Intersectional Climate Justice

Ana Terra Amorim Maia

INTERSECTIONAL CLIMATE JUSTICE

— THEORY, PRAXIS, LIVED EXPERIENCE —

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Note: U.S. spelling is used in this work

To my mother, my father, and to Greg.

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Acknowledgements

"Ehara taku toa i te toa takitahi engari he toa takitini"
My success is not mine alone, but it is the strength of many
Maori Proverb

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Preface

Climate justice is the challenge of our times.

So is gender equality.
And racial and ethnic justice.
The reduction of social inequality and vulnerability.
And guaranteeing basic rights, such as adequate housing and health.
These challenges are deeply interconnected, so it is futile to address them separately.
But can cities tackle them all at once?

Through this work, I demonstrate that it is possible, necessary, and urgent for cities to adopt more integrated and intersectional responses to climate adaptation that recognize the complexity and interdependency of these challenges while working to address their root causes. I propose a framework based on empirical observation for intersectional climate justice, which offers a conceptual pathway for bridging adaptation planning, transformative action, and social equity. In this dissertation, I first illustrate this pathway by drawing on the practice of cities around the world that are advancing what I classify as intersectional principles in climate action and zoom in on Barcelona (Spain) in particular – a critical example of emerging intersectional practice. I then explore how emerging intersectional climate justice efforts are implemented and governed in Barcelona at the city level, understanding the institutional arrangements and tactics put in place to operationalize intersectionality in urban climate adaptation. Finally, I conduct a grounded examination of one type of urban adaptive infrastructure in Barcelona – namely, climate shelters – based on embodied and lived experiences of climate extremes to understand the extent to which these interventions are addressing intersecting vulnerabilities.

Through these linked studies rooted in empirical examination of contemporary Barcelona, I provide a roadmap for cities to address multiple, multifaceted, intersecting crises in a more integrated way so that, as we adapt to climate change, we also have tools for working towards ensuring we do not simply recreate existing socioeconomic vulnerabilities through climate action. This roadmap does not aim to be exhaustive. Rather, it aims to contribute from one perspective and context to the ongoing and growing scholarly, political, and civic debates around urban climate justice. Through this in-depth and multilevel study of Barcelona – a city

considered a frontrunner on climate policies with a social justice perspective – I provide illustrative directionality for researchers, policymakers, and practitioners seeking to develop a vision and engage in the negotiated process of urban intersectional climate justice.

Statement of positionality

"I don't think people need to give up what they're passionate about to tackle climate change. I think they need to figure out how to connect what they're passionate about with the climate crisis. Because this is the work of our lifetimes."

Naomi Klein

In my doctorate journey, I was fortunate enough to be able to choose my own research path. Being independent from a project meant that I was free to pick any topic I was interested in and study it for the next four years.

I always knew it was going to be climate adaptation. In fact, I began this path as a 16-year-old high school student when I learned about the effects that climate change posed on Earth and its most vulnerable communities. So, off I went to study environmental engineering and a masters in environmental studies – cities and sustainability, searching for concrete and technical tools to help me change the world. But while models and projections intrigued me, they didn't make my eyes sparkle. I didn't feel like I was contributing in any tangible way to improving people's lives – something I knew was vital for me.

It was only when I started my PhD at ICTA-UAB within the *Barcelona Lab for Urban Environmental Justice and Sustainability (BCNUEJ)* that I began to see the light at the end of the tunnel. Because it allowed me, for the first time, to unite my interest in climate adaptation and my yearning to somehow advance social justice. Still, I had to ask: which ways do I pursue to make this tangible? And, the reader may ask, how did I end up going from this goal to taking on the issue of intersectionality?

A few years ago, different experiences in my life awakened me to the ideals of feminism. Soon enough, I was devouring anything I could find to familiarize and educate myself on the topic. That included a long list of "feminist books" I wanted to read which I pinned at the top of my notes. The list of authors ranged from Wollstonecraft to Davis to Federici.

Two months into my PhD, at a meeting where I was feeling particularly lost about whether to investigate loss and damage in the Pacific Islands or community-based adaptation in Latin America, one of my supervisors asked, "Ana, what are you *really* passionate about? Perhaps

take a couple of days to think about what it is that really excites, puzzles, or infuriates you. For instance, I see you have an extensive list of feminist books there that you'd like to read. Could that be something that you're really passionate about?"

I've never been more thankful for anyone snooping into my notes. To me, that moment changed everything. It's not that I didn't know about the intersection between feminism and climate justice, but somehow, I hadn't thought that I could unite both and write a thesis out of it.

The more I read about feminism and how it evolved over the years, the clearer it became to me that I *needed* to take an intersectional approach. This meant that I could not talk about gender injustice in the climate crisis without considering how it intersects with other systems of oppression, such as racism, classism, ableism, homophobia, and xenophobia. Otherwise, I would be very likely to essentialize gender and compartmentalize intersecting experiences of oppression and marginalization. I drew a lot of inspiration from Audre Lorde's 1982 address in "Learning from the 60's" (one in my long list of feminist readings), where she says that "there is no such thing as a single-issue struggle because we do not live single-issue lives".

Intersectionality and the writings of Black feminist authors such as Angela Davis, Audre Lorde, Kimberlé Crenshaw, and Patricia Hill Collins, taught me to recognize myself not as a sum of identities and social positions – cis woman, white, heterosexual, able-bodied, middle-class, Brazilian living in Spain, survivor – but as a complex result of the intersections of my experiences of privilege, trauma, and oppression. Likewise, I understood that my research should reflect this complexity as well. That I could use my experiences of oppression to develop empathy, work in solidarity, and join the fight for liberation. And I could use my privileges to amplify the voices, knowledges, and experiences of those who tend to be ignored, invisibilized, and marginalized.

I commit to use my privileged position to elevate the perspectives and lived experiences of individuals and communities who find themselves at the forefront of climate change. These frontline individuals and communities are often the most affected by the adverse impacts of climate change and possess extensive knowledge regarding alternative ways of being and coping with it. With that, I intend to explore forms of knowledge that are frequently disregarded and cast as peripheral – such as the lived experiences of female, working-class, and immigrant subjects – as well as those affected by ongoing urban injustices. I also directed efforts towards engaging with scholarship from Black, Brown, and female scholars, hoping that by interacting

with these often-overlooked sources of knowledge, the work presented here can help envision and realize new urban futures. Thus, this work seeks to acknowledge and appreciate the experiences and needs of minoritized people who are surviving and thriving amid climate breakdown and catastrophe and to value and learn from a more diverse range of knowledges and experiences than the white, patriarchal, Western epistemologies that have traditionally dominated climate change research.

With this dissertation, I attempted to provide a humble, small-scale, localized roadmap – strongly constrained by the pandemic which started a few months into my PhD – with new conceptual, political, and empirical theories that can hopefully work as a guide for cities, scholars, and anyone interested in pivoting adaptation planning and action towards intersectional climate justice.

I am committed to giving back to the municipality of Barcelona (policymakers, council members and representatives), which supported me during my research with their expertise and insights. I am also dedicated to giving back to the community of La Prosperitat and its residents who welcomed me warmly and shared candidly their perceptions and experiences on climate vulnerability. Some of these efforts to give back to the city and community include a policy meeting organized in June 2023 with members of the Barcelona Climate Change and Sustainability Office, a short report in Spanish about my findings, and continued collaboration with the City Council's Citizen Science Office, which is interested in expanding the focus and methodology used in my fourth empirical chapter to other socio-ecologically vulnerable neighborhoods in Barcelona. Finally, I would like to highlight the collaborations within BCNUEJ, where I am proud to collaborate with amazing colleagues on engaged research and activism in a caring environment.

Abstract

Historically marginalized populations, often living in vulnerable areas due to unequal past urban development and exclusionary land policies, are not only experiencing the unequal impacts of climate change and environmental degradation but also unfair outcomes from policies aimed at addressing these issues. Conventional adaptation approaches have been shown to overlook the compounded vulnerabilities faced by marginalized communities and, as a result, risk reproducing inequalities. Addressing climate injustices requires interventions that confront the climate crisis while dismantling intersecting systems of oppression and considering contextual factors that contribute to vulnerability. In the first part of this study, I propose a framework for intersectional climate justice that addresses underlying racial and gender-based inequalities, reduces differential vulnerabilities, employs ethics and politics of care, adopts place-based and placemaking approaches, and promotes cross-identity forms of activism. I illustrate the framework with examples from Barcelona and other cities around the world which are implementing innovative strategies that integrate intersectional thinking and justice-driven principles into climate action. I then explore how Barcelona is governing and implementing intersectional climate justice in city planning. I find that the tactics employed to translate intersectional justice into climate action include disruptive approaches that challenge existing political structures and planning norms, transversal work across agencies to mainstream climate and gender, care-centered approaches to urban and climate planning, and place-based strategies to promote social empowerment and redistribution. I also identify challenges and limitations to achieving these outcomes and emphasize key lessons learned from the Barcelona case. Last, I zoom in on one type of climate-adaptive intervention – climate shelters – to examine their ability to meet the needs of vulnerable residents. By applying an intersectional climate justice perspective, I find that intersecting vulnerabilities of marginalized populations are not adequately addressed by such projects, resulting in uneven access to coping mechanisms and exacerbating vulnerability to climate risks. I find that housing inadequacy, energy poverty, and gender disparities contribute to these unequal experiences and highlight the need for infrastructures of heat and cold refuge to be more inclusive, accessible, and culturally sensitive in order to address intersecting social and climate needs, particularly for those most affected by climate impacts. Overall, this dissertation offers insights for researchers, policymakers, and practitioners interested in advancing urban intersectional climate justice, providing a roadmap for cities to adopt intersectional approaches to climate adaptation in ways that tackle multiple crises in a more integrated manner.

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Chapter 1 – Introduction and research objectives

1. Background and motivation

"The neighborhood needs more greenery. More greenery and more shade. For example, in the square [Ángel Pestaña] there is nothing. We have fought hard for that square. Ten years fighting for it. But there is no shade, only concrete benches. So, in the winter it freezes your ass, and, in the summer, it gives you hemorrhoids".

Maruja, president of the Prosperitat senior residents' association.

Maruja, at the age of 85, is undeniably one of the most remarkable people I have ever met. Her extraordinary resilience stems from her challenging upbringing by her grandmother, first in a cave in Andalusia and later in shacks and social housing units in Nou Barris, Barcelona, while both her parents were imprisoned during the Franco regime. Her lifelong dedication to justice shines through her role in leading extended strikes, kidnapping a bus to demand transport services for an underserved neighborhood, and enduring multiple periods of imprisonment. In an interview I had the privilege of conducting, Maruja shared awe-inspiring personal stories that revealed an unwavering dedication to social justice. She described the state of the neighborhood of La Prosperitat and highlighted the power of social mobilization, all while infusing her narratives with a blend of passion and humor. Her candid narratives vividly expose the (lack of) preparedness in some underprivileged neighborhoods to protect residents from extreme temperatures.

Figure 1 - Benches in Plaza Ángel Pestaña, La Prosperitat, Barcelona, Spain

The summer of 2022 was the hottest ever recorded in Barcelona, Catalunya, Spain, and Europe. In Barcelona, thermometers measured an average temperature of 28.2°C, 3.9°C higher than the 1961-1990 average (Meteocat, 2022). Apart from intermittent days of extreme heat, the 2022 heatwaves were also unusual as they started earlier, lasted longer, and were more intense than ever (Meteocat, 2022a, 2022b, 2022c). This extraordinary heat caused "extraordinarily high" excess mortality during the summer, with nearly 4000 excess deaths recorded by health authorities between July and September (WHO, 2022). This excess mortality was higher among older women and in disadvantaged urban areas, especially in the districts of Ciutat Vella and Nou Barris, tracing a clear relationship between socioeconomic conditions and access to coping mechanisms against extreme heat, such as air conditioning and easy access to green cooling areas. Those health impacts followed two summers of COVID-19 pandemic, which had profound effects on residents, infrastructures, and services.

The heatwaves thus unveiled and exacerbated pre-existing inequalities and injustices. Moreover, during the summer of 2022, high energy prices, economic inflation, and geopolitical conflicts all contributed to greater energy poverty, hampering people's access to adequate indoor temperatures, satisfactory degrees of thermal comfort, and an overall ability to adapt and upgrade their homes to longer and more intensive heatwaves. In Barcelona, it is known that the groups most susceptible to energy poverty are women aged 65 and older, people born in low-income countries, and those from more disadvantaged social classes (Oliveras et al., 2020). Research also shows that the distribution of extreme heat across the city is highly unequal, with some neighborhoods remaining much warmer than others, especially at night (Marí-Dell'Olmo et al., 2022). These accounts show that extreme heat is not distributed equally across the city or its inhabitants. Nor is the capacity to face them. Rather, different axes of identity, inequality, and social positions intersect with territorial characteristics and urban design to make some populations more exposed, sensitive, and less able to cope with the hazards of a warming climate.

As I write these lines in April 2023, thermometers are marking temperatures up to 15°C above the average for this time of the year. 200 Spanish cities have reached 38°C – in April. Temperatures in Europe have increased more than twice the global average in the last 30 years (WMO, 2022). The local weather service forecasts that Barcelona will be among the worst hit cities by extreme heat in Europe, with a significant increase in the number of heatwaves, hot and torrid days, and tropical and torrid nights per year (Catalan Meteorological Service, 2020).

Unless the city of Barcelona urgently accelerates adaptive efforts, the number of people who perish will continue to increase. Simple adaptation measures such as increasing the number of street trees can quite literally save lives. A recent study by the Barcelona Institute for Global Health indicated that by increasing urban tree cover density from 8% to 30%, Barcelona could avoid one in every three deaths (Iungman et al., 2023). Back to the summer of 2022, that would have meant an estimated 1,300 deaths avoided in a couple of months. However, planting trees in densely urbanized and consolidated terrains such as Barcelona is not at all simple.

Thus, increasing residents' levels of thermal comfort and wellbeing will require the city to be more innovative and equity-focused, through an umbrella of measures. The number of adaptation interventions is remarkable and growing. However, several studies have questioned the distribution, accessibility, and inclusivity of such interventions, showing that the everyday lived experiences of climate vulnerability is remarkably different across the city and across social axes such as gender, age, and income (for examples, see Anguelovski et al., 2022; Baró et al., 2019). In this study, I thus argue that it is by using an intersectional approach that researchers and planners can understand the interlinkages between different axes of inequality and vulnerability. This can then lend support to more integrated and transformative responses to multifaceted crises.

2. Research objectives

"You cannot get through a single day without having an impact on the world around you. What you do makes a difference, and you have to decide what kind of difference you want to make."

Jane Goodall

In this work, I aim to demonstrate how intersectional approaches to city planning can help climate adaptation be a tool for addressing compounding crises and overlapping injustices in a more integrated way. Moreover, with this work, I aim to generate conceptually, politically, and socially relevant lessons and insights that inform how to actually achieve intersectional climate justice through a tight interlock between theory and practice.

The broader contributions of an intersectional lens to the urban climate literature are manifold. First, it addresses a deficit in theoretical and empirical connections between intersectionality and justice (Mikulewicz et al., 2023), which helps to elucidate what climate justice actually means in practice by specifically showcasing the extent to which climate adaptation strategies address intersecting vulnerabilities. Second, it addresses a knowledge-action gap of how climate transformation is implemented and governed at the local scale (Bentz et al., 2022), describing the tactics, principles, and relationships that underpin urban intersectional climate justice. Third, it addresses the need for documented perspectives of marginalized communities, listening to how people define their own embodied, lived experience of risk, (dis)comfort, and vulnerability to climate change (Hamstead, 2023; Liverman, 2015) and empirically connecting these lived experiences to intersectional, historical, and structural inequalities. Thus, this perspective helps understand vulnerability on a more profound, personal, and political level, beyond objective quantifications, to highlight systemic issues and guide the development of more comprehensive modes of urban climate policy.

To address these three main objectives and research gaps, I:

1. Develop a conceptual framework for intersectional climate justice, outlining a transformative adaptation agenda that contends not only with climate impacts but also the entrenched social, political, and economic reinforcers of inequities and vulnerabilities.

2. Describe governance processes and institutional tactics that attempt to break silos of urban governance and encourage more disruptive, transversal, care-centered, and place-based approaches to climate planning and policymaking.
3. Elevate lessons from the ground through a neighborhood-level analysis of everyday risks and vulnerabilities, documenting individual lived experiences to measure the effect of adaptation interventions at the local scale, and contextualizing them within the broader history and urban developments of one specific neighborhood (La Prosperitat).

These approaches allow for a deeper understanding of *WHAT* is being advanced in terms of urban intersectional climate justice, *HOW* it is being implemented and organized at the city level, and *WHAT* constraints municipalities and residents are facing based on local knowledge and lived experience.

Next, I expand upon my general theoretical framework with a brief review of the state-of-the-art literature on (urban) climate adaptation, focusing on the gaps and omissions that provide the answer to *WHY* we need to approach adaptation theory and practice differently. The general theoretical framework presented in this introductory chapter is deliberately brief, as it is merely the starting point for the extensive theoretical discussions in the second chapter, which links the concept of intersectionality and urban adaptation efforts. Certain threads of these theoretical discussions are elaborated further in the subsequent chapters.

3. Theoretical background

Don't worry about the glass ceiling – the basement is flooding.
Laurie Penny

3.1. Urban climate adaptation: from global negotiations to local lived experiences

Between August 2021 and March 2023, the Intergovernmental Panel on Climate Change (IPCC) released its Sixth Assessment Report (AR6), with a series of reports evaluating scientific, technical, and socioeconomic information on climate change. These included the report released in February 2022 by Working Group II on Impacts, Adaptation, and Vulnerability (AR6 WGII), which details observed and projected impacts and risks, current adaptation planning and implementation and its benefits, and prospects for climate resilient development. The report states with a very high degree of confidence that "global warming is expected to cause unavoidable increases in multiple climate hazards" (IPCC, 2022, p.1) but "vulnerability of ecosystems and people differs substantially among and within regions" (ibid), being "driven by patterns of intersecting socio-economic development, unsustainable ocean and land use, inequity, marginalization, historical and ongoing patterns of inequity such as colonialism, and governance" (ibid). The report also affirms with very high confidence that "progress in adaptation planning and implementation has been observed across all sectors and regions, generating multiple benefits" (IPCC, 2022, p.2). However, it raises concerns that adaptation efforts are often limited to short-term and specific sectors and tend to remain in the planning stage rather than progressing towards implementation.

