purported capacity to enhance climate resilience and social well-being—as highlighted by project proponents, media coverage, and national and international institutions that recognized the project—and the scepticism voiced by a range of stakeholders, including residents, community-based associations and certain municipal officers. These gaps and discrepancies suggest that cities are still far from understanding the real effectiveness of the adaptation actions they implement, or their justice implications. It also calls into question the reliability of sustainability certifications like LEED or WEDG (where Hunters Point earned the highest score), which tend to focus on project outputs rather than outcomes and often prioritize environmental aspects over social ones (Awadh, 2017). The development and implementation of evaluation frameworks focused on the effectiveness of project outputs, in both public and private evaluation protocols, could help bridge this gap.

5.2. Issues of climate injustice in public space are deeply intertwined with economic urban dynamics, especially with the power of the real estate market

The CJAPS pilot test was also instrumental in uncovering critical climate justice issues related to diverse aspects of public space. This encompassed everything from programming and design elements to citizen engagement in project decision-making, as well as more intangible values related to place ownership or cultural and ecological heritage. Yet, it also shed light on the limitations of evaluating individual projects without considering the broader urban context, particularly their relationship to surrounding lands and how these areas, through real estate market dynamics, can influence their value and meaning, potentially hindering progress toward just adaptation. Indeed, real estate and land use regulations significantly conditioned the location, size, funding and feasibility of the project.

This becomes particularly evident when situating Hunters Point South within its local geography and historical landscape. Just a few kilometres north along the East River lies Queensbridge, home to Queensbridge Houses—one of the largest public housing development in North America—and Queensbridge Park (Fig. 5b). While both parks provide waterfront access and recreational amenities, their development trajectories and social functions differ significantly. Queensbridge, developed in the late 1930s as part of a broader New Deal-era commitment to public housing, was designed to provide thousands of permanently affordable units for low-income New Yorkers (Petrus, 2019). The surrounding park continues to function primarily as a neighbourhood space, with minimal tourist traffic or speculative real estate pressure, and the area's demographic composition has remained relatively stable.

By contrast, the Hunters Point South development—shaped by contemporary dynamics of public-private partnerships, climate resilience planning, and high-stakes real estate development—has contributed to the transformation of Long Island City into one of the fastest-gentrifying neighbourhoods in New York City. Here, public space adaptation was part of a broader strategy to make the area more livable and marketable, ultimately influencing nearby property values and stimulating further speculative development. While any direct comparison must acknowledge the vastly different political, economic, and urban planning paradigms in which these projects were conceived, placing them side by side helps illustrate how evolving models of urban development can lead to radically different climate justice outcomes—even within the same geographic corridor. This observation adds to the work of scholars examining how adaptive interventions, especially iconic and green ones, capitalize on urban land prices, stimulating speculative urban development (Bolitzer and Netusil, 2000; Geoghegan, 2002; Herreros-Cantis et al., 2020; Jo Black and Richards, 2020), but also with studies on the relationship between urban aesthetics and gentrification (Lindner and Sandoval, 2021).

The urban climate justice literature has often overlooked economic analysis. Recent reviews indicate a scarcity of discussions about urban economy within climate justice debates, in contrast to prevailing discussions on urban governance or urban form and physical planning (Mohtat and Khirfan, 2021). Typically, climate and environmental justice valuations consist of spatial assessments of urban risks and vulnerability, where the economy is only mentioned in the form of socioeconomic indicators of vulnerability to climate impacts (e.g. Baró et al., 2019; Kabisch and van den Bosch, 2017). Similarly, tools assessing public space often confine their scope to the space itself, neglecting the interplay with market dynamics in the surroundings (Gehl Studio NY, 2015; Mehta, 2014; Santos Nouri and Costa, 2017).

Results from this study suggest that some qualities provided by public space adaptation projects, such as risk reduction, aesthetics, biodiversity or health influence and are influenced by wider economic and market dynamics. Therefore, the impact of public space in terms of climate justice cannot be understood or assessed without integrating the economic dimensions of urban development. This is in line with studies assessing the impact of real estate and urban development interests on public space (Hollis and Fulton, 2002; Kohn, 2004; Low, 2005; Webster, 2007). And, more generally, with critical voices in climate justice who emphasize the necessity of uncovering and comprehending structural economic and power dynamics that perpetuate unjust vulnerabilities in cities (Castán Broto and Westman, 2019; Malloy and Ashcraft, 2020; Shi, 2020). The CJAPS tool includes some metrics that inquire about the provision of socioeconomic co-benefits for vulnerable communities (#6), gentrification processes in the surrounding area (#11) or anti-displacement measures (#12). But to have a comprehensive understanding of the power and risk factors at play, such assessment should be complemented with a broader study at the district or city scale, examining urban transformation, development and