In recent years, particularly following the Fifth Assessment Report (AR5) in 2014, the IPCC has acknowledged the vital role played by urban areas in both adapting and mitigating the impacts of climate change. The latest chapter of AR6 on Cities, Settlements and Key Infrastructure explains how the impacts of climate change are felt more severely in urban communities, with marginalized groups being the most affected. The report attributes this to intersecting vulnerabilities "shaped by drivers of inequality including gender, class, race, ethnic origin, age, level of ability, sexuality and non-conforming gender orientation, framed by cultural norms, diverse values and practices" (high confidence) (Dodman et al., 2022, p.909). Despite that, currently, few adaptation plans take into account the social and climate concerns and capacities of marginalized communities (ibid).

A few months after the release of the report by AR6 WGII, in November 2022, the United Nations Environment Programme released its Adaptation Gap Report: Too Little, Too Slow – Climate Adaptation Failure Puts World at Risk, with the latest global progress in planning, financing, and implementing adaptation actions. This report corroborates the outcomes of the AR6 WGII report: while there are some positive updates, such as the fact that most (90%) planning instruments now display consideration for gender, Indigenous peoples, and other historically disadvantaged groups, it concludes that current adaptation practice "falls woefully short of what is required" (UNEP, 2022, p.15). According to the report, adaptation actions remain largely incremental in nature, fail to address future climate change, and risk exacerbating existing vulnerabilities or creating new risks, particularly for the most vulnerable (ibid). The publication attributes this largely to the exclusion of local communities and marginalized groups from decision-making and co-development of adaptation planning and implementation; inadequate attention to local contexts and knowledges; and a tendency to focus interventions on dealing with short-term impacts rather than adaptation to long-term, future climate change. The report discusses how the exclusion of local communities and marginalized groups from decision-making processes has resulted in further disadvantages for these groups, who bear significant costs but reap little benefit from climate adaptation interventions. It concludes by emphasizing the need for context-specific solutions that not only address climate-related exposures but also tackle the root causes of vulnerability, such as underlying structural inequities and gendered disadvantages (UNEP, 2022b).

3.2. Sharpening the focus: cities on the world stage

These reports are helpful in painting a global picture of the state-of-the-art of adaptation action around the world. Yet, the broad international scope of the current climate dialogue makes it difficult to integrate learning from local contexts, including the direct impacts on people, and their lived experiences of climate change. Besides, intergovernmental bodies and conventions alike have been criticized by some scholars and activists as arenas of climate colonialism, primarily driven by influential governments, scientists, and elites, thus reinforcing and perpetuating political-economic systems and institutions that have led to the climate crisis (Simpson & Choy, 2023; Sultana, 2023).

The city level thus provides a better stage to investigate adaptation politics, allowing for more detailed understandings of the complex interactions and interdependencies between actors involved in making (and resisting) adaptation action (Cannon et al., 2023; Fitzgerald, 2022). It

is well established that cities are a critical location for the fight towards climate justice (Castán Broto, 2019; Castán Broto et al., 2020; Romero-Lankao et al., 2018), not only because they concentrate the majority of the world's population (UN-Habitat, 2022), but also because they are increasingly spaces where climate change-induced risks and inequalities are unevenly produced and reproduced (Rice et al., 2023). As Castán Broto, Robin, and While (2020, p.1) have argued, climate change is fundamentally transforming urban governance and the way we live in urban areas, as it "reshapes how we understand, imagine, live in, and intervene in cities". Cities are governed by ethnic, cultural, and gendered power relations, and while they are displaying increasingly greater regard for justice and equity in adaptation planning, it is becoming more evident that efforts to address climate impacts may be reinforcing these power relations and injustices (Angelo et al., 2022; Chu and Cannon, 2021; Fitzgerald, 2022).

Harriet Bulkeley and Michele Betsill's 2003 book, "Cities and Climate Change: Urban Sustainability and Global Environmental Governance", was among the earliest seminal works to undertake a critical assessment of the role of cities in multilevel climate governance. It emphasizes the importance of urban areas in addressing climate change, implementing international agreements and national policies in the face of limited resources and conflicting interests. In the book and in later works, the authors describe how climate governance has evolved over the decades, undergoing different 'waves' that went from municipal voluntarism in the 1990s to institutionalization and mainstreaming in the early 2010s, to wider issues of social justice more recently (Bulkeley, 2021). This is further discussed in chapter 3 of this dissertation.

Climate adaptation has been mainstreamed into cities' urban planning strategies for over a decade now (Bulkeley, 2021; Rauken et al., 2015; Shi & Bouma, 2023). Despite that, many cities still tend to apply sectoral, silo-based approaches to adaptation planning (Kotsila et al., 2022), engaging departments narrowly associated with "environmental" issues and excluding municipal agencies that are critical to solving compounding crises such as those responsible for health, building codes, and water (Aylett, 2015). Apart from excluding critical urban institutional actors, cities have also tended to apply technical, top-down approaches that favor the participation and representation of technocratic elites while neglecting the experiences, needs, knowledges, and voices of marginalized members of society, who are often the most impacted (Haverkamp, 2017; McManus et al., 2014). However, the cross-cutting and compounding nature of the climate crisis agenda is not compatible with incremental, short-

term, and exclusionary approaches to climate planning (Oseland, 2019) and it is becoming increasingly clear that adaptation projects and processes undertaken with these approaches can end up reinforcing historical patterns of inequality (Rice et al., 2023).

3.3. When adaptation is more harmful than helpful

Scholars examining the politics of adaptation have related these approaches to pervasive capital-oriented urban development paradigms that prioritize technological fixes to solve urgent threats, accommodating risks rather than tackling their root causes (Long & Rice, 2019, 2020; Pelling, 2010). The early urban climate adaptation literature already emphasized the "opportunistic" nature of adaptation planning, through which early adapters engaged in adaptation by taking advantage of existing opportunities, networks, and incentives and linking projects to existing priorities (Carmin et al., 2012). Most recently, by embracing a technocratic and market-based approach to climate governance, cities have been able to develop innovative programs and projects that enhanced their appeal to investors and boosted their marketability, turning adaptation into an opportunity for profitmaking through the new climate-resilient city (Garcia-Lamarca et al., 2021; Kotsila et al., 2020; Rice et al., 2023; Shokry et al., 2020). These approaches have been framed by recent scholarship as "Climate Urbanism", a model of profit-oriented urban development wherein the form and function of cities are redefined by climate-resilient large-scale infrastructural projects aimed to attract "green" private capital, though often enabling projects that protect certain populations while exacerbating the vulnerability of others (Castán Broto & Robin, 2021; Castán Broto et al., 2020; Goh, 2021; Long & Rice, 2019, 2020; Robin & Castán Broto, 2020). This new model of climate urbanism is reflected, for instance, in defensive infrastructures and technological solutions – such as seawalls, large dams, and floodgates – which often protect important physical and financial assets while neglecting or even exacerbating climate impacts on marginalized communities (Castán Broto et al., 2020; Goh, 2021, 2023; Truelove, 2011). The complex mosaic of climate injustices within cities is well explained in plain terms by Lisa Ellis, "the rich get seawalls and the poor get moved" (Ellis, 2018, p.7). She explains simply complex processes whereby wealthier groups receive infrastructure investments while poorer residents receive eviction notices (Anguelovski, Irazábal-Zurita, et al., 2019; Castán Broto et al., 2020; Shi & Bouma, 2023).

Several studies have unpacked the contested nature of adaptive interventions, demonstrating how the reduction of risk for certain groups is often achieved at the expense of increasing it for others (Atteridge and Remling, 2018; Eriksen et al., 2015). For example, Anguelovski et al.

(2016) demonstrated how climate adaptation measures resulted in unequal access to flood-protected infrastructure, allowing affluent communities to stay in place while forcing marginalized residents to move for the development of adaptation projects. Furthermore, Anguelovski et al. (2019a; 2019b) have shown how the greening of urban neighborhoods ultimately led to unaffordable housing, economic segregation, displacement, and green gentrification, also specifically examining these phenomena within the context of Barcelona (Anguelovski et al., 2018a, 2018b; Kotsila et al., 2021). Other critical studies revealed how, as wealthier and predominantly white individuals sought to adopt more "climate friendly" lifestyles (Rice et al., 2020) or move to "climate-proof" areas (Anguelovski et al., 2019a; Shokry et al., 2020), lower-income and nonwhite communities were displaced and excluded, exacerbating existing race-based and classed social inequalities. Further research documented how the tools used in land use planning for adaptation have consistently resulted in the exclusion of urban poor and minority groups from climate-resilient enclaves to areas with lesser desirable environmental conditions (e.g., located near waterways, landfills, shorelines, and wetlands) (Gould and Lewis, 2018; Mohai et al., 2009; Shi and Bouma, 2023), thus turning adaptation into a private environmental good with exclusionary externalities (Meerow, 2017; Silver, 2017). Initiatives related to energy efficiency programs such as building retrofitting have also led to increased housing prices and displacement of low-income populations (Edwards et al., 2017) and further studies found race, ethnicity, and socioeconomic disparities in access to energy-efficient residential technology and renewable energy subsidies (Lukanov and Krieger, 2019; Reames et al., 2018).

Studies conducted in Global South cities have also detailed the ways in which historically marginalized populations, who have long suffered from disproportionate exposure to environmental hazards, are now not only enduring the unequal consequences of climate change and environmental degradation, but also the unfair outcomes of policies intended to address these issues (Goh, 2023, 2019). For instance, examining the experiences of Quito (Ecuador) and Surat (India), Chu et al. (2016) provided early evidence that adaptation planning systems tended to prioritize economic growth while failing to align climate action and development goals. Looking at adaptation projects in Bangladesh, Sovacool (2018 p. 183). described how adaptation initiatives caused "processes of enclosure, exclusion, encroachment, and entrenchment", which further disempowered women and minorities and contributed to wealth and income inequality. The situation is even worse for informal settlers, who tend to face increased exposure to environmental impacts and have their informal status used to justify

efforts to remove them in order to prioritize the security of more "formal" sectors (Ajibade, 2017; Dodman et al., 2023; Goh, 2019; Ziervogel, 2020). The examples go on, with increasingly more studies demonstrating how traditional adaptation approaches are linked to the creation of new socio-material injustices and the uneven distribution of adaptation costs and benefits, disproportionately benefitting more affluent groups and excluding low-income and vulnerable communities (Anguelovski et al., 2020; Anguelovski, Irazábal-Zurita, et al., 2019; Blok, 2020; Fainstein, 2018; Kaika, 2017; Mabon & Shih, 2018; Meerow et al., 2019; Pelling et al., 2015; Robin & Castán Broto, 2020; Shi et al., 2016; Sovacool et al., 2015; Ziervogel et al., 2017).

3.4. Climate change (intervention) as a reinforcer of intersecting systems of oppression

The evidence presented above shows how so-called climate-resilient development in many cities is perpetuating the same dynamics that have historically led to dispossession, racial stratification, and exclusionary development. It emphasizes the connection between unequal access to basic social and environmental goods and the legacy of systemic racism, exclusion, and disinvestment in communities, which resulted from policies such as racial zoning, redlining, and urban renewal programs (Leichenko et al., 2023). Nowadays, rather than highways, urban renewal focuses on green infrastructure; segregation has given way to climate gentrification; and "bluelining" – where banks and insurance companies refuse to lend in flood-prone areas – has replaced practices of redlining based on race (Shi and Bouma, 2023).

As an old problem in a new guise, the populations worst affected by these actions continue to be low-income and communities of color, who had already been pushed to vulnerable areas by past waves of urban development and exclusionary land policies (Anguelovski et al., 2016a; Goh, 2023; Gould and Lewis, 2018; Long and Rice, 2019; Meerow and Newell, 2019). Notably, several studies revealed how low-income and communities of color are more likely to live in hotter areas of cities with little green space, as well as areas that are more vulnerable to flooding, landslides, and other climate-related hazards, both in the Global North and Global South (Jung et al., 2023). At the same time, these communities tend to lack access to resources and infrastructure needed to adapt to climate change due to historic discriminatory housing policies or disaster relief policies (Brennan et al., 2022, 2021; Vaughn, 2022). This background stresses how inequity in adaptation is a complex process of favoring already privileged groups

while refusing resources and voice to marginalized communities and perpetuating historical exclusion, social inequality, and environmental exploitation (Henrique and Tschakert, 2021).

The examples above show the intricate ways in which climate impacts interlock with pervasive systems of oppression (i.e., sexism, racism, ableism, heterosexism, colonialism) (Piketty, 2014), to create new forms of exclusion at the intersections and exacerbate existing socioeconomic, gender-based, and racial inequalities (Kruczkiewicz et al., 2021; Lahsen and Ribot, 2022; Schipper, 2020; Warner and Kuzdas, 2017). They also indicate that solutions to tackle climate change still fail to address underlying social, economic, and cultural factors that contribute to risk and vulnerability, including patterns of discrimination and exclusion, lack of political power and representation, and limited access to resources and infrastructure (Cole and Foster, 2000; Fraser, 2009; Langhans et al., 2023; Leichenko, 2011; McDermott et al., 2013; Schlosberg et al., 2017). Furthermore, evidence shows that responses to the climate crisis may inadvertently (or not) reinforce systemic oppressions, potentially perpetuating the same systems of racial, economic, social, and gender-based oppression that led to the crisis in the first place (Castán Broto et al., 2023). Given this context, there is an increasing urgency to understand how urban processes and socioenvironmental injustices are perceived, and how more equitable approaches to responding to climate change in cities can be developed (Bulkeley et al., 2013; Steele et al., 2012)

In response, as further described in Chapter 2 of this dissertation, there is room to further conceptualize the meaning of climate injustice as fundamentally linked to the devaluation of non-white-abled-cis-male bodies and the production of devalued spaces, which dictates who is protected from climate hazards and who has to be "resilient" (Pulido, 2017). Analyzing climate injustices in this manner enables unveiling commonalities among seemingly disparate forms of oppression and considering how systems of power and social injustices - including colonization, environmental racism, and heteronormativity – (re)shape adaptation outcomes (Osborne, 2015; Rice et al., 2023). Recent critical scholarship has called for new approaches to climate justice that recognize entrenched, intersecting processes of marginalization, by adopting postcolonial (Robin and Castán Broto, 2020), abolitionist (Ranganathan and Bratman, 2021), feminist (Sultana, 2014), and subaltern (Olazabal et al., 2021) perspectives. In fact, this push is not recent. Since the 1990s, environmental justice movements have been highlighting the interconnectedness of environmental and social injustices and the need for more integrated approaches to solving these intertwined issues (Agyeman, 2013). They brought attention to

racial and ethnic disparities in the distribution of polluting facilities and other environmental hazards, as well as the lack of access to environmental amenities, such as green and open spaces, in low-income and minority communities (Cole & Foster, 2000; Corburn et al., 2006; Fothergill et al., 1999). These movements also demanded fairer representation and involvement of communities affected by environmental injustices in decision-making processes and conveyed a common desire to dismantle the colonial and capitalist structures that underpin the multiple crises they face (Cole & Foster, 2000; Raditz, 2023).

Nevertheless, if local governments attempt to address these intersecting crises by compartmentalizing them and treating them as discrete phenomena, they risk further disempowering those who are already oppressed and perpetuating social inequalities (Bell, 2013a; Jerneck, 2018). Therefore, addressing climate injustices requires interventions that not only confront the climate crisis but also take into account the underlying contextual factors that contribute to vulnerability in specific areas / for specific populations and work to dismantle intersecting systems of oppression that perpetuate and exacerbate vulnerabilities (Aronoff et al., 2019; Garcia and Tschakert, 2022; Leichenko et al., 2023; Ruiz-Mallén et al., 2022). In short, climate action necessitates transformative responses that go beyond incremental change (Bentz et al., 2022; Fedele et al., 2019; Wilson et al., 2020).

Taking a transformative approach to climate adaptation allows for the analysis of how economic and social injustices contribute to the root causes of climate change with the aim to restructure political economies and power dynamics at various levels when governing and operationalizing urban adaptive strategies (Kates et al., 2012; Pelling, 2010; Ruiz-Mallén et al., 2022; Zografos et al., 2020). However, there is also a growing critical examination of this field (Strange et al., 2022). While recognizing the potential for radical change in some emerging urban climate action, scholars are beginning to suggest that transformation is inherently political and contested, urging both academics and practitioners to question: transformation of what, for whom, and for what purpose (Ajibade and Adams, 2019; Blythe et al., 2018; Newell et al., 2021). Failing to address these questions risks perpetuating uneven power dynamics under the guise of transformation (Kuhl et al., 2021; Woroniecki et al., 2019). Discussions, implications, and aspirations about transformation thus also remain mostly abstract and broad (Elmqvist et al., 2019), with few attempts to specify how transformation is translated into everyday urban climate governance and politics (for a few exceptions, see Deubelli & Mechler, 2021; Fedele et al., 2019). In fact, recent scholarship has cast doubt on the need to define what

transformative is or what it should look like, arguing that attention should instead be given to rethinking urban climate politics and its ability to challenge social and environmental injustices (Castán Broto et al., 2020). That is, instead of trying to preemptively determine what qualifies as transformative, greater emphasis should be placed on understanding the intricate intersections between climate change and other forms of injustice in order to address them in a more effective and integrated manner. I here argue that transformative urban climate action requires an intersectional lens because, without it, the transformation that cities seek may be constrained and, at least from one perspective, not properly transformative. In other words, an intersectional pivot in climate adaptation can steer the transformation towards greater equity.

3.5. Intersectionality

Intersectionality is a valuable approach for understanding the complex ways in which social identities and power structures intersect and interact to (re)shape an individual's experiences of marginalization and oppression, including in the context of climate change. The formal academic thread of thinking in this area extends back to the 1990s, but the issues raised have long-been familiar ground for people who live with the effects of social "othering". That said, the formalization of the experience of intersectionality offers an important point of connection for climate justice scholarship and practice.

The term "Intersectionality" is most associated with feminist, anti-racist, activist, and legal scholar Kimberlé Crenshaw, although the concept emerged from diverse experiences of women struggling and organizing across race, class, sexuality, and nationality. In her seminal essay, "Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracism Politics" (1989), Crenshaw talks about a propensity to view race and gender as distinct and separate categories of experience and analysis in discrimination cases. She suggests that the use of a single-axis framework disregards the unique compoundedness of the experiences of Black women, whose oppression results from more than the mere sum of "racism and sexism". Rather, their experience of oppression emerges from the *intersection* of race and sex and represents a broader and more intricate phenomenon than the addition of distinct categories of discrimination. Crenshaw explains that because Black women are situated at the lowest socioeconomic rank, "it is only through placing them at the center of the analysis that their needs and the needs of their families will be directly addressed" (p. 166). In this way, she justifies the need to focus political efforts

on addressing the needs of those most disadvantaged so that other marginalized populations – and society as a whole – can benefit.

Three years later, Patricia Hill Collins further developed the concept of intersectionality in her groundbreaking book "Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment" (Collins, 1991) by referring to it as the "analysis claiming that systems of race, social class, gender, sexuality, ethnicity, nation, and age form mutually constructing features of social organization, which shape Black women's experiences and, in turn, are shaped by Black women" (p. bii). Collins relates intersectionality to a "matrix of domination" that explains how the combination of various identities can lead to unequal access to resources and opportunities concerning policies. Over the last thirty years, the concept of intersectionality has been increasingly used as an analytical tool, lens, and framework to shed light on the ways in which different forms of discrimination (such as those resulting from sexism, racism, classism, homophobia, and ableism) intersect and operate systematically within a broader economic and social context (Matthaei, 2018). Intersectionality has been applied to a multitude of fields, from women's and gender studies (Cho et al., 2013; McCall, 2005) to psychology (Cole, 2009) to public health (Bowleg, 2012), and prejudice studies (Yuval-Davis, 2006).

3.6. Intersectionality and climate change studies

Climate change too is increasingly recognized as an issue characterized by intersectionality: as mentioned previously, it disproportionately affects low-income communities, people of color, and other marginalized populations and exacerbates existing inequalities and vulnerabilities. Despite this confluence of social factors, few studies to date have adopted a truly intersectional approach that considers the interplay of multiple identities in understanding people's experience of climate impacts and of adaptation (Ravera et al., 2016). Most research on adaptation impacts has focused on single aspects of identity, such as gender, race, or class to analyze disparities in adaptive capacity (Thompson-Hall, Carr, & Pascual, 2016). For instance, research on gendered vulnerability has revealed that women are particularly impacted by climate change due to long-lasting gender-specific barriers such as discriminatory practices within households and communities, unfair division of caring responsibilities, limited access to resources, underrepresentation in decision-making and leadership, and gender-based violence (Alston & Whittenbury, 2013; Arora-Jonsson, 2011; Eastin, 2018; Nelson et al., 2002; Perkins, 2018; Reckien et al., 2017; Sultana, 2014). However, there has been limited examination of how gender intersects with other identities and how these intersecting identities

impact adaptation processes and outcomes (Djoudi et al., 2016; Iniesta-Arandia et al., 2016; Osborne, 2015; Resurrección et al., 2019). This situation persists despite growing awareness that vulnerability increases when gender inequality intersects with other aspects of social difference, such as income, ethnicity, religion, age, and sexuality (Carr and Thompson, 2014; Kaijser and Kronsell, 2014; Rao et al., 2019; Resurrección et al., 2019; Sultana, 2014).

This scenario is changing fast with recent significant theoretical and empirical contributions on intersectionality, climate adaptation and climate justice. Researchers are increasingly employing empirical metrics and indicators to measure intersecting climate vulnerability, encompassing a combination of various factors that influence the susceptibility of different populations to climate hazard and their ability to recover from them. For instance, Walker et al. (2019, 2020), Cundill et al (2021), Erwin et al. (2021), and Phuong et al. (2023) use intersectionality approaches to better understand impacts of climate hazards across intersections of gender, location, race, ethnicity, and age and how those intersections shape individual and community adaptive capacity. Intersectionality has advanced in the field of climate governance as well. For example, Foran (2020), McArdle (2021), and Versey (2021) argue for incorporating intersectional approaches to climate policy that consider the experiences of marginalized groups and investigate how multiple axes of identity intersect with systems of oppression and compounding vulnerabilities to envision more socially equitable and culturally appropriate adaptive responses. Finally, there have been significant conceptual contributions to the broader field of climate justice. Sultana (2022) and Mikulewicz et al. (2023), for instance, propose using the lens of intersectionality to enhance climate justice scholarship, focusing on marginalized populations, considering contextual intersectional oppressions and challenging dominant epistemologies to support more impactful and accountable climate action.

Despite the growing acknowledgement of the need for intersectional responses that address different markers of vulnerabilities, many cities still concentrate efforts on single, specific issues – such as climate adaptation to specific impacts (e.g., heat, flooding) or access to housing or healthcare – and specific markers of oppression, such as gender, race, or class. Most cities fail to recognize how each marker reinforce the other and fail to plan for projects that more transversally and conjointly address compounded vulnerabilities. This dual failure highlights the urgency of unlocking the transformative potential of intersectional theory in shaping fairer urban futures. For that reason, in this dissertation, I choose to further dig into emerging

practices of intersectionality as they relate to climate justice. Intersectionality can be a means to visiblize and further support cities' next steps and actions to mitigate the climate crisis and protect residents from its harms while working to reduce rampant forms of discrimination, segregation, and inequality. I argue that this approach can lead us towards a climate-just city that embraces intersectionality – or an intersectional climate-just city.

Through this work, I develop a framework to conceptually establish what intersectional climate justice is; I inspect governing tactics and institutional arrangements to understand how urban intersectional climate justice is being governed and implemented; and I converse with frontline communities to understand how the construction of the intersectional climate-just city it is being experienced and enacted by marginalized populations.

4. Research gaps, questions, and overarching research design

	Research questions	Approach	Methods
Chapter 2	In what ways can the application of an intersectional lens in urban climate planning inform and guide justice-oriented adaptation actions on the ground?	Qualitative: identification of key themes and important insights based on the literature and ongoing projects and policies, to develop a conceptual framework.	Narrative and analytical review. Content analysis of relevant policy and planning documents. Global approach, with some focus/emphasis on Barcelona.
Chapter 3	How are emerging intersectional climate justice efforts being implemented and governed in the city?	Qualitative: systematic coding and thematic analysis of interviews and city documents.	23 in-depth semi-structured interviews. Analysis in NVivo. Content analysis of relevant policy and planning documents. Case study: Barcelona.
Chapter 4	To what extent are adaptive urban infrastructures responding to the intersecting vulnerabilities and lived experiences of climate change of marginalized populations?	Qualitative and quantitative: mixed methods and citizen science approaches.	Archival analysis. Focus group. Interviews. Neighborhood-level surveys. Analysis in R. Case study: Barcelona.

5. Glossary of diversity, equity, and inclusion

Next, I provide a brief, non-exhaustive list of terms used throughout the thesis and not explicitly defined in the introduction. This glossary is not meant to reduce or essentialize these concepts but rather clarify my understanding and employment of complex phenomena in very few words. This glossary is based on Black Feminist resources and thinkers, such as Patricia Hill Collins' Black Feminist Thought, the Racial Equity Tools[1], and the Race and Health collective[2].

1. Discrimination: differential treatment or outcomes that are unfavorable towards a group or individual based on their social or political identity, such as race, religion, gender, social status, physical ability, or sexual orientation. Discrimination can result in the differential allocation of resources and opportunities, furthering existing power hierarchies and inequalities. Racial discrimination includes any distinction, exclusion, restriction, or preference based on race, color, descent, or national or ethnic origin that nullifies or impairs the recognition, enjoyment, or exercise of human rights.

2. Equity: an equitable approach involves examining the systemic factors that benefit certain communities while harming others in order to achieve justice. In some cases, justice may require an unequal response to achieve equity, to ensure that historically marginalized and disadvantaged groups have equal access to opportunities and resources in ways that account for historical, persistent, and systemic inequalities.

3. Ethnicity: a social construct that divides people into distinct social groups based on shared characteristics, such as cultural beliefs, behaviors, language, history, and geographic origin, among other factors.

4. Feminism: social, political, and cultural movement that advocates for gender equality and seeks to eliminate discrimination and oppression based on gender. It aims to challenge and dismantle patriarchal systems and values that perpetuate gender inequality and promote liberation of all gender identities and expressions.

5. Justice: approach to societal organization that opposes oppression, aiming to address the root causes of institutional and structural discrimination. It envisions a world where

[1] https://www.racialequitytools.org/glossary
[2] https://www.raceandhealth.org/definitions

all individuals and groups are recognized and treated as fully human across personal, social, and institutional spheres. It rejects the dominance of any particular group and promotes the inherent worth and interconnectedness of all people, resources, and the planet.

6. Marginalization: social process where individuals or groups are intentionally or unintentionally pushed away from accessing power and resources and are made to feel unimportant or less valuable to society. Marginalized groups are excluded from mainstream social, economic, cultural, or political life, and can comprise those excluded based on race, religion, political or cultural affiliation, age, gender, or financial status. The extent of marginalization depends on the cultural organization of the social site in question.

7. Minority / Minoritized: group or community of people who have been subjected to social, political, and economic marginalization, exclusion, and oppression due to their perceived minority status. The term "minoritized" emphasizes the systemic and structural nature of the marginalization experienced by these groups as opposed to an individual or personal attribute.

8. Oppression: system of power relations where one group, often the dominant or privileged group, uses institutional and cultural forces to subjugate, exploit, and systematically deny access to societal resources to another group, often marginalized, over an extended period of time. Significant forms of oppression include racism, sexism, classism, homophobia, xenophobia, ableism.

9. Race: socially constructed concept based on physical appearance and ancestry, imbued with social, economic, and political meaning. It was constructed as a tool of racism to create a racial hierarchy, assigning superiority and inferiority, and determining access to resources and human rights, despite being morally and biologically unfounded. Racial categories are fluid and can change over time, location, and context, and intersect with other systems of oppression to differentially allocate power and privilege.

10. Racism: system that affords power and privilege based on a hierarchy of race, which is itself a socially constructed classification. Racism is a system that unfairly disadvantages some individuals and communities based on their phenotype, while at

the same time unfairly privileging others. Racism is interpersonal, institutional, and structural. The social racial categories are deeply ingrained in and serve as instruments of larger interconnected systems of oppression, which operate through various structures to unevenly distribute power and privilege.

11. Sexism: historically entrenched and institutionally perpetuated system of oppression and exploitation that assigns authority and privilege to those identified as male or those exhibiting male characteristics, who occupy positions of political leadership, moral authority, and control of property. The system implies and enforces the subordination of females and can lead to gendered outcomes, even without specific gendered animus expressed between individuals.

12. Vulnerability (climate): a function of exposure to climate-related hazards, the sensitivity of a given population or system to these hazards and their capacity to adapt and cope with the impacts. Climate vulnerability is (re)shaped by a range of factors, including social and economic inequalities, demographic characteristics, environmental conditions, and institutional capacity.

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Chapter 2 - Intersectional climate justice: A conceptual pathway for bridging adaptation planning, transformative action, and social equity[‡]

Abstract

Local governments around the world are formulating different ways to address climate change. However, the compounding and overlapping vulnerabilities of historically marginalized residents are commonly tackled in a fragmented manner by conventional adaptation approaches, even when justice is presented as an overarching goal of these plans. In response, we propose an intersectional pivot in climate adaptation research and practice to analyze the interconnected forms of social-environmental injustices that drive vulnerabilities in cities, paving the way for more concrete and integrated strategies of just urban adaptation and transformation. This paper brings together narrative and analytical review methodologies to inform a new conceptual framework that highlights the need to (1) tackle underlying reinforcers of racial and gender inequalities; (2) redress drivers of differential vulnerabilities; (3) take politics and ethics of care seriously; (4) adopt place-based and place-making approaches; and (5) promote cross-identity forms of activism and community resilience building. We illustrate the framework with examples of ongoing projects in Barcelona, Spain, which is an early adopter of intersectional thinking and justice-driven principles in climate action. Although many initiatives are in a pilot phase and do not all exclusively focus on climate adaptation, experiences from Barcelona do provide illustrative directionality for innovative and integrated approaches that can address multiple and intersecting social-environmental inequities.

Keywords: Intersectionality; Urban Climate Justice; Barcelona; Differential Vulnerabilities; Ethics of Care, Place-based Adaptation.

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1. Introduction

Around the world, those cities that are engaging in climate adaptation planning continue to face compounding emergencies attributed to increasing gender-based and racially motivated violence, socio-economic inequality, crises of care, and, most recently, the COVID-19 global pandemic. The need to address these crises one-by-one can detract from comprehensive efforts towards more resilient and inclusive futures and, depending on the tools and strategies implemented, risk exacerbating already deep social, economic, and political divisions in cities. There is thus increasing urgency for planners and policymakers to adopt intersectional frames that tackle these inequalities in a holistic way, while simultaneously striving to expand capacity to build transformative sustainable futures.

This paper proposes a conceptual pivot to intersectionality as a way to coalesce the theoretically fragmented scholarship on climate adaptation planning and the normative principles, strategies, and values developed by practitioners to tackle social exclusion and vulnerability. Based in critical race theory and feminist studies, intersectionality notes how social characteristics such as gender, race, class, age, disability, and sexual orientation intersect each other to drive and exacerbate privilege, discrimination, and oppression (Ahmed, 2017; Crenshaw, 1989). Single focus lenses on social inequality (e.g., race, gender, or class) leave little space to address complex problems (Collins and Bilge, 2020), including those induced or exacerbated by climate change. For instance, we see cities promulgating innovative policies to tackle gender inequalities, as is the case in Barcelona (Ajuntament de Barcelona, 2016), or address racial injustice, as we see in London (London City Hall, 2020), but these actions are often self-contained. As a result, these policies tend to offer only a partial and de-contextualized response (Anguelovski et al., 2020; Ranganathan and Bratman, 2021). Therefore, our call for a pivot to intersectionality as an organizing principle for urban climate adaptation action seeks to formalize the recent conceptual shift away from technocratic and exclusionary forms of climate change planning (see Long and Rice, 2020) towards more socially transformative approaches that redress the drivers of diverse, underlying, and systemic inequalities (Anguelovski et al., 2020; Chu et al., 2017; Shi et al., 2016). We argue that prioritizing actions designed to simultaneously account for multiple inequities and associated compounding and overlapping vulnerabilities – across both space and time – is necessary to break free from processes that have continued to generate deep climate vulnerabilities in cities. In other words, an intersectional pivot can enable an integrated and socially transformative program that builds

on past advances while taking into account power relations that hinder contemporary efforts (Phoenix and Pattynama, 2006).

Recent scholarship has similarly acknowledged the need for intersectional approaches to climate adaptation (see Djoudi et al., 2016; Kaijser and Kronsell, 2014; Owusu et al., 2019); however, this paper argues for a formalized conceptual pivot towards intersectionality and offers a framework for operationalizing intersectional thinking in climate planning and policy-making on the ground. To begin, we review recent literature on intersectionality and justice in climate adaptation, with the aim of proposing and consolidating a normative language focused on intersectionality and derived from existing scholarship in the area. Next, we describe our conceptual framework for intersectional climate justice, which includes five distinct subcomponents. We illustrate these subcomponents by using notable examples from Barcelona, Spain, as an emblematic pioneering city in both policy and practice for the advancement of a transformative vision for climate justice. Still, even though Barcelona showcases recent policies, plans, initiatives, and citizens' engagement around intersectionality and climate action, it remains a nascent and experimental process. Thus, we situate Barcelona within a community of other cities around the world that are thinking seriously about climate justice, highlighting a pathway toward transformation which, although fragmentary and contentious, can inform an ideal of intersectional climate justice.

Given the ongoing and preliminary nature of efforts in Barcelona and the scope of this article, our intention is not to provide a fully developed case study, but instead to highlight instances where the city is pursuing policies and projects to further intersectional thinking in its climate adaptation planning. By exploring these examples, we piece together potential pathways to realize intersectional climate justice on the ground. Our approach is perhaps best described as providing illustrative directionality for those seeking to develop a vision and struggle through the negotiated process of urban intersectional climate justice (Harris et al., 2017). We conclude the article by highlighting the larger implications of the frame we present for urban climate adaptation and development and outline limitations and opportunities for further research.

2. Methods

This paper brings together narrative and analytical review methodologies to provide a state-of-the-art overview of the main debates in the field, assess how the field is moving forward, and inform a conceptual framework that we then further illustrate with notable examples of climate

initiatives from Barcelona. Narrative reviews are a valuable contribution to the literature as they provide comprehensive syntheses of targeted substantive issues based on previously published information, thus presenting a broader perspective on an otherwise elusive topic and describing the development of a problem or its management (Goodier, 1999; Green et al., 2006). Our goal is therefore to leverage the combined strength of narrative and analytic reviews to explore themes across recent scholarship and synthesize insights from multiple perspectives and disciplines (Sovacool et al., 2018). Given this goal, we do not pursue an exhaustive, quantitative, systematic review of all literature. Rather, we identify key themes, important insights, and suggest avenues for further research based on our reading of the literature, as well as develop a novel conceptual framework that ties together different fields of inquiry to advance critical social scientific research on urban adaptation going forward. This approach is useful and necessary since there is comparatively little simultaneous scholarly engagement with intersectionality, climate change adaptation, and urban justice.

Our review methodology was both inductive and deductive. We included specific searches based on pre-defined theoretical concepts (e.g., intersectionality, urban justice) and refined the topic and objective of the review through an analysis of further literature pertaining to the core topics (e.g., climate change adaptation, resilient cities), synthesizing a set of main takeaway points from this evidence. We began with a literature search in Web of Science, Scopus, and Google Scholar, identifying 432 articles that matched the pre-established theoretical concepts and filtering results based on relevance and year of publication. We screened titles and abstracts to identify peer-reviewed publications addressing intersectionality, intersectional approaches to climate studies, justice, and equity in urban climate adaptation and resilience. We selected a subset of 168 articles based on their relevance to the core topics, although they did not need to address all the above-mentioned topics to be included in the narrative review, allowing for permeability and complementarity. We also prioritized relevant articles published between 1985 and 2021 in journals that included original empirical data or offered original theoretical contributions. We then searched for references and secondary citations in those papers, gathering pertinent articles cited by and within the results, until we reached a point that we considered representative of the state of the literature based on the four authors' backgrounds and repeated mentions of similar issues (i.e., saturation). We excluded articles which, after full-text screening, did not seem directly relevant to the topic (i.e., not concerned with urban issues or climate change adaptation). In the end, we arrived at a pool of 160 articles to review and

synthesize scholarly critiques and identify theoretical gaps. Figure 1 shows the process undertaken.