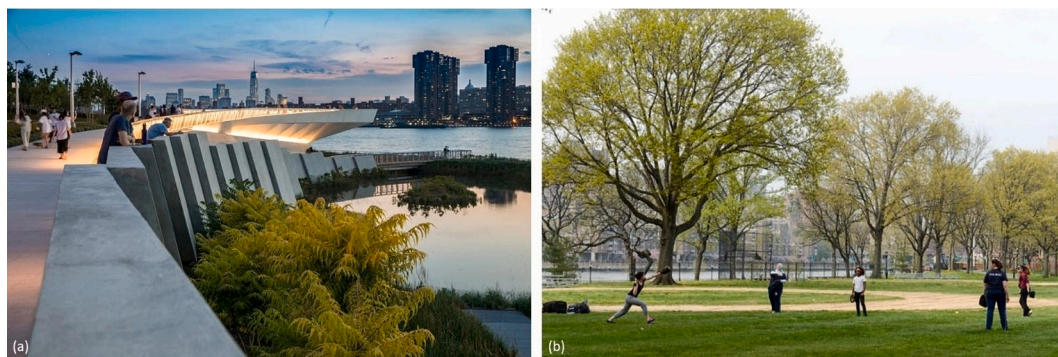


Fig. 5. (a) Cantilevered viewing platform in Hunters Point South. Source: David Lloyd, n.d. (b) Queensbridge Park baseball fields. Source: NYC Parks.

investment patterns, including changes in socio-demographics and land use and value, and how those configure climate vulnerability and risk under a climate justice lens. This would allow, on the one hand, to identify which aspects are under the scope and responsibility of public space designers or managers, and at the same time, to reveal implicit patterns of exclusionary urban development that generate or perpetuate situations of injustice citywide.

5.3. Collective assessments can critically inform climate justice from diverse perspectives

From a methodological point of view, the collective assessment of the metrics through the CJAPS tool proved to be valuable in capturing the diverse perspectives that coexist among the involved community. Recognizing the inherent debatability in defining and interpreting indicators or metrics, the tool presented a selection of potential metrics based on literature and expert reviews. Local stakeholders were then invited to assign scores and weights, reflecting their individual interpretations of climate justice within the context of Hunters Point South Park. This approach reframes ‘debatability’ not as a limitation but as an opportunity for stakeholders to articulate their thoughts, uncovering the multiple perspectives that coexist within this case study, some of which have remained hidden or undervalued until now.

However, it is important to acknowledge certain limitations of this methodology, particularly regarding the factors influencing the provision of weights by respondents. While the instructions for weighting metrics were provided in advance in clear and concise language and reiterated at the start of each interview, the process remains inherently subjective. Designers of the park project, for instance, may have perceived that certain metrics extended beyond the scope of what their project could achieve, potentially leading them to assign lower weights under the assumption that those aspects were not relevant to the evaluation of the park. Moreover, the tool results are not meant to be objective but rather qualitative reflections shaped by the experience, expertise, and perceptions of stakeholders. As previous research has shown (Olazabal et al., 2018), it is not possible to fully disentangle these factors from the assessment process. While this subjectivity can be seen as a strength—capturing the nuances of lived experiences—it also highlights the need for careful interpretation of the findings, particularly when comparing across different case studies.

Considering the imperative of involving a wide spectrum of stakeholders in climate adaptation evaluation (Feldmeyer et al., 2019; Meerow and Stults, 2016), this collective assessment process showed two remarkable properties. First, it enables stakeholders to express their representations and perspectives on climate justice in a given context. The tool allows stakeholders to express their representations and perspectives on climate justice in a given context, and can highlight and make visible areas of consensus or conflict, such as balancing the needs of marginalized communities with environmental priorities. Second, the tool facilitates the establishment of a common language around this shared yet contested issue. By offering a structured framework and clear definitions of key concepts like justice, inclusion, vulnerability, and participation, the tool helps bridge differences in understanding, making complex and often abstract ideas more accessible to all involved. However, it is important to note that this common language is primarily constructed by the researchers based on stakeholder input, rather than through direct negotiation or collaboration among stakeholders themselves. For the common language to be fully developed through interaction, it would be beneficial to incorporate more collaborative dynamics, such as focus groups, where stakeholders can actively engage in dialogue and negotiation. Such an approach would help ensure that the tool functions not only as a means of collecting diverse views but also as a platform for ongoing exchange, collaboration, and mutual learning. The CJAPS tool’s capacity to generate contextualized and ‘socially robust’ knowledge (Barré, 2010) on climate justice might be highly valuable for assessment, learning, and decision processes concerning climate adaptation interventions. This is relevant for any adaptation project, but becomes critical when assessing interventions in shared public spaces which are pivotal nodes of cultural, social, and political life and contestation.