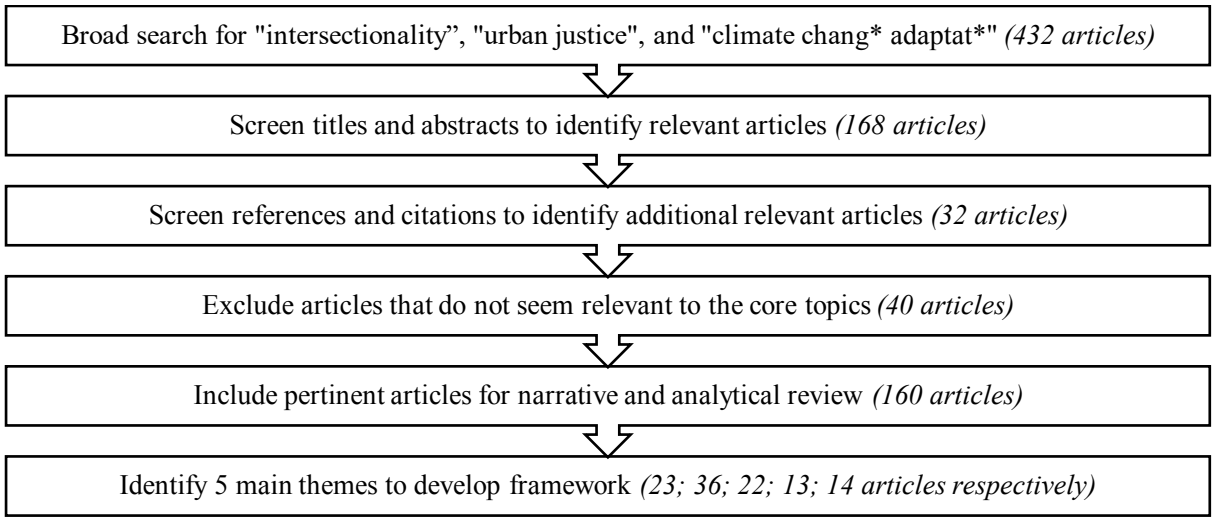

Figure 1 - Literature review process and results of each step

Our review informs an analytical framework that identifies five main components for advancing intersectional climate justice. This framework builds upon previous work by operationalizing intersectional thinking into urban adaptation practice, so that it can be, we argue, more inclusive, care-driven, and transformative. We illustrate this framework with brief examples of ongoing projects in Barcelona, Spain. We position Barcelona within a larger community of cities around the world that are implementing principles, policies, and planning tools to advance agendas associated with the subcomponents of our proposed framework. We do this using a two-stage approach, where we identify cities around the world that are considered among those that are pursuing transformative principles, policies, and programs on the ground. We identified these emblematic cities based on an analysis of recent reports published by relevant global organizations and research institutes (i.e., World Resources Institute[4], Barcelona Laboratory for Urban Environmental Justice and Sustainability, Local Governments for Sustainability[5]), as well as informal interviews and professional exchanges with experts on the topic, including the authors of the reports. These exchanges were supplemented with extensive keyword and internet searches. This process shortlisted pioneering cities that are developing work at the intersection of climate justice, equity and

[4] https://wrirosscities.org/research/publication/unlocking-potential-transformative-climate-adaptation-cities
[5] http://www.bcnuej.org/projects/green-trajectories/

urban sustainability, each bringing in different ways to tackle social inequalities, such as allowing for informality in Cape Town (Fox et al., 2021), empowering youth in Quito (Chu et al., 2019, 2016), combatting racism in Portland (Connolly & Anguelovski, 2021; Goodling, 2021), and assimilating Indigenous and local knowledge in climate action in North American cities (Mustonen et al., 2021). We apply these other examples to contextualize individual actions in Barcelona and reflect on how intersectional climate adaptation actions can be furthered.

We chose to highlight Barcelona as an emblematic city due to its wide base of action relative to other early adopter cities. In short, our review showed that the city displays a comparatively wide range of justice principles for climate action with intersectional lenses on vulnerability across a variety of urban policies and interventions. Ada Colau, Mayor since 2015, is the first woman to hold the office and places feminism, the fight against inequalities, promoting a more caring city, public participation, and the climate emergency at the center of her governance approaches (Ajuntament de Barcelona, 2018; Barcelona, 2020a, 2020b, 2015). We draw upon governmental plans, by-laws, policies, and projects that detail Barcelona's stated commitments to create a fairer and more inclusive city while championing climate community-centered action. Annex 1 shows a list of the documents accessed, which were located through extensive internet searches and keyword research in the City Council's open knowledge repository, as well as official city websites, and their individual department online archives. We distilled those documents building on the main analytical concepts of this paper and identifying relevant projects and approaches. Although not all plans, policies, or projects are explicitly related to climate adaptation, many call for new transversal institutional practices across planning domains and sectors. In that sense, they plant new narratives and imaginaries about what planning for intersectional climate justice can look like in the city.

3. Intersectionality and climate studies

Intersectionality is a core conceptual lens to understand how various forms of social inequalities and vulnerability interconnect and overlap with each other. With roots in Black feminist thought, proponents of the theory posit that different social identities and categorizations -- such as gender, race, socioeconomic class, cultural and ethnic background, age and disability -- combine to create unique modes of disadvantage and oppression (Crenshaw, 1989; Crenshaw, 2017). It is a push to look beyond the effects of any one social

driver (e.g., racism or sexism) and toward the forces that simultaneously generate power imbalances across multiple drivers as the sources of injustice.

Intersectionality does not only concern categories of identities, but it also embraces the complexities that are essential to understand entrenched social, political, and structural inequalities (Sumi Cho et al., 2013; McCall, 2005), which in turn translate into different kinds of vulnerabilities and unequal caring needs and responsibilities (Hankivsky, 2014a). On that premise, intersectionality builds on care ethics and prescribes "good care" practices that shift away from historic – often racial and gendered – hierarchies constraining who is responsible for care versus those who are deprived from it (Raghuram, 2016). Hence, intersectionality is a key theoretical resource to understand, confront, and transform the entrenched interlocking power inequalities that govern the (mal)distribution of care (Hankivsky, 2014b), further developing and advancing the debates on political ethics of care (Collins, 1991) and the (re)production of care inequities (MacGregor, 2006). Moreover, intersectionality is committed to the structural dimensions of the context (Crenshaw, 1991), acknowledging the role played by place and space in shaping people's perceptions and experiences of privilege, discrimination, and oppression (Davis, 2008). Ultimately, intersectionality is inextricably linked to an analysis of power relations and structures of subordination (Johnson et al., 2020), encouraging cross-identity forms of activism and community responses that can bring about justice-oriented change (Collins and Bilge, 2020). It is within this theoretical backdrop that we develop our frame to operationalize intersectional thinking into urban climate adaptation.

Intersectionality has been increasingly adopted as an analytical framework in different fields, ranging from gender and feminist studies (Ahmed, 2017; Nash, 2008; Shields, 2008), and psychology (Cole, 2009), to organizational studies (Acker, 2006). In this paper, we focus on intersectionality as a framework to guide justice-oriented transformations in urban environmental planning and, more specifically, in climate change studies. We thus respond to the need for more holistic, multiscale, and integrated approaches to justice in climate adaptation (Coggins et al., 2021). Such an approach calls for academics and planners concerned with urban justice to (1) analyze how residents decipher, sense, and occupy spaces (even in more invisible and heterodox manners) while distilling multiple, concurring exposures to environmental risks, insecurity, and inequalities, and (2) interpret those identities and experiences in different historic moments and spaces (Anguelovski et al. 2020).

In the context of justice in climate change, intersectionality is increasingly being applied to examine the overlapping and interdependent systems of disadvantage and oppression that restrict people's adaptive capacity and create new or exacerbate existing social-ecological vulnerabilities (Djoudi et al., 2016; Kaijser and Kronsell, 2014). Examples of intersectionality can also be found in climate mitigation, such as in energy transition (Cannon and Chu, 2021; Johnson et al., 2020) and land restoration (Thompson-Hall, 2016) literatures. However, most of these studies focus on agrarian settings in the Global South (Carr and Thompson, 2014; Thompson-Hall et al., 2016), for example access to secure land for women farmers in India (Ravera et al., 2016b), Ghana (Lawson et al., 2020) and South Asia (Sultana, 2014). Literature on intersectional approaches to climate change in urban contexts is insipient, with a few exceptions (e.g., Wilson & Chu, 2019). Yet, with well-documented multiple forms of climate injustice faced by people of color, low-income, and migrant communities in today's cities (Anguelovski et al., 2019a), together with increasing pressures posed by climate change on cities' infrastructures and services, it is essential to apply an intersectional lens to urban climate studies to help uncover the interconnected and lasting systems of oppression and disadvantage that drive and sustain vulnerabilities in cities while depriving some groups of ecological benefits (Connolly and Anguelovski, 2021), so that adaptation strategies can be more boldly inclusive and just.

In fact, research indicates that traditional urban climate adaptation practice has taken exclusionary, inequitable, and technocratic approaches, which have aggravated the structural causes of vulnerability and undermined the need for deeper social reforms (Chu et al., 2017; Meerow, 2017; Robin and Castán Broto, 2020). For instance, studies have shown that climate adaptation and resilience developments tended to overlook historic and ongoing patterns of uneven and inequitable development, leading to worsening social and environmental vulnerabilities for marginalized groups and causing unjust and maladaptive externalities – even when pursued under the intent of justice (Anguelovski et al., 2019a, 2016b; Connolly, 2018; Shokry et al., 2020).

An intersectional pivot would respond to the heaviest critiques of recent climate action by analyzing and addressing the interconnected forms of social-environmental injustices that drive vulnerabilities in cities. It fundamentally differs from traditional (i.e., technocratic, sectoral) adaptation planning and practices (Westman and Broto, 2021) by encouraging strategies that support the current and long-term intersecting vulnerable identities and needs of

underprivileged groups while creating new opportunities for a more inclusive and resilient city at both the individual and community level. Thus, an intersectional pivot in climate adaptation can pave the way for more concrete strategies of urban transformation that challenge social power imbalances and break away from dominant political economic interests (Devereux and Sabates-Wheeler, 2004; R.W. Kates et al., 2012; O'Brien, 2012; Mark Pelling, 2010).

However, despite a wide range of adaptation critiques and justice-oriented strategies, these approaches are presently fragmented both in theory and practice and rarely take intersectional needs, identities, and vulnerabilities into consideration. We argue that an intersectional pivot in urban climate can help to orient justice-focused adaptation actions on the ground around normative goals, empirically informing urban transformations. Next, further building on specific themes in the literature, we propose a conceptual framework with five key components that cities must focus on to devise more integrated, intersectional, and transformative adaptation solutions, which can help to promote climate action while taking into account place-based and historic legacies of socioeconomic and environmental injustices.

4. Intersectional Climate Justice – a Conceptual Frame for Urban Adaptation Planning

In this section, we bring together the various bodies of theory noted earlier to propose a conceptual framework with five subcomponents that are essential for cities seeking to operationalize intersectional thinking in urban climate adaptation. The five subcomponents emerging from our review point to the need to: (1) tackle underlying economic reinforcers of racial and gender inequalities; (2) redress differential vulnerabilities; (3) take ethics and politics of care seriously; (4) adopt place-based approaches, especially those promoting invisible or unmapped senses of place and place-making; (5) and promote cross-identity and vulnerability activism and community resilience building. To each of these subcomponents we offer a theoretical description and critique followed by brief empirical examples of policies and projects in Barcelona and elsewhere that are attempting to address these issues in transformative ways. Figure 2 illustrates the five subcomponents of the intersectional climate justice frame and Table 1 summarizes them. It also articulates drivers behind injustices and pathways to achieve intersectional climate justice.

Figure 2 - Intersectional Climate Justice: a conceptual framework for urban adaptation planning

Table 1 – Intersectional Climate Justice framework subcomponents, drivers of injustices and pathways to achieve intersectional climate justice

Component	Driver of Injustice	Intersectional Climate Justice pathways
Tackle underlying systemic reinforcers of racial and gender inequalities	- Racial and gendered capitalism - Gender- and race-blind climate policies	- Recognize and question economic reinforcers of racial and gender inequalities - Dismantle systems of gender and racial oppression and subordination - Devise racial and gender equality goals in key regulations, plans and programs
Redress drivers of differential vulnerabilities	- Historical and structural inequalities, pre-existing risks and urban vulnerabilities - Exclusionary land use planning, zoning, and unequal enforcement of land use regulations	- Consider historic legacies of social and environmental injustices in adaptation planning - Address enduring inequality in land use planning - Include the most vulnerable in decision-making
Take politics and ethics of care seriously	- Cities centered on productive over reproductive work - Austerity, devaluation, and crisis of care	- Rethink planning from a care perspective, putting caring relations, reproductive uses, and self-care needs at the fore - Recognize and value unpaid care, reproductive and other forms of invisibilized work - Set measures and services that regenerate people's physical and emotional wellbeing
Adopt place-based and place-making approaches	- Colonial, scientific, technocratic, and expert-driven approaches to planning and development - Policed state and disciplined landscapes and practices	- Foster decolonial / postcolonial approaches to planning and development - Recognize traditional, situated, and local knowledge arising from diverse and often invisible experiences of place and space - Arrange reparations and access to land and natural resources for marginalized residents
Promote cross-identity climate action and community resilience building	- Limited citizen involvement and engagement in adaptation planning, implementation, and evaluation - Limited or tokenistic civil society participation	- Empower local communities to manage their resources and lead the change - Invest in mentoring programs leveraging local leaders and promoting stewardship opportunities - Support participation and representation of, and training/business opportunities for minority-focused organizations and social movements

4.1. Tackle underlying systemic reinforcers of racial and gender inequalities

The concept of intersectionality aims to address the fact that the experiences and struggles of women of color have fallen between the cracks of both feminist and antiracist discourse (Crenshaw, 1989). Thus, the first component of the intersectional climate justice framework picks up this critique to recommend that specific attention be given to the role of past racial and gender-based violence in the (re)production of social inequalities, recognizing the systematic devaluation of female and nonwhite bodies and its assimilation into economic processes (Pulido, 2017; Robinson, 2000). Hence, this component suggests adopting a more intersectional conception of capitalism than traditional Marxist theory, recognizing its deeply racialized, sexist, and colonial nature (Federici, 2004; Pulido, 2016; Virdee, 2019). This means acknowledging that - beyond proletary exploitation and dispossession - capitalism has relied on the consistent oppression of racial minorities and undervaluation and invisibilization of women's work, transforming them from co-producers of common wealth into reproducers of the capitalist workforce (Federici, 2004; Melamed, 2015).

These deeply embedded injustices of historic racism and sexism are reflected in contemporary communities' capacity to cope with and adapt to climate change. There is growing recognition that the impacts of climate change have a disproportionate effect on women, Black, Indigenous, and low-income communities (Costello et al., 2009; IPCC, 2012). Research has shown that these groups tend to be more vulnerable to the effects of climate change because they are less likely to own land and resources, have less education and training, less access to institutional support, health services, and information, and fewer opportunities to participate in decision-making (Alston and Whittenbury, 2013; Denton, 2002; Nelson, 2012; Röhr, 2006). Despite that, we do not suggest that intersectional climate justice calls for reproducing simplistic portrayals of poor, Black, and Indigenous women as the main victims of environmental degradation while at the same time reinforcing a narrative that they have greater environmental awareness (Johnsson-Latham, 2007), positioning them as 'eco-warriors' (Resurrección, 2017), and community leaders toward resilience (Enarson, 2013; Veuthey and Gerber, 2012). Such a simplified approach to underlying race and gender inequalities attributes yet another responsibility to the already long list of caring roles. Rather, an intersectional lens pushes back against reductionist narratives to the extent that they further disempower those who are socially oppressed and deflect attention from the power relations that perpetuate social inequalities (Bell, 2013b; Jerneck, 2018).

In contrast, this subcomponent of our understanding of intersectional climate justice highlights the condition wherein, despite being the most negatively affected by climate change, women and racial and ethnic minorities remain under-represented in adaptation planning and decision-making processes (Kelly and Adger, 2000; McManus et al., 2014; Resurrección et al., 2019), which are often still dominated by technocentric approaches that perpetuate adaptation as the exclusive domain of experts and elite actors, while neglecting local needs, traditional knowledge, and historical struggles (Anguelovski et al., 2019a; Haverkamp, 2017). The result is often climate policies that are race- and gender-blind, which risk leaving the deeply embedded injustices of historic and contemporaneous racism and sexism untouched, while exacerbating injustices and producing new tensions over time.

To avoid the perpetuation of biases, injustices, and intersecting forms of discrimination, climate policies seeking to internalize the intersectional approach would focus on the embodied experiences of environmental and climate struggles, with a particular critique of racist and sexist legacies that make cities unsafe, climate-insecure, productivity and consumption focused, and exclusively benefiting the few. To do that, it is necessary to prioritize policymaking approaches that heed to the intersecting identities, perspectives, and needs of historically marginalized groups, adopting planning approaches that are intrinsically feminist and antiracist. Thus, the first pillar of this frame calls for taking steps toward a transformation of the oppressive systems and structures that reinforce racial and gender inequalities, examining, questioning, and redressing the power dynamics that have reified privilege and disenfranchisement throughout history.

Barcelona is an emblematic city which has started to embed feminist policies in its governance structure. In 2016, the City Councilor's Office for Feminism and LGBTI Affairs launched the "Plan for Gender Justice (2016-2020)" (Ajuntament de Barcelona, 2016), aimed at combating gender inequalities and transforming the city from a feminist perspective. Its goals included strengthening mechanisms for the political, social, and technological participation of female residents, as well as rethinking public spaces, infrastructures, mobility, housing, social, educational, and health care services from the principle of gender fairness. In March 2017, the City Council introduced the government bill "Urban planning with a gender perspective. The urban planning of everyday life", which incorporates a gender perspective to all urban projects, situating everyday life at the heart of Barcelona's urban policies and applying an inclusive perspective to respond to the needs and desires of society as a whole (Ajuntament de Barcelona,

2017a). Among the actions proposed are the planning of public and green spaces from a gender perspective, such as the super blocks in Sant Antoni, which were based on participatory diagnostics and proposals for a feminist transformation in the urban model at the local level (Ajuntament de Barcelona, 2019a, 2019b). Since 2016, these policies have been gradually implemented across municipal sectors and systems, but this is still an initiative working from outside of planning to change climate action, so it is too early to assess the larger social impacts and political implications. While Barcelona is at the forefront in achieving gender equality and supporting the rights of international migrants and refugees, the city is not as advanced yet in the fight against the structural racism that long-term racialized minorities are facing in, for example, housing security or job hiring practices (García-Lamarca, 2022), pointing to approaches that although transversal, must incorporate more axes of vulnerability.

Moving beyond Barcelona, the city of Portland, Oregon, in the United States presents an example of climate action with an antiracist approach. Portland has a long history of environmental racism, from redlining policies in the 20th century to the ongoing exclusion of non-white and low-income populations from green amenities, as studies on the city have recently shown that racialized populations experience disproportionate exposure to extreme heat and have less access to refuge from high temperatures, be it green spaces or cooling centers (Nesbitt and Meitner, 2016; Voelkel et al., 2018). To counter that trend, Portland launched in 2017 a Five-Year Racial Equity Plan to address historical and current disparities in parks distribution, access and quality, as an attempt to reveal the city's history of urban racial exclusion and become a leader in equitable greening and sustainable urban living in North America (BCNUEJ, 2018; Goodling et al., 2015; Portland Parks & Recreations, 2017). While Portland presents an aspiring example of policymaking for racial and environmental justice, it continues to be a plan built on a single axis of inequality (race) thus not inherently intersectional.

4.2. Redress drivers of differential vulnerabilities

Intersectionality is not exclusively preoccupied with categories of identities, but also with political and structural inequalities (Cho et al., 2013), which are deemed underlying drivers of climate vulnerability (Shi et al., 2016). Thus, the second component of the intersectional climate justice frame is the acknowledgement and rectification of differential vulnerabilities. The concept of differential vulnerability emerged from a pursuit driven largely by feminist

scholars to better understand the nuances of vulnerability and its relations with gender, cultural and social norms, race and ethnicity, age and religion (Blaikie et al., 1994; Cardona, 2004; Denton, 2002; Nelson et al., 2002). Rather than a stationary attribute of certain populations, differential vulnerability is a function of compounding risks (i.e., conflicts, natural disasters, pandemics) and intersecting axes of social differences (i.e., gender, racial, socioeconomic inequalities), which can coexist and aggravate each other (Cardona et al., 2012; Soares et al., 2012; Thomas et al., 2019; Vancura and Leichenko, 2015). Thus, the integration of an intersectional perspective is essential as it helps analyze and understand the ways in which axes of social inequality intersect with climate impacts, hazards, and crises to create diverse experiences of oppression and vulnerability in different contexts (Kuran et al., 2020; Ravera et al., 2016a).

Despite a growing body of work on adaptation strategies to address differential vulnerabilities (Berrouet et al., 2017; Soares et al., 2012; Tapia et al., 2017), research is yet to elucidate how adaptation projects can redress pre-existing and intersecting drivers of differential vulnerability in urban contexts, with a few exceptions (e.g., Chang et al., 2021). The understanding of differential vulnerabilities to climate change in urban contexts is timely not only because cities house the majority of the world's population, but also because a changing climate poses threats to high numbers of urban residents, affecting basic infrastructures, networks and services, as well as economic and health systems (Tapia et al., 2017). For instance, flood exposure is expected to cause significant global financial and material losses in cities (Douglas et al., 2008; Hallegatte et al., 2013), while warming temperatures are likely to disrupt power supplies, increase vulnerability to heat stress, and intensify health inequalities (Harlan et al., 2006; McMichael et al., 2008). These impacts are likely to intersect with other risks and crises - i.e., poverty, crime, racial and gender-based violence, and pandemics (Davies et al., 2020) - and pre-existing urban vulnerabilities, such as precarious access to infrastructures and services, weak institutional structures, lack of secure tenure, and limited political agency (Satterthwaite et al., 2007), imposing additional burdens on urban communities who are least able to cope (da Silva et al., 2012). They will also likely intersect with new risks such as those triggered on to marginalized groups by the Covid-19 pandemic (Pelling et al., 2021).

A significant trigger of injustice in adaptation planning is cities' increasing reliance on intergovernmental and private sources of finance for climate-resilient development. A study of the first 25 years of adaptation finance (from the signing of the UNFCCC in 1992 to 2018)

through a climate justice lens found that adaptation finance has moved away from climate justice towards neoliberal principles, with a growing emphasis on private finance and market-based strategies and increasingly inadequate and unfair distribution of funds (Khan et al., 2019). While there is certain indication that climate finance can reduce climate-related risks in poor communities by enhancing agency (Barrett, 2013), studies have also shown that the increasing reliance on private finance has allowed real estate and investment firms to seize land and benefits for adaptation, while further marginalizing, invisibilizing, and displacing vulnerable residents (Robin and Castán Broto, 2020; Teicher, 2018). One outcome of this process is a phenomenon known as climate or resilience gentrification, in which increases in land and property prices driven by adaptation initiatives – such as new green areas, pedestrianized zones, and bike lanes – force low-income and minority residents to relocate, while attracting residents with a higher economic status to previously undesirable neighborhoods (Anguelovski et al., 2018b; Gould and Lewis, 2018; Keenan et al., 2018; Porter et al., 2020).

To combat unsustainable urban growth and neoliberal development models and to prioritize social vulnerability in urban resilience (Connolly, 2018), cities must take into account historic legacies of social and environmental injustices, including unequal land and housing rights and inequitable zoning regulations (Connolly and Anguelovski, 2021). This involves stronger regulations of private finance-driven resilience work, including policy and planning tools that promote housing stability and affordability, while increasing the presence and accessibility of green, climate-adapted public spaces in the city (BCNUEJ, 2021). In addition, to avoid displacement and inequitable green development, cities must improve multilevel and multi-actor governance, fomenting institutional reforms that support participatory planning and that include the most vulnerable in decision-making (Shi et al., 2016). To avoid tokenism in participation, diversity and inclusion, governance processes must commit to meaningful participation of different sectors of society, building bridges between stakeholder groups and tapping into existing local community networks (Chu et al., 2019).

On this front, Barcelona is driving initiatives to reduce differential vulnerabilities through policies that prioritize housing and land rights, ensuring the ability of lower-income and minority residents to remain in place. Examples include regulations on touristic/short-term rental apartments, property tax support for homeowners, and a minimum of 30% of social housing units in any new real estate development (BCNUEJ, 2021). On the equitable greening

front, the city is fighting the negative impacts of unequal access to greening in historically marginalized neighborhoods through projects that seek improved access to and inclusiveness of urban green amenities. One such project involves the creation of a "network of climate and care refuges with a community and ecofeminist perspective" in the city's most vulnerable district Nou Barris. These climate and care refuges will connect public facilities and spaces of daily use, such as schools, primary care, and sports centers, through green and grey infrastructure interventions, which will provide public, safe, and shaded spaces to take shelter during hot days and allow for caregiving activities. These spaces will be collectively designed and planned by local residents, prioritizing the participation of marginalized populations, who will receive financial compensation for their work. This generates job training and skills development opportunities for those who face difficulty finding paid work (particularly women migrants, caregivers, people with functional diversity or over 45 years old), pointing to innovative ways in which intersectional approaches can help redress differential vulnerabilities and create greater financial security for vulnerable groups. The project also envisages creating new opportunities for care and solidarity work by engaging local residents in the care of children and older persons during the construction of the space, thus recognizing and valuing informal, domestic, and care work. Figure 3 shows the proposed areas for the implementation of the climate and care refuges and Figure 4 shows Plaça Angel Pestaña, the central square of the neighborhood.

Figure 3 –Proposed areas for the implementation of the Climate and Care Refuges (in orange), covering a 200-meter radius in relation to the Plaça Angel Pestaña (in blue). It connects schools, high schools, civic centers, retirement homes, a primary health center, a sports pavilion, churches, a mosque, and several shops and supermarkets (Diagram: Collectiu Punt 6, Google Earth, 2019).

Figure 4 - Plaça Angel Pestaña, a hard-paved square at the center of the neighborhood and the Casal de Barri Prosperitat in the background, which concentrates much of the local cultural and civic activities (author's own photo).

Nevertheless, the plan is not fundamentally addressing drivers of unequal and uneven (climate-sensitive) development in Barcelona such as real estate construction and development, dependence on mass tourism, or its connected concentrated profit economy.

Looking at additional experiences, Kansas City, Missouri, in the United States presents an example of a district-wide revitalization initiative, with the creation of a "Green Impact Zone" in which a declining district was transformed into a thriving and sustainable area with improved housing, community services, health and employment programs (BCNUEJ, 2018). In the United Kingdom, Bristol has developed innovative ways to address social and environmental inequalities with the requirement of an "Equalities Impact Assessment" for all new policies, striving to develop integrated green infrastructures and public amenities that address the specific needs of vulnerable groups (ibid.). These interventions point to innovative strategies and approaches that foster neighborhood revitalization and greening while preventing displacement and gentrification, with a particular focus on vulnerable groups.

4.3. Take politics and ethics of care seriously

Intersectionality embraces the complexities that are essential to understand entrenched social inequities, which in turn manifest in care inequities (Bowleg, 2012). Thus, the third component of the intersectional climate justice framework entails taking the politics and ethics of care seriously, understanding and valuing care as a form of labor essential to social reproduction (Held, 2006; MacGregor, 2006). In capitalist societies of the global North, the model of distribution of production and care has assigned to men (understood as white, heterosexual, cisgender and able-bodied) the productive tasks of wage labor in the public space, while women have traditionally been relegated to the reproductive and unpaid tasks of caregivers in the private space of the home, thereby also leaving little time for self-care. This model has not only crossed the structure of households and the labor market, but also public policies and the very configuration of cities and living environments (Greed, 1997; Hayden, 1985). Care is therefore a moral orientation which has been feminized and privatized in global North societies and, to this day, unpaid and/or undocumented care work continues to be exploited as an instrument to facilitate economic restructuring and the dismantling of the welfare state (Aguirre et al., 2014; MacGregor, 2006; Raghuram, 2016). Moreover, politics of care relates to intersectionality in the division of "nurturant" or rewarding care (i.e., teaching, nursing, social work) and "non-nurturant" or "dirty" care work (i.e., cleaning, coming in contact with bodily products or unclean substances) (Duffy, 2011). The former is primarily done by white women and the latter by women of color, migrants, and working-class people, who are forced to care (Glenn, 2012), taking up the invisible dirty work that is often rejected and outsourced by the better-off (Ehrenreich and Hochschild, 2004).

For urban climate adaptation, the ethics of care offers a feminist moral approach which is still largely missing in existing literature (Adger et al., 2017; Tronto, 1993). Initial adaptation efforts have been characterized as relying on scientific and economic assessments of vulnerability to natural hazards associated with infrastructures and services, often overlooking other types of vulnerability associated with anthropogenic risks, social crises, and economic inequalities (Smit and Wandel, 2006). This, in addition to cities' increasing reliance on private sources of finance for climate adaptation, implied the pursuit of technological interventions that favored private political economic interests, perpetuating relations driven by profit, competition, production, and consumption over general wellbeing and sustainability. Conversely, by focusing on new forms of relationships, institutions, and actions that enhance trust, mutuality,

well-being, and solidarity while also taking the politics and ethics of care seriously, we recognize care and reproductive functions as a form of labor that must be distributed fairly if intersectional climate justice is to be realized (Lawson, 2007).

As we take ethics of care seriously, we bring to the fore the historical agency of reproductive and subsistence workers that take care of the biophysical conditions for human reproduction (Barca, 2020; Federici, 2013). To break the vicious circles of unequal care, cities must rethink urbanism from a care perspective. This includes formulating public policies in the fields of care, reproductive, and domestic work, and setting measures, practices, and services that regenerate people's physical and emotional wellbeing and allow for self-care. This subcomponent also entails the promotion of caring, social and solidarity economy (SSE) practices, pointing to pathways that not only facilitate sustainability, resilience, and needs provisioning, but also question structural modes of growth and finance as well as social and power relations (Utting, 2015). SSE focuses on values such as equity, inclusion, participation, and a commitment to the community, and helps improve society by creating jobs, providing services, connecting with the territory, supporting social causes, and collaborating with transformational social movements (Rossel et al., 2015). Ultimately, the ethics of care in adaptation is a call for cities to provide public policies, services, and infrastructures that value, support, and guarantee (giving and receiving) care as a human right.

Barcelona is a unique example of an early adopter of care policies and institutionalization of ethics of care within decision-making, although not explicitly associated with climate adaptation. In 2017 the City Councilor's Office for Feminism and LGBTI Affairs launched a "Government Bill for Democratizing Care Work" (Ajuntament de Barcelona, 2017b). Driven by the Commissioner for Cooperative, Social and Solidarity Economy, the bill consisted of 68 initiatives geared towards a fairer distribution and responsibility of care work from an intersectional perspective, seeking to turn Barcelona into a pioneering "Caring City" (Chinchilla, 2020; Valdivia, 2018). Tasked with a clear transformational and feminist purpose, the Caring City aims to provide a tool to help bring recognition to the social value of care work and to ensure the right to care and be cared for under fair conditions. This bill is particularly timely given the outbreak of the coronavirus pandemic in 2019-2021, which intensified the "care work crisis" (Kent et al., 2020) and laid bare the inability of the economic and social systems to guarantee the wellbeing of the population's broadest sectors. In the context of the "Caring City", Barcelona launched two pioneering initiatives around care with a community

perspective: the Care Superblocks and the VilaVeïna project. Launched in 2018, Care Superblocks offer integrated health and social services to local communities. Considered a benchmark model based on proximity, the system employs small teams of ten to fifteen specialized professionals who care for forty to sixty people living in the same residential area. Barcelona's City Council plans to expand from its current eight to 120 Care Superblocks by 2025, establishing care communities across all neighborhoods (Ajuntament de Barcelona, 2020a). Along the same line, the VilaVeïna is a pilot project to bring support, resources, and advice related to care to local communities, through "social superblocks" that provide socially organized, better distributed, and more equitable care. The city plans to expand from its current four to 115 units, providing emotional support groups, shared parenting spaces, support for community care projects, as well as legal and labor advice for domestic and care workers (Boada, 2021). Besides services and resources, each unit will develop an urban transformation plan from a feminist care perspective, in line with the Care Superblocks and the Superblocks model (Ajuntament de Barcelona, 2021; Barcelona, 2020c).

While these initiatives show Barcelona's progressive initiatives around politics of care, as discussed, none of these initiatives is directly associated with climate adaptation or environmental measures, pointing to governance approaches that are potentially siloed. By adding a climate or environmental lens to the Caring City initiatives, Barcelona would value not only the types of care work that focus on those who are dependent or need help, but also all the work necessary to preserve and repair our world, including our bodies and our environment, thus acknowledging that they are all interwoven in a life-sustaining web (Fisher and Tronto, 1990). At the same time, it would mean acknowledging nature's contribution to people's physical and emotional wellbeing (Kabisch et al., 2017), thus improving the offer of green public spaces that cater for reproductive uses and self-care needs.

Beyond Barcelona, few examples to our knowledge exist at the city scale. At the country level, countries like Uruguay are recognizably at the forefront of institutionalizing public care policies that seek to promote visibility to care work and transform gender relations on a national scale. In 2010, the country launched its national care plan, which promotes care as a universal human right, and gives visibility to non-paid work and its value for social welfare and the economic system (Junta Nacional de Cuidados, 2015). This visibility was enabled by the measurement of non-paid work through country-wide time use surveys, which led to the formulation of public policies designed to transform unequal gender relations (Aguirre et al.,

2014). Another example of institutionalization of care policies comes from Ecuador, which included non-paid reproductive work in its 2008 constitution, and in the strategic goals of its National Plan for Buen Vivir (see Section 4.4). Here, as well, the institutionalization of time use surveys was instrumental to expose the sexual division of labor and women's work overload, raising the visibility of these issues in public debate (Batthyány, 2015). More recently, the National Plan for Buen Vivir also recognized the importance of reproductive work as a fundamental axis of a model of development that is solidary and equitable, and that satisfies people's needs – accounting for diverse individual and collective identities - in peace and harmony with nature (Plan Nacional para el Buen Vivir, 2017).

4.4. Adopt place-based and place-making approaches

Intersectionality embodies a commitment to the situatedness of all knowledge (Haraway, 1988) and the structural dimensions of the context (Crenshaw, 1991). It acknowledges the role played by place and space in shaping people's perceptions and experiences of privilege, discrimination, and oppression (Davis, 2008). The fourth component of the intersectional climate justice framework therefore stresses the importance of adopting approaches that are centered on local communities and their relationship with the characteristics and meaning of places. Place-based planning emphasizes adaptation approaches that are context-specific and locally-led, placing the knowledge, priorities, and needs of historically disadvantaged residents at the center of urban decisions (Olazabal et al., 2021). This implies moving away from expert-driven and technocratic approaches towards a model of adaptation that integrates local and vernacular knowledge, particularly the traditionally overlooked knowledge of women, racial minorities, and immigrants (Anguelovski et al., 2019a). These approaches question the dominance of traditionally privileged classes in the design and construction of urban spaces while promoting community ownership over their co-designed, co-created, and co-managed assets, thus promoting spaces that are socially constructed and comprise the histories and everyday life of those who build and use it. The focus on place also sheds light on the complexities of racialized geographies, especially those shaped by histories of (neo)colonialism, slavery, and contemporary practices of racism. These approaches demand an engagement with the different senses of place and place-making practices that historically marginalized groups – especially racialized, gendered, and immigrant minorities – construct in unmapped and heterodox manners, away from dominating planning schemes and practices (McKittrick, 2011). Thus, we recognize place-based struggles as subaltern strategies of

localization and call for the use of informal, contested, and invisible urban spaces as protected spaces and refuges for those residents (Anguelovski, 2014; Escobar, 2001).

Traditional urban adaptation has relied historically on colonial, scientific, and expert-driven approaches to planning and development, which have exacerbated historic injustices and unequal outcomes such as unfair distribution of land use power, natural, and financial resources (Heckert and Rosan, 2016; Meerow et al., 2019b; Pelling and Garschagen, 2019). To combat the uneven distribution of adaptation costs and benefits, this subcomponent promotes a set of actions to: (1) arrange reparations and access to land and natural resources for marginalized residents; (2) foster decolonial approaches to planning and development, including right to place and right to return; (3) recognize traditional, situated, and local knowledge arising from diverse and often invisible experiences of place and space. This subcomponent also encourages the reflection of the conditions in which knowledge is produced, as well as the social identities and locations of the knowledge producers. This means paying sustained attention to traditional Indigenous and local leadership and knowledge systems. Place-based approaches offer the potential to contest colonial and Eurocentric ontologies, recognizing and valuing traditional social philosophies such as *Buen Vivir* (loosely translated as 'Good Living' from the Ecuadorian Quechua *'Sumak Kawsay'*). Influenced by both Andean Indigenous worldviews and western political philosophies – especially feminist thought, postcolonialism and environmentalism – Buen Vivir describes a way of doing things that is community-centric, ecologically-balanced, and culturally-sensitive, focusing on well-being of both nature and human beings (Gudynas, 2011). Buen Vivir is contemplated as an emerging narrative on development in the latest Barcelona Cooperation for Global Justice Plan (2018-2021) (Direcció de Justicia Global i Cooperació Internacional, 2018) and is increasingly part of the urban agenda in the form of conferences and cultural events (e.g., Chávez Ixcaquic, 2016).