The CJAPS tool could be applied to different public space adaptation projects, since specific metrics can be added, removed or weighted according to specific conditions and through collective decision-making. However, there always exists the risk that the proposed components and metrics, which were taken from mostly Western academic literature and practitioners’ input, lack transferability to different sociocultural contexts. It would be worth exploring the conceptualisation of new components and metrics from the context of non-western societies in order to ensure they are context-relevant (Arnott et al., 2016; Ziervogel et al., 2021). The context-specific nature of climate justice issues renders the tool unsuitable for cross-case comparisons. However, it can be highly beneficial for longitudinal studies of individual projects, which should be repeated periodically adapting metrics to evolving climatic data, respondents’ perceptions and the evolution of the project under study. Tool metrics could also be applied as principles or guidelines for the design of future public space adaptation projects under climate justice criteria, in which a preliminary collective assessment can identify the most critical aspects to consider. This study has addressed the challenge of operationalizing the concept of climate justice to be applied in actual planning, in this case with a specific focus on public space projects. One policy implication is that the collective assessment of CJAPS can be used as an instrument of participatory governance, as it supports collective decision-making processes through a shared dialogue where stakeholders’ diverse values and views over potential metrics are identified. It can help to integrate and institutionalize place-based local knowledge into municipal adaptation planning and evaluation processes, and also builds trust and legitimacy, which may be key in this case study given the lack of trust in municipal participatory processes expressed by some stakeholders.

6. Conclusion

This article presents the design and pilot testing of the Climate Justice Assessment in Public Space (CJAPS) tool as a novel framework for the collective assessment of climate justice in public space adaptation projects, which rendered key to capturing the diversity of visions that overlap in the interpretation and understanding of climate justice in this specific context. The application of the

CJAPS tool to the Hunters Point South Park in Queens, positioned as a flagship climate-resilient public space, revealed the lack of scientific evidence regarding its actual contribution to climate resilience. It also highlighted the extent to which its performance is more or less positive in terms of climate justice, from the perspectives of the diverse stakeholder groups consulted. Furthermore, the tool helped identify how public space design and management can contribute to climate justice, while also exposing how real estate market dynamics in the affected area largely condition the transformative potential of public space adaptation efforts. The pilot testing of this tool demonstrates how public space adaptation planning should go hand in hand with city-scale development planning, examining under a justice lens how climate vulnerability and risk are continuously shaped by changes in land use and socio-demographics.

We conclude that rather than relying on top-down approaches, stakeholder engagement should be placed at the core of climate justice assessment processes. The collective nature of the assessment tool presented here aligns with this principle. Although this paper presents only a pilot test of the tool, with potential for further refinement, it offers a preliminary framework and analytical approach that may help integrate diverse stakeholder perspectives from affected communities. By gathering and synthesizing different forms of knowledge, the tool aims to surface a broader range of understandings of climate justice that might otherwise be marginalized or overlooked. This process can support deeper reflection and potentially help identify areas of consensus or conflict, laying the foundation for defining context-specific metrics and goals for adaptation projects. The collective assessment tool's flexibility allows for customization to enhance its relevance to particular contexts, further enriching the understanding of stakeholders' diverse perspectives on climate justice. This adaptable approach operationalizes climate justice in specific scenarios and supports project evaluation based on the interpretations of those directly affected. While still exploratory, this approach may contribute to operationalizing justice-oriented evaluation in public space adaptation projects. Embracing assessment tools like CJAPS may be a valuable step toward learning from experience and supporting the development of more resilient and just urban environments in the face of climate change.

CRediT authorship contribution statement

María Ruiz de Gopegui: Writing – review & editing, Writing – original draft, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Marta Olazabal:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Vanesa Castán Broto:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Formal analysis, Conceptualization. **Timon McPhearson:** Writing – review & editing, Resources, Investigation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.uclim.2025.102505>.

Data availability

The data that has been used is confidential.

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