Another way in which Barcelona is adopting place-based approaches is the project "Climate shelters in schools". Launched in 2019, the project aimed at transforming schoolyards considered vulnerable to heat into so-called 'cool islands' open to all citizens, through innovative techniques that apply green (vegetation and shading), grey (improvements in insulation and ventilation), and blue (incorporation of water points) measures (UIA, 2020). The adaptations followed a micro-local model of governance, where students, the educational community, and various institutions and experts co-designed the spaces based on their specific needs (Ajuntament de Barcelona, 2020b). The definition and follow up of the measures were

part of an educational project that focused on climate change information and training. Students also participated actively in the monitoring and evaluation of the measures together with research and public institutions, focusing on climatic, health and wellbeing indicators. Thus, learning has been rooted in students' and staff's own place and space (e.g., their schoolyard, neighborhood, community), fostering their sense of place while solving community problems.

In one year, the pilot project transformed eleven schools into climate shelters, replacing 1000 m^2 of concrete with soil and vegetation, adding 2213 m^2 of new shaded spaces with pergolas and awning, planting 74 trees and installing 26 new water points. While the chosen schools were evenly spread across the city (one by district), several were in wealthy and privileged areas. Although this choice does not diminish the environmental value of such initiatives, adaptation projects are shown to have a greater social impact on poorer neighborhoods, where residents are generally more vulnerable to heat (e.g., due to advanced age or pre-existing chronic medical conditions) and have less access to cooling options (Nesbitt and Meitner, 2016; Voelkel et al., 2018). These neighborhoods also tend to be more racially and ethnically diverse and have lower household income and level of education, although there also seems to be a greater effort to integrate the knowledge, cultural practices and traditions of the minorities living there, as observed in Barcelona (Barcelona, 2020d).

A further illustration of place-based planning occurred in the racially and culturally diverse neighborhoods of the Nørrebro district in Copenhagen, where a new park and cycle routes were developed between 2009 and 2012 using public furniture, landscaping, and art objects imported and replicated to represent the several cultures with which residents identified, including palm trees from China, basketball hoops from Somalia, and a fountain from Morocco (BCNUEJ, 2018). The project was driven to foster intercultural tolerance and social cohesion in Nørrebro, responding to the social unrest and divisions that emerged after the 2008 publication of the 'Mohammed cartoon.' Through newspapers, radio, and online ads, residents had the opportunity to propose physical representations of their cultural belonging, which eventually included 108 objects spread across the park and representing 60 nationalities (Rutt, 2022). While this effort shows commendable procedural and recognitional approaches to urban design, by turning Nørrebro in what is colloquially called "Copenhagen coolest neighborhood", the project raises concerns related to distributional justice in public spaces, including issues of gentrification, hipsterization and genderization. In fact, a study of gendered aesthetic

experience of Nørrebro park revealed that women's experience of the area was mostly associated with evocative properties of discomfort, unsafety, and fear (Ottolini, 2016).

Figure 5 – Courtyard of a school which underwent the project "Refugis Climàtics a les Escoles" in Barcelona, where one can see new green interventions (vegetation and shading). Source: (Ajuntament de Barcelona, 2020c).

4.5. Promote cross-identity and -vulnerability climate action and community resilience building

Ultimately, intersectionality is inextricably linked to an analysis of power relations and structures of subordination (Johnson et al., 2020), encouraging community responses to social injustices, and enhancing activism (Collins and Bilge, 2020). Thus, the fifth component of the intersectional climate justice frame is the promotion of cross-identity and cross-vulnerability forms of activism and the strengthening of community-driven resilience. The promotion of cross-identity and cross-vulnerability climate action is timely and necessary to combat siloed forms of activism (e.g., environmentalism, LGBTQI+ rights, #Black Lives Matter, #MeToo), recognizing that they are all part of a struggle for social justice within planetary boundaries (Di Chiro, 2008; Terry, 2009). Hence, we propose that climate action and activism expand from siloed movements to intersectional efforts for climate justice, striving for environmental sustainability while standing in solidarity with and supporting resilience-building of women, BIPOC, LGBTQI+, (dis)ability, and other minority communities. We hereby understand resilience as a flexible concept, which is adjusted to address local contexts (Woodruff et al., 2021), and build on Meerow et al.'s (2016) definition of resilience as communities' ability "to

maintain or rapidly return to desired functions in the face of disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity" (p.39). Thus, this subcomponent focuses particularly on offering mechanisms of mobilization and intervention to build long-term empowerment and adaptive capacity for marginalized populations to address vulnerabilities across different social identities. One such mechanism, for instance, is the notion of urban climate experiments, which imply "purposive interventions" that aim to achieve resilient cities, offering spaces of community-focused experimentation in which to innovate, learn and gain experience in climate governance (Bulkeley et al., 2014; Caprotti and Cowley, 2017). To avoid being bound by space and time – and hence non-replicable – this subcomponent argues that an intersectionality lens calls for a model of urban and climate experiments that fosters communities' ownership over their co-owned assets and co-constructed spaces.

In the case of communities which are particularly vulnerable to climate change (e.g., urban poor, residents of informal settlements, displaced persons), this subcomponent calls for community empowerment through insurgent planning to reshape power dynamics of decision-making while reducing climate risks (Fox et al., 2021). With that, it encourages a model of citizenship from below, in which practices of urbanism extend beyond "invitations" to participate, towards "invented" spaces of citizenship, where residents innovate to create their own opportunities and terms of engagement (Cornwall, 2002). This is important, as even when urban adaptation includes participatory processes, cities still struggle with tokenistic civil society engagement in adaptation planning, implementation, and evaluation (Chu et al., 2019). To counter this trend, cities must support the representation of minority-focused organizations and social movements, empowering local communities to manage their resources and take charge of the direction of change (Olazabal et al., 2021). For that to happen, it is vital to improve the delivery of climate data to local populations, enabling regional planning entities to facilitate the exchange of information and knowledge brokerage. Here, it is also worth mentioning the power of social media and online resource hubs for advancing intersectional thinking in climate activism and environmental movements (e.g., Intersectional Environmentalism). This subcomponent also includes advancing joint work between local governments and not-for-profit or cooperative enterprises, offering ways beyond the state versus (for-profit) market dichotomy (Hinton and Maclurcan, 2017). This goal is also about engaging local organizations in the training and hiring of residents and in developing their own adaptation projects from within the neighborhood and community, thus promoting the creation

of new skills, jobs, businesses, and interpersonal relationships, and achieving community-driven development and adaptation.

Barcelona's city council has a strong focus on promoting citizen action in environmental projects through supporting initiatives undertaken by local organizations and the general public. An emblematic initiative around climate resilience is the municipal program "Pla BUITS" (loosely translated from Catalan as "Vacant Lots Plan"), in which the city council revitalizes disused land such as empty lots or wastelands for temporary use (over a period of three years) by public or private non-profit entities. Since 2012, these various entities – formed mostly by neighborhood associations and cooperatives – have transformed the vacant lots into community spaces, creating urban gardens of various types (including permaculture, organic vegetables, medicinal herbs) as well as implemented projects focused on bioconstruction, rainwater collection and environmental education. Another initiative is the municipal support of green roofs as therapeutic tools for people with intellectual and physical disabilities, unemployed, youth and older people, which also help build social cohesion and community identity. The Horts al Terrat green roof projects are led by local nonprofit entities and social enterprises that support the conversion of unused municipal rooftops into gardens (Ajuntament de Barcelona, n.d.). These projects have shown significant benefits for people with disabilities and mental health disorders as they enhance physical and emotional wellbeing, social inclusion, sense of purpose, interpersonal relations, and general improved quality of life. Decisions are taken by the gardeners themselves which allow them to build a much greater sense of autonomy and freedom than in the traditional institutional settings in which they live (Triguero-Mas et al., 2020).

A similar project worth mentioning is the 2021 winner of the World Resources Institute and Ross Center Prize for Cities Award, the program "Sustainable Food Production for a Resilient Rosario" in Argentina ("Prize for Cities | World Resources Institute," 2021). This flagship urban and peri-urban agriculture program was designed to repurpose under-utilized public and private land to improve food security and nutrition for low-income residents and strengthen resilience to floods and extreme heat. Through the program, more than 2,400 families were able to produce their own sustainable vegetable gardens, providing healthy local produce, and thus reducing carbon emissions via more compact food supply chains. The spaces also offer a variety of social programs around sustainability and environmental education, contributing to

community's cohesion and place-making ("Sustainable Food Production for a Resilient Rosario," n.d.).

5. Conclusion

As cities face an unprecedented climate emergency compounded by other social and health crises, we argue that there is a growing need for scholars and practitioners to bring forth a conceptual pivot to intersectionality in urban climate adaptation, laying the groundwork for connecting planning theory with justice-led action on the ground. At present, adaptation strategies that aspire to be just and equitable remain theoretically fragmented, normatively scattered, and often not fully engaged with emerging socially transformative priorities on the ground. In this article, we subsumed these disparate adaptation strategies within the critical theoretical umbrella of intersectional climate justice, offering a normative frame to house these fractured literatures in one space and guide them towards justice.

We proposed a fivefold framework to operationalize intersectional thinking in urban climate adaptation (see Table 1). The first component highlights the need for adaptation scholarship and practice to challenge historical economic reinforcers of racial and gender inequities, recognizing and transforming the oppressive systems and structures that have devalued female and nonwhite bodies throughout history. The second component describes the importance of identifying and redressing the drivers of differential vulnerabilities, taking into account the compounding effects of climate impacts, social crises, neoliberal urban development models and, most recently, the Covid-19 pandemic health and social crisis, in the (re)production of social and environmental injustices. The third component speaks to the need to take ethics and politics of care seriously, valuing care as a form of labor essential to social reproduction and putting in place the necessary systems for care to be given and received fairly. The fourth component calls attention to the importance of adopting planning analytical frames and practical approaches that are centered on local communities and their relationship with the characteristics and meaning of places. This entails fostering decolonial approaches to planning and recognizing traditional, situated, and local knowledge arising from diverse and often invisible experiences of place and space. Finally, the fifth component underlines the identification, recognition, and promotion of boundary-spanning forms of activism that support the participation and representation of minority-focused organizations and make local communities more resilient and empowered to take charge of the direction of change. In short,

intersectional climate justice accounts for power differentials in order to ensure that the everyday lives of all, not just those with resources and recognition, are safe, secure, and fulfilling.

While conceptually novel, our study requires some potential methodological caveats. Narrative reviews might have limitations when compared with other research designs, attributed to a general lack of systematic, reproducible approaches, which could be vulnerable to bias (Green et al., 2006). To address that limitation, we reveal the number and source of articles reviewed, as well as the inclusion and exclusion criteria adopted. That said, it is worth reiterating that the purpose of this narrative review was not to provide a systematic review of all literature available on core topics. Rather, our aim was to provide a state-of-the-art overview of the main debates in the field and inform a conceptual framework for intersectional climate justice, which we then further illustrate with notable examples from Barcelona. Further research would benefit from a systematic review of historical inequalities in planning for climate justice, and a systematized catalogue of global examples of cities piloting innovating approaches to achieve intersectional climate justice. Further directions for future research include a deeper understanding of the intersecting experiences and needs of disenfranchised urban residents in the context of climate change; the role of social movements in realizing intersectional climate justice in cities; and the policy implications of planning for intersectional climate justice. Specifically, we call for new scholarship on the following questions: (1) To what extent do adaptation projects and policies challenge historical reinforcers of racial and gender inequalities? (2) How do municipalities ensure that vulnerable populations have a right to the "resilient city", including fair and secure housing and access to green resilient amenities? (3) What policies, regulations, and financial tools must cities put in place to value and democratize care work, including self-care and caring for the planet under a changing climate? (4) In which ways do place-based approaches help decolonize climate adaptation, so that traditionally silenced voices are heard? (5) How can governments support civil society action that advances intersectional climate justice?

Through exploring concrete practices from the emblematic case of Barcelona, we identified recent policies, programs, and projects that attempt to consider the five components of our proposed intersectional climate justice framework. These examples do not exhibit deliberate coordination around the notion of climate justice, as exemplified by approaches that focus on single axes of inequality and offer partial responses to the multiple drivers of vulnerability.

Despite that, the illustrations from Barcelona point to evidence of innovative plans and policies that can bring about transformative change in climate action and respond to the climate emergency that Barcelona declared in January 2020 (Barcelona, 2020a). We have also brought in further brief examples of cities that illustrate progress towards intersectional climate justice.

In sum, by pivoting to intersectional thinking, once fragmented principles, policies, and strategies can become more cognizant of addressing the other subcomponents of climate justice thus enabling more integrated and socially transformative adaptation approaches. Intersectional climate justice might be an elusive and negotiated process; yet it is necessary to truly examine, question and redress the oppressive systems and structures that reinforce social and environmental injustices. This framework highlights a pathway for those seeking to develop and operationalize this vision, thus setting off larger implications for how we think about urban climate adaptation and development.

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Supplementary data
Appendix A

List of public documents from the Barcelona City Council

Year	Document type	Original name	Name in English
2020	Declaration	Declaració Emergència Climàtica	Climate Emergency Declaration
2019	Methodological notebook	Quaderns metodològics feministes	Feminist methodological notebooks
2019	Manual	Manual d'urbanisme de la vida quotidiana	Everyday life urbanism handbook
2018	Plan	Barcelona Pla Clima 2018-2030	Barcelona Climate Plan 2018-2030
2018	Master Plan	Pla Director de Cooperació per a la Justícia Global de Barcelona 2018-2021	Barcelona Cooperation for Global Justice Master Plan 2018-2021
2017	Government Bill	Mesura de govern: Urbanisme amb perspectiva de gènere. L'urbanisme de la vida quotidiana.	Government bill: urbanism with a gender perspective. Urbanism of everyday life.
2017	Government Bill	Mesura de govern per una democratització de la cura 2017-2020	Government bill for the democratization of care 2017-2020
2016	Plan	Pla per la justícia de gènere 2016-2020	Plan for gender justice 2016-2020
2015	Commitment	Compromís de Barcelona pel Clima	Barcelona Commitment for the Climate
2013	Plan	Pla del verd i de la biodiversitat de Barcelona 2020	Barcelona green infrastructure and biodiversity plan 2020

Chapter 3 – Governing intersectional climate justice: Tactics and lessons from Barcelona[††]

Abstract

Cities and local governments are important actors in the global governance of climate change; however, the specific governance principles and arrangements that enable urban climate plans and policies to realize commitments to social equity and justice remain largely unexplored. This paper uses the City of Barcelona as a critical case study of emerging "intersectional climate justice" practice, where plans to build resilience to climate change are pursued in conjunction with efforts to tackle structural inequalities in accessing the built environment, health services, energy, housing, and transportation experienced by frontline communities. The study illustrates how Barcelona and its community partners do this through four different categories of governance and decision-making tactics, which include: (1) experimenting with disruptive planning strategies; (2) working transversally across agencies and actors to institutionalize climate justice over time; (3) putting care at the center of urban planning; and (4) mobilizing place-based approaches to tackle intersecting vulnerabilities of frontline residents. All these tactics seek to redistribute the benefits of climate-resilient infrastructures more fairly and to enhance participatory processes more meaningfully. Finally, we assess the limitations and challenges of mobilizing these tactics in everyday climate governance practice. Barcelona's experience offers a valuable and nuanced contribution to research on urban climate governance by revealing overlapping dimensions of climate action that coexist spatially and temporally and demonstrating approaches to address structural and intersecting socioeconomic vulnerabilities that exacerbate the experience of climate change of frontline residents.

Keywords: Intersectional Climate Justice, Climate Governance, Environmental Policy, Social Justice, Barcelona

[††] This chapter corresponds to Amorim-Maia, A. T., Anguelovski, I., Chu, E., & Connolly, J. Governing Intersectional Climate Justice: Tactics and Lessons from Barcelona. Submitted to: *Environmental Policy and Governance*. Under review.

1. Introduction

Cities play a strategic role in facilitating the global governance of climate change (Brundtland, 1987; Gordon, 2020). Recently, efforts to tackle the climate emergency have been increasingly mobilized in conjunction with the fight for wider social justice (Bulkeley, 2021; Kotsila et al., 2022; Rice et al., 2023). However, research has yet to shed light on the principles and governance arrangements that allow for urban climate planning and policymaking to translate climate-resilient development into justice-centered actions on the ground. Despite greater explicit rhetoric on justice in cities' climate plans and policies, there is little evidence to show how this goal is effectively operationalized to improve the wellbeing of historically marginalized communities (Anguelovski et al., 2016b; Chu and Cannon, 2021).

Recent research has showcased Barcelona as an early adopter of "intersectional climate justice" (Amorim-Maia et al., 2022) and has demonstrated how the city is starting to integrate equity and social justice concerns into climate-resilient development to tackle differential social vulnerabilities (Ruiz-Mallén et al., 2022; Satorras et al., 2023, 2020). Barcelona may thus be seen as a "critical" case (Yin, 2009, p.51) for asking if and how intersectional climate justice efforts can be implemented and governed in a city. In this paper, we use this experience of Barcelona to specifically unpack the tactics, political choices, and governance arrangements that support the implementation of climate strategies while also accounting for intersecting vulnerabilities among residents. We do so in order to derive the key dynamics shaping action in this case, but not to claim Barcelona has realized climate justice, so we also explore the constraints of achieving this outcome in everyday climate politics and decision-making (Bee et al., 2015).

To assess the governance principles and arrangements used in climate governance, we examine two key climate projects in Barcelona – Climate Shelters (Refugis Climàtics in Catalan) and Superblocks (Superilles) – as well municipal initiatives to reduce energy poverty more broadly. Climate Shelters are urban adaptative infrastructures that aim to provide thermal comfort to vulnerable groups in public facilities, such as schools, libraries, and civic centers. Superblocks are large-scale interventions that include street pedestrianization and landscaping, with the goals of reducing emissions and noise pollution, improving air quality, and increasing pedestrian and communal spaces (Ajuntament de Barcelona, 2023; Zografos et al., 2020). Barcelona's initiatives to reduce energy poverty include projects to subsidize and finance

building retrofits, promote community solar energy generation, and provide information and technical advice to people who are unable to maintain their homes at an adequate temperature. These latter initiatives provide a helpful backdrop against which to assess how the city is adopting governance principles that enable intersectional approaches to climate adaptation.

Figure 1 - A schoolyard transformed into a climate shelter in Barcelona. Interventions include a new garden with drought-tolerant trees and herbs, unsealed pavement, a gazebo with a vine, water points and seating arrangements. Source: Ajuntament de Barcelona

Figure 2 - Superblock in Sant Antoni. Interventions include plant beds with trees and shrubs, tables and seats, traffic-calming elements and play areas. Source: Ajuntament de Barcelona

In the next section, we contextualize Barcelona's evolving efforts to govern climate change at the local level. We employ Bulkeley's (2021) framework of the history of urban climate governance to situate Barcelona relative to three distinct waves and argue that the city's recent efforts relate to the so-called 'third wave' – *climate connected* – in which the challenge of addressing climate change is recognized as intricately intertwined with broader concerns of social justice. We relate this recent push to calls for applying an intersectional pivot in urban climate governance to orient policy and action towards justice-focused approaches that redress systemic inequalities (Amorim-Maia et al., 2022; McArdle, 2021; Perkins, 2018). Our results show that Barcelona is beginning to operationalize intersectional climate justice through innovative and disruptive planning, transversal actions, care-centered approaches, and place-based efforts to reduce intersecting vulnerabilities; however, in a departure from Bulkeley (2021), our findings show how Barcelona's successes defy the notion of distinct waves, instead revealing overlapping dimensions of climate action that coexist both spatially and temporally. Barcelona's experience holds lessons on the various challenges and opportunities for enhancing an intersectional approach to urban climate governance.

2. The Evolution of climate governance

The concept of "governance" refers to the allocation of authority and resources necessary for coordinated action and control (Rhodes, 1996). Building on this concept, Bulkeley (2005) adopted a definition of urban environmental governance that situates local government actors within a range of activities and authorities spanning multiple scales, including transnational and intermunicipal networks. Later, Anguelovski and Carmin (2011, p. 169) defined urban climate governance as the ways in which "public, private, and civil society actors and institutions articulate climate goals, exercise influence and authority, and manage urban climate planning and implementation processes". A more recent idea of "climate urbanism" reorients climate policy to the local level and promotes cities as the most viable and appropriate sites of climate action (Castán Broto et al., 2020; Castán Broto and Robin, 2021; Long and Rice, 2019).

Reflecting on the theoretical progression of climate urbanism over the last three decades, Bulkeley (2021) described three 'waves of climate urbanism' which mark a shift in how climate politics (and associated governance processes) has been understood and conducted by (and between) cities. The first wave, labeled as *municipal voluntarism,* defines a period where urban authorities voluntarily integrated climate change into their strategic priorities to enable

economic and urban development (Betsill and Bulkeley, 2004; Bulkeley et al., 2010b). During this stage, cities' protagonism in addressing climate change grows largely coordinated by transnational organizations and municipal networks (Bulkeley et al., 2010a; Kern and Bulkeley, 2009). The second wave originated in the late 2000s and was named *strategic urbanism.* This wave is marked by greater institutionalization and mainstreaming of climate concerns into urban matters, shifting the role climate change plays in urban politics and planning (Chu et al., 2017; Friend et al., 2014; Sharma and Tomar, 2010; Uittenbroek et al., 2013). It is also marked by experimentation with climate policies and programs, their formalization to strengthen policy legitimacy and support (Anguelovski and Carmin, 2011), as well as the rise of hybrid (Toxopeus et al., 2020), adaptive (Juhola, 2021) and polycentric governance models (Jordan and Huitema, 2023; Petrovics et al., 2022). Finally, the third wave – beginning in the mid 2010s and designated as *climate-connected* – is characterized by cities' recognition that the issue of climate change is inextricably connected to broader concerns related to social justice (Bulkeley, 2010; Vancura and Leichenko, 2015).

The "third wave" gives rise to new forms of urban politics that position climate change as a systemic issue and recognizes that previous climate initiatives have tended to privilege specific interests over others (Anguelovski et al., 2016a; Juhola et al., 2016). This results in the demand for climate actions that are both socially and environmentally equitable and those that encompass a range of social infrastructure systems beyond interventions in the urban built environment (Tenzing, 2020). These include, for instance, the provision of critical social programs, housing services, and the use of urban nature to promote new notions of urban resilience (O'Brien, 2016; Shi et al., 2016).

Third wave climate urbanism focuses on how climate action is addressing the distribution of the impacts and benefits of climate change, as well as the rights and obligations of those tasked with responding to this challenge (Armstrong et al., 2022). For instance, based on more developed notions of climate justice (Schlosberg and Collins, 2014; Shi et al., 2016) and resilience (Rockström et al., 2023; Ruiz-Mallén et al., 2022), researchers have documented how efforts to promote resilience of urban infrastructure and environments to climate change may prioritize areas of the city that hold the highest value while neglecting the needs and rights of the most vulnerable populations who often lack the means to advocate for themselves, thus worsening and/or creating additional inequities (Anguelovski et al., 2019c; Kotsila et al., 2021; Shokry et al., 2023, 2020). At the same time, research has increasingly emphasized the need to

meaningfully involve communities in planning for climate change (Chu and Michael, 2019a; Kotsila et al., 2022; Shi et al., 2016). Thus, climate urbanism grew to involve a more holistic social justice perspective through engagement with fundamental aspects of urban life – such as energy distribution, participation in decision-making, and access to climate-protective infrastructure – across multiple agendas simultaneously. However, while this third wave shift has created momentum for addressing multiple fundamental aspects of urban life with direct consideration for social justice, the actual process through which this can be effectively achieved remains an area of ongoing exploration for practitioners and academics alike (Shi et al., 2016).

One promising advancement is through intersectional urban climate justice. Intersectionality informs and analyzes how social categorizations and positions intersect to create unique systems of discrimination and oppression (Crenshaw, 1989). Recent studies have proposed an intersectionality approach to climate justice and urban resilience, arguing that it supports a more comprehensive understanding of the drivers of climate injustices and historical inequalities experienced by marginalized populations as well as when adopting measures to respond to climate impacts (Amorim-Maia et al., 2022; McArdle, 2021; Mikulewicz et al., 2023). Recent advancements in this direction include empirical efforts to measure intersecting climate vulnerabilities (see, for instance, Cundill et al., 2021; Erwin et al., 2021; Owusu et al., 2019) and theoretical contributions and frameworks to apply an intersectional lens to managing climate hazards (see, for instance, Foran, 2020; Walker et al., 2019). Overall, this literature emphasizes the need to incorporate intersectional approaches into climate justice scholarship and public policy to achieve more equitable and accountable climate action (Amorim-Maia et al., 2022).

Despite these advancements, recent scholarship has predominantly remained rhetorical in nature while the practical tactics and mechanisms through which intersectional climate justice can be operationalized remain unclear. Significant adjustments to urban governance arrangements are needed to both address climate and social issues, not to mention also meeting the goals of Bulkeley's (2021) third wave climate urbanism through an intersectionality lens. Questions remain about how this governance model is being developed in practice among those who are working on everyday climate politics and decision-making on the ground. In pushing in this direction, we can better understand how increasing attention on intersectional climate justice is being translated into urban governance mechanisms, institutions, and processes.

3. Methods

3.1. An overview of the Barcelona case and recent plans

Barcelona presents a critical case of progressive climate action and has a history of proactively pursuing intersectional policies to respond to compounding crises. With a population of 1.6 million people, Barcelona is one of the most densely populated cities in Europe (16.5 inhabitants/km^2) and presents a very low ratio of accessible greenspaces (6.82 m^2 greenery/inhabitant) (Barcelona, 2020b). Barcelona is one of the most visited cities in the world and close to 15% of its GDP come from tourism (Barcelona, 2023a). The city experiences a Mediterranean climate with hot summers, cold winters, and humidity amplified by the nearby sea. Climate scenarios predict more frequent and intense heatwaves (Altava-Ortiz and Barrera-Escoda, 2020). Barcelona's high population density and low availability of large green spaces within the most populated and accessible neighborhoods accentuate the heat island effect. The city is especially susceptible to extreme heat, which has varying effects on different population groups according to age, gender, health, socioeconomic status, and zip code (Ingole et al., 2020; Marí-Dell'Olmo et al., 2019). Moreover, the average age of Barcelona's buildings is 65 years and approximately 60,000 buildings, or 85% of the city, were built before the city's first building standard that made it compulsory for them to be thermally insulated (Barcelona, 2023b). Consequently, with insulation of buildings in Barcelona being generally poor, compounded by the fact that 12.4% of the population lives below the energy poverty line, many residents cannot keep their homes at an adequate temperature in the winter or summer months (Tirado Herrero, 2018). This situation is exacerbated for certain populations when data is disaggregated by social class, gender, and age, revealing that older women and individuals from low-income countries face heightened vulnerability to energy poverty (Marí-Dell'Olmo et al., 2022; Oliveras et al., 2020).

In recent years, particularly since the left-wing *Barcelona en Comú* party won the mayoral elections in 2015, Barcelona has taken a leading role in creating a greener, more livable, and inclusive city while working to reduce social and economic inequalities. This has included plans to increase green coverage across the city and development strategies with an explicit "feminist urbanism" perspective, which entails designing urban environments that are more inclusive and welcoming to caregiving and playing (Ajuntament de Barcelona, 2023). Table 1 presents a selection of the city's planning documents released since 2015 around climate justice

and resilience. These documents comprise one set of information used to triangulate the findings presented in this paper.

Table 1 – Official city plans, declarations, and commitments related to climate action and social justice launched since 2015. Plans presented in English only are available for consultation in English. For documents available exclusively in Catalan, we provide the English translation along with the original Catalan names in brackets.

Year	Document	Code
2015	Barcelona's Commitment to the Climate	D1
	Govt Measure: Gender Mainstreaming in the Barcelona City Council (Mesura de govern: La Transversalitat de Gènere a l'Ajuntament de Barcelona)	D2
2016	2016-2019 Social and Solidarity Economy Promotion Plan (Pla d'Impuls de l'Economia Social i Solidària)	D3
	2016-2020 Gender Justice Plan	D4
	2016-2020 Neighborhoods Plan (Pla de Barris)	D5
	2016-2024 Strategy against the feminization of poverty and job insecurity	D6
	2016-2025 Right to Housing Plan	D7
	Creation of energy advice and basic supply guarantee centers	D8
	Govt Measure: Let's fill the streets with life – Establishing Superblocks in Barcelona	D9
	Urban Resilience Plan	D10
2017	2017-2020 Govt Measure for the Democratization of Care Work (Mesura de Govern per una Democratització de la Cura)	D11
	2017-2022 Strategic Plan Against Sexism in the City (Pla Estratègic Contra el Sexisme a la Ciutat)	D12
	2017-2037 Trees for Life: Master Plan for Barcelona's Trees	D13
	Govt Measure: Urban Planning with a Gender Perspective (Mesura de Govern: Urbanisme amb Perspectiva de Gènere)	D14
	Govt Measure: Stimulus Program for The City's Urban Green Infrastructure	D15
2018	2018-2030 Climate Plan	D16
	Action Plan for Preventing the Effects of Heatwaves on Human Health (Pla d'Actuació per Prevenir els Efectes de les Onades de Calor sobre la Salut)	D17
	Cooperation for Global Justice Master Plan	D18
	Govt Measure: Plan for Play (Mesura de Govern: Estratègia Cap a Una Política de Joc a l'Espai Públic)	D19
2019	2019-2024 Urban Mobility Plan (Pla de Mobilitat Urbana)	D20
	Climate Shelters in Schools (UIA)	D21
2020	Climate Emergency Declaration	D22
	Start of the deployment of the "Let's Protect Schools" Program	D23
	Start of the deployment of the Low Emission Zones	D24
2021	2021-2024 II Neighborhoods Plan (Pla de Barris)	D25
	2021-2025 II Plan for Gender Justice	D26
	2021-2030 Climate Emergency Action Plan	D27
	2021-2030 Green Deal Plan	D28
	2021-2030 Nature Plan	D29
	Start of the deployment of the VilaVeïnas	D30
2022	2022-2030 Change for the Climate Plan: Sustainability Culture Strategy (Pla Camviem pel Clima)	D31
2023	Proposals of the Citizen Climate Assembly	D32

Barcelona has gained wider recognition as a leader in environmental protection and climate action. Its 2018 Climate Plan won awards for best major European city initiative by the Covenant of Mayors for Climate and Energy and for its high ambition and compatibility with the Paris Agreement awarded by C40. In November 2021, and in response to the 2020 Climate Emergency Declaration, the city launched the Climate Emergency Action Plan for 2030. The plan puts people at the center by focusing on reducing climate risks for the most vulnerable groups, improving thermal comfort, and maximizing citizen participation through inclusive decision-making. In recognition of these efforts, Barcelona became the first European capital for democracy bestowed by the Innovation in Politics Institute, Council of Europe, and European Commission. In 2022, Barcelona was also nominated as the first "World Capital of Time Use Policies" by the Network of Governments and Regions for Time Policies for its efforts to democratize the right to time – a feminist approach that recognizes and aims to rectify the gendered allocation of time for work, family, socializing, resting, and caregiving responsibilities. Moreover, the Superblock street-calming model, which according to the City Council is "at the forefront of the world's greatest urban transformations" (Barcelona, 2023), has been recognized by the United Nations as an example for other cities to follow.

Since 2016, Barcelona has launched several initiatives to reduce energy poverty and improve thermal comfort in private homes, public facilities, and public spaces. Climate Shelters, launched in 2019 in libraries, schools and other public facilities, are spaces that provide vulnerable groups with thermal comfort during extreme heat and cold (Barcelona, 2021a). As of May 2023, Barcelona has 202 climate shelters, which include a network of libraries, civic centers, and schools. In addition to the broader municipal project, Barcelona had previously received funding from the European Commission through the Urban Innovations Actions Program to transform eleven schools into Climate Shelters (UIA, 2022). These were accompanied by commitments to transform patios (*Transformem Patis)* and traffic-calming strategies (*Protegim Les Escoles program*) to enhance thermal comfort, street safety, accessibility, sociability, and playability in and around schools.

Lastly, the city is devising long-term strategies to improve the energy efficiency of older public and privately-owned buildings. These include subsidizing home insulation and retrofit projects through neighborhood improvement plans (*Pla de Barris*) and structurally rehabilitating buildings in socioeconomically vulnerable areas (*Pla de finques d'alta complexitat).* The city is also coordinating initiatives to rehabilitate vulnerable buildings by improving the built

structure, insulating, and installing photovoltaic panels, as well as improving accessibility and the surrounding settings (*Programa de regeneració urbana*). Another noteworthy initiative is the opening of regional Energy Advice Points (*Punts d'Assessorament Enèrgetic, PAEs*), which offer information and technical advice to avoid supply cuts and guarantee residents' access to energy services (Barcelona, 2016). By mid 2022, the PAEs had avoided over 108,000 supply cuts, 65% of which were requested by women (Barcelona, 2023b). In this study, we explain how Barcelona is operationalizing efforts and governing intersectional climate justice using Climate Shelters, Superblocks, and initiatives to reduce energy poverty.

3.2. Primary data collection: interviewing city leaders addressing the climate emergency

We conducted 23 in-depth semi-structured interviews between October 2022 and February 2023 with municipal employees, technicians, and elected officials who work on various aspects of climate planning and/or action in Barcelona. We first identified interviewees through the municipality's organization chart and then used snowball sampling to proceed with interviews until reaching data saturation. Participants represented diverse practices, fields, sectors, and positions designing and/or implementing climate action in Barcelona, as shown in Table 2. All participants provided informed consent for participation. For those who agreed, interviews were audio-recorded and transcribed. Interviews generally lasted one hour and were conducted in Spanish.

Table 2 – City personnel interviewed with office and role or responsibility.

Office (alphabetical)	Role/responsibility	Code
Area for Social Rights, Global Justice, Feminisms, and LGBT Affairs	Director of Research and Knowledge	I1
Barcelona Activa	Responsible for Orientation in Socio-Economic Innovation	I2
Barcelona Cuida	Coordinator of the Barcelona Cuida Program	I3
Barcelona Institute for Global Health (ISGlobal)	Specialist Area for Environmental Health	I4
Barcelona Regional	Director Area of Environment and Energy Efficiency	I5
C40 Cities Climate Leadership Group	Inclusive Climate Action City Advisor for Barcelona	I6
Climate Change and Sustainability Office Services Department	Director	I7
Councilor's Office for Climate Emergency and Ecological Transition	Chief of Staff	I8
Councilor's Office for Health, Aging, and Care	Chief of Staff	I9
Department of Participation (Urban Ecology)	Director	I10
Municipal Institute of Parks and Gardens	Representative involved in the Biodiversity Program and Nature Plan	I11

Municipal Institute of Parks and Gardens	Director of Technical Services and Planning	I12
Municipal Institute of Urbanism	Director of Urban Regeneration and Director of European Projects	I13
Office for Climate Emergency Service and Environmental Education (AMB)	Technicians coordinating the Climate Shelters Program in the Metropolitan Area	I14 I15
Office for Gender Services and Time Policies of the City Council	Responsible for Gender Mainstreaming in Ecology and Sustainability projects	I16
Office for the Chief Architect	Technical Coordinator of International Relations Projects (Climate Shelters in Schools)	I17
Office for the Chief Architect	Superblock Technical Office Agent	I18
Office for Urban Policy Development (AMB)	Representative involved in the Urban Master Plan	I19
Public Health Agency (ASPB)	Head of the Area for Quality and Environmental Health	I20
Public Health Agency (ASPB)	Specialist in health impact of climate change and energy poverty	I21
Public Space Promotion and Conservation Office (AMB)	Director of the Parks Office	I22
Technical Cabinet of the Department of Climate Action, Food and Rural Agenda of the Government of Catalonia	Responsible for transversal policies and gender equality	I23

Interviewees provided their knowledge, expertise, and perspective on city- or region-wide policy and planning processes. We interviewed some representatives of the metropolitan area and one member of the government of Catalunya in response to recent scholarship suggesting that climate strategies – particularly those related to green infrastructure – need not necessarily follow strict municipal boundaries (Castán Broto, 2019; Nalau et al., 2015; Shi and Bouma, 2023) and are influenced by metropolitan and regional politics and relations. Interviews were conducted using semi-structured guidelines which included specific questions about the following themes: government coordination and collaboration; conceptualization of justice, equity, and vulnerability; conceptualization and implementation of climate strategies (with a focus on Climate Shelters, Superblocks, and energy poverty reduction initiatives); inspiration and peer-learning; challenges; and future vision.

3.3. Secondary data sources: policies and reports

Primary data sources were complemented with relevant secondary data to enrich our understanding of local urban climate planning and to triangulate the case results reported below. These included recent climate policy and framework documents, reports, and other city planning documents (Table 1). Also included were internal documents provided by

interviewees, such as "Quaderns Metodològics" (methodological toolkits), selection criteria for implementation of urban programs (i.e., Climate Shelters in Schools, Urban Regeneration), reports, presentations, and articles published in local journals and magazines. All documents were used to triangulate and verify the accounts of interviewees and to identify specific information about the urban programs and interventions in question. In all, the combination of interview and document data – coupled with informal in-person observations in the city of specific interventions such as Climate Shelters, Superblocks, and *Finques d'Alta Complexitat* (highly complex buildings) – enabled the analysis that supports this study.

3.4. Analysis

We coded the interviews using NVivo 12 (software release 1.7.1), abstracting from the interviews a set of themes and processes that were aggregated to identify trends in how Barcelona is advancing progressive policies and operationalizing intersectional climate justice. The materials, arguments, and quotes presented in the results build directly on the interviews conducted and their thematic coding. These interview codes were then manually cross-referenced against the documentation in the final analysis.

3.5. Methodological limitations

While our methodology was robust, it is important to acknowledge the limitations of our study. Our analysis is primarily based on interviews with city representatives, which may have introduced bias in the sense that these respondents would be expected to express a generally positive portrayal of the city's projects and initiatives. We are aware of the potential risk of presenting an excessively commendatory perspective and encourage the results to be read with this limitation in mind even while asserting the importance of extracting the lessons learned from those engaged as these processes unfold. To address this concern, we made deliberate efforts to incorporate critical viewpoints in our interview follow-up questions and discussion. We recognize that the inclusion of a broader range of stakeholders, including representatives from civil society and academia, would enrich the understanding of our study findings and would comprise a suitable follow-up to this study. However, given our primary objective of understanding governing tactics and political arrangements from the point of view of municipal climate action, engaging with public administration stakeholders at various levels provided valuable insights into the governance dynamics we sought to explore.

4. Results

This section explores the four categories of tactics employed by Barcelona to govern and implement emerging intersectional climate justice efforts. These tactics are disruptive, transversal, care-centered, and place-based, which work in concert to mobilize innovative policies that challenge business-as-usual development models and approaches. These tactics are guided by an overarching commitment to mainstream climate and incorporate a gender perspective into all municipal policies and to place care at the forefront of urban development. Furthermore, the policies aim at grounding justice in efforts to empower communities to make decisions and enable access to climate goods, services, and the built environment. In the following table, we outline the main interventions associated with what we consider to be the city's overarching climate strategies plus outstanding initiatives related to democratizing and valuing care work.

Table 3 - Barcelona's climate interventions: outcomes, beneficiaries and lessons learned

#	Intervention	Description	Outcomes and beneficiaries	Lessons learned
P1	Climate Shelters	Climate-responsive indoor and outdoor public spaces for vulnerable populations	202 climate shelters; 95% population within 10-minute walk. Low-cost, no structural changes, use existing spaces. Transform patios, more resilient schools.	Population unaware of the network and not using it as shelter. Public skepticism about the program. Accessibility and inclusivity issues.
P2	A) Urban Regeneration Program B) Building retrofits C) Neighborhood Plan	City-led retrofitting of vulnerable buildings. Integrated actions for safer, more functional, and habitable buildings.	Energy-efficient buildings with improved insulation, structure, and surroundings. Goal: 10k/year homes. Major social gains in reducing energy poverty and precarity.	Costly and complex project to implement. Low visibility in city outskirts. Time-consuming. Trust-building with locals required.
P3	A) Energy advice points B) Solar pergolas and public productive rooftops C) PV panel subsidy	Technical advice to reduce bills and avoid supply cuts. Access to renewable energy from public pergolas and buildings Financial and technical support for rooftop solar installation.	100k+ supply cuts avoided, 65% requested by women. 17 solar pergolas, 100+ municipal buildings powering poor communities. 25% bill savings; tax/work permit discounts. 2000 families join in 2022.	Conflicting interests with energy providers. Massive investments required. Need coordination with home retrofit projects. Lifestyle changes needed.
P4	Superblocks	Street-calming, green hubs and squares, spaces for meeting, playing	217 traffic-calmed school environments; 900 play areas, 245km bike lanes, 75% 30km/h limit; lower air/noise pollution. Green axes could boost greening benefits.	Benefits for health and wellbeing can be tainted by gentrification risks if not addressed by housing and local economic development policies. Distribution and procedural concerns.
P5	Mobility Plan and Low Emission Zones	Expand walk and bike networks. Promote sustainable, efficient, safe, collective mobility.	Prioritize pedestrians, cyclists, public transport. Reduce private vehicle use, regulate commercial and tourist mobility. Healthier city with lower emissions.	Citizen rejection (especially among lower-income car-dependent workers). Can conflict with personal interests and needs.
P6	New Economic models: Doughnut Economics and Social and Solidarity Economy	Socioeconomic measures that prioritize satisfying humans within planetary boundaries	Provide fundings for SSE, promote local development, redistributive tax policies, cooperative initiatives. Host trainings and workshops for a new economy.	Conflicting interests: big businesses, multinational corporations, hospitality and tourism sectors. Entails citizen habit changes.
P7	A) VilaVeïnas B) BCN Cuida C) Carer Card	Caring City initiatives. Resources and services for carers: support groups, legal advice, community care projects, trainings.	Identify and connect caregivers, support their wellbeing. Meeting spaces; shared parenting; municipal childcare. Democratize care, support women's caregiving and work-life balance.	Democratization hard to achieve in practice. Care remains feminized, precarious, invisible. Requires paradigm shift in care role and responsibilities.
P8	Environmental Health	Monitoring of climate indicators, air & water quality, temperature, mortality, energy poverty.	Climate health impacts monitoring key to combat climate vulnerability, health conditions, and energy poverty.	Health authorities consultative, not deliberative role. Limited decision-making power.

4.1. Disruptive: challenging the status quo

An essential element of Barcelona's ability to address intersectional elements of climate justice relates to collective efforts to disrupt conventional approaches to urban and climate planning. These actions occur at various levels of the governance system, but some can be mainstreamed into public policies and programs. Here we understand disruption as policies and practices that actively drive change by challenging and transforming existing political structures and planning norms, thus enabling the emergence of radically new policies, technologies, and critical infrastructures. Our results show that Barcelona gained international visibility and legitimacy as a pioneer in climate action by showcasing experimental and disruptive climate practice in transnational networks (i.e., C40 and ICLEI) and fostering city-to-city knowledge exchange.

The first tactic of disruption involves enabling innovation through connection with research and transnational networks. Interviewees recurrently highlighted Barcelona's status as a "case study" city and emphasized Barcelona's role as a "cradle for international research projects" that seek to utilize the city as a test site or living lab. This is evidenced by a statement from I13 (see table 2): "for us, making the city available for international projects is perfect, because it is the way for us to move forward. The role of Barcelona as a demonstrator is very important". This engagement with international research projects and networks enabled and validated innovation and experimentation as transformative forces, thereby allowing the city to push boundaries and adopt disruptive approaches to climate governance.

Innovation is also enabled by leveraging transnational networks that pushed Barcelona's government to embrace a culture of innovation driven by a willingness to learn from other cities. In other words, this innovation comes from "trying hard to be a knowledge sponge", as attested by I8. This is confirmed by I9, who noted that "we are in constant search for references that we can apply and adapt to the Barcelona context". Interviewees revealed, for instance, that Barcelona drew inspiration from Paris to devise its greening and biodiversity plans (D13) and progress the 15-minute city locally ("proximity model"); from Bogotá to develop its district-based care system (VilasVeïna – P7); from Porto Alegre for participatory budgeting (P9); and from Milan and London for advancing low emission zones (P5). The Climate Shelters (P1) were also inspired by experiences in the US and Australia with cooling centers, air-conditioned spaces for individuals especially impacted by extreme heat to cool down. Participation in these

networks was a mechanism for disruption in the Barcelona case because it allowed the city to learn from other cities, adapt and experiment within its unique context, and gain insights from its own experiences, thus being a catalyst for continuous refinement of experimental approaches.

The second and, according to interviews, most important tactic of disruption involves a willingness to persist on unpopular policies accepting that there will be contestation. Such policies likely generate public resistance because they can interfere with people's daily habits and lifestyle. Some interviewees explain that resistance also happens because some projects like the Superblocks (P4), which entail traffic-calming strategies, interfere with people's perceived privileges (of, for instance, using the car as and when they want), making them feel personally curtailed or attacked. This polarization can become strongly political, with residents taking sides on the ideological battleground of their desired urban model. In the words of I18, "the citizenry is very polarized among those who defend tooth and nail that a change is necessary to reduce environmental issues, and, therefore, that active mobility be promoted… And there is a super radical sector that considers it an attack against their freedom of mobility." Because of this divide, there is a central preoccupation with enshrining innovative and disruptive practices in public policies. As I1, explains "it is important to treat these actions as city policies, which cannot be waived by any government actor." Simultaneously, the city is striving to mitigate this polarization by extensively communicating the benefits (i.e., in health, wellbeing, safety) of projects, with a particular emphasis on social media platforms, and broadening citizen participation in decision-making, as further discussed in 4.4.2.

Although the Superblocks (P4) initially faced significant citizen resistance due to an early abrupt and rather undemocratic implementation (in Poblenou), the City Council remained committed to implementing the disruptive model, maintaining a steadfast conviction that Superblocks played a pivotal role in mitigating air and noise pollution, calming traffic and increasing greenspaces. As residents have become more aware of the positive impacts and more involved in decision-making processes, the initial rejection has waned. However, new concerns have surfaced regarding the equitable distribution of Superblocks throughout the city. Notably, they are currently primarily located in the Eixample neighborhood, the city's affluent and touristy district.

Furthermore, pilot efforts to transform schools into climate shelters (spaces that provide thermal comfort to vulnerable populations) challenged entrenched building and neighborhood

norms about what can be modified in urban design or infrastructure. I13 explains the choice for working to improve schools: "We realized that schools were not climate shelters, but climate hells. They had a horrible behavior in the heat, with very high temperatures. When the children go out to the patio [for recess], it is a track yard without a single tree." While this problem had persisted for years, a rapid and disruptive push characterized what the city did with a "climate transformative intention" (I17). The design and mobility actions in schools, interviewees believe, have a transformative potential precisely because the disruption has begun to become the norm. As I17 puts it, "the transformation will continue to happen. I think it is non-negotiable. Everyone wants it […] And the will is to transform all the courtyards of all the schools".

The broader Climate Shelters program (beyond the pilot in schools) has a lesser disruptive connotation as it was implemented in existing public facilities and open spaces (i.e., libraries and parks) without structural reworkings. Still, as interviewees suggested, the underlying goal has a disruptive intent: to transform the role of public and quasi-public spaces in the city toward universal climate shelter access. Although climate shelters do not change the urban fabric, their functionality is changed for residents, opening up possibilities to previously unconsidered forms of using public spaces (e.g., for recreation *and* shelter). Interviewees relate this to more and less visible scales of action to tackle the climate emergency, as explained by I18:

> "Climate Shelters and the Superblocks are different ways of acting. I believe that when you have a problem, you must do this, act at different scales. In other words, the Climate Shelters are almost free, and there may be people who will benefit from them. The Superblock is much more expensive. Here you need millions of Euros. So, it's very spectacular, but you may go very slowly."

Barcelona's disruptive model is a delicate balance between slow and fast action that leverages international research, transnational networks, and local political will to generate a stream of more and less visible projects. This disruptive ecosystem is always operating in response to the reality that measures which are not yet well established in the existing legal framework face the risk of being blocked by judges. This has happened, for instance, with the Low Emission Zone (P5) that restricted polluting vehicles from certain parts of the city. The program was temporarily annulled in March 2022 due to "lack of reports that support some restrictions, excessive geographic scope of implementation and excessive restriction of the type of vehicles

affected"[7]. In the words of I8, "everything goes much slower when it comes to approving disruptive policies now, because we know that the judges are going to try to overthrow them. So, we need to shield them as much as possible and make sure that they are as robust and solid as possible". Shielding policies includes getting approvals from different sectors, relying on extensive scientific data, publishing lengthy documentation for consultation processes, and encouraging participation in ways that the average resident is not burdened by the necessary paperwork for approving projects.

4.2. Transversal: mainstreaming climate and gender in all policies

One of the main leaps of mainstreaming innovative and disruptive climate actions involved the launch of Barcelona's Commitment to the Climate (D1) in 2015, which cemented links with other early plans (i.e., D3, D4, D5, D7, D10) that aimed to change the political economy of the city. These plans sought to reconfigure the way the city regarded climate change from an "environmental matter" to an issue that needs to be tackled at multiple levels, by multiple sectors and through transforming manifold existing systems and ways of governing. At the same time, the "traditional" environmental agencies (i.e., urban ecology, greenspaces) were also working to revamp their plans by incorporating a climate perspective, as seen, for instance, in D13 and D15 launched in 2017. These efforts culminated in the 2018 Climate Plan (D16), which encompassed comprehensive urban strategies addressing mitigation, adaptation, and promoting citizen action.

Climate mainstreaming was accomplished by transversal work across institutional sectors, which enabled different government actors to work on climate actions in a more integrated manner. Interviewees highlighted highly structured and internalized networking and coordination between and across governmental agencies (i.e., health agencies, academic institutions, and civil society) as a means to effectively integrate climate action into municipal governance structures. As I12 puts it, "here, even though you have a title, all work is transversal". "Transversality means working collaboratively by project", says I7, who leads the Climate Change and Sustainability Office. Established in December 2020 in recognition of the need to have a designated body to institutionalize efforts, this Office acts as the umbrella for

[7] Tweet by the Catalan High Court of Justice translated from Spanish to English by authors. Available on https://twitter.com/tsj_cat/status/1505909339521007618?s=20. Viewed on November 21, 2023.

climate-related projects. The Office spearheads diverse steering groups that strategize, oversee, and monitor the city's key climate initiatives. The experiences from Barcelona demonstrate that transversal endeavors necessitate the engagement and collaboration of diverse stakeholders across the city, as well as centralized and structured coordination in ways that respond to the city's stated priority of responding to the climate emergency (Barcelona, 2020a).

Aside from mainstreaming climate policies, since 2016, the city spearheaded an initiative to mainstream gender, incorporating a feminist perspective into all its municipal policies and governance practices with the goal of reducing entrenched gender inequalities, including those related to climate impacts and benefits from climate action. This is implemented by a designated department of "gender mainstreaming" – the Municipal Management Body for Gender and Time Policy Services. This department has put 38 gender mainstreaming units and 52 reference figures in place to ensure that the gender perspective reaches all municipal policies. Representatives from the agency working on climate policies, in particular, revealed how they take part in climate-related steering groups in a consultative role and assess all climate plans and programs with a gender perspective. The work of the department is anchored in the Barcelona II Plan for Gender Justice (D26) as well as several other guiding documents to consolidate feminist municipal policies that combat inequality and discrimination against women.

However, interviewees noted several persisting challenges of gender mainstreaming with an intersectional perspective. For instance, municipal staff shared ongoing efforts to incorporate different axes of inequality into their analysis (e.g., social class, age), but acknowledged that these efforts are nascent and may not be as effective in addressing intersectional inequalities. Notably, designing efforts that target specific racial or ethnic groups remains a taboo, as disclosed by one interviewee,

> "We do not talk about race because it is a protected and political variable, but if we think about skin color, it is a very clear axis of inequality. It is usually the people who are in an economically vulnerable situation, or migrants and refugees. This axis should be made more visible."

Moreover, interviewees emphasized a pervasive implementation gap, as highlighted by I11 who worked on the city's Nature Plan: "the Plan proposes working with gender equity, and social justice in mind. The thing is *actually doing* it. I believe that more professionals and

experts are needed in the field". This shows the need to integrate the gender perspective beyond policy design and into operationalization and monitoring, especially through the training and support of municipal employees working on the ground. Despite these challenges, Barcelona's mainstreaming of climate and gender exemplify a proactive reshaping of the dynamics of urban climate politics, institutionally restructuring it to effectively address pressing concerns – climate change and gender inequality in particular – in a more integrated manner.

4.3. Care-centered: visibilizing the climate-health-care nexus

A main outcome of mainstreaming feminist principles into climate change policies is the elevation of care as a fundamental aspect of society and economy. As a self-proclaimed "Caring City", Barcelona has put everyday life and care work at the center and has taken a localized approach to care – caring for people, for the city, and for the climate. This is best exemplified by the VilaVeïnas (P7A), which serve as local centers that support care needs and aim to align with the Superblocks (P4) through environmental improvements (greening and traffic-calming) in the vicinity. However, interviewees point out that effectively aligning VilaVeïnas with Superblocks remains challenging, due to disparities in terms of scope, budget, and complexity of each project. At the same time, the city is expanding its walking and cycling network – a central measure of its climate mitigation and adaptation goals – with a feminist perspective by focusing on everyday journeys carried out for reproductive and caring activities. In fact, the new sustainable mobility plan (P5) characterizes "walking [as] taking care of yourself, of others, and of the environment" (Barcelona, 2022 p.100, translated from Catalan). Apart from VillaVeïnas that have been spread across all city's districts, Barcelona has one central hub to offer services, information, and resources to carers, the "Barcelona Cuida" (P7B).

Putting care at the fore entails not only addressing the needs of care recipients but also attending to the wellbeing and support systems of carers. This is in recognition that "caregivers are the people that no one takes care of [...] Who takes care of the person who cares for the sick? Nobody. Us." (I3). To further address this, the city introduced in 2022 the Carer Card (P7C) with the goal to identify caregivers and provide them with resources, training, and support related to care. The resources range from artistic and entertainment activities that promote emotional wellbeing to trainings focused on mitigating the health impacts of heatwaves. They also include visa services and legal advice for immigrant cardholders to obtain contracts as

domestic and care workers, thereby aiming to regularize an often irregular and invisible occupation. As explained by I3: "Care is very invisible and very little valued. [...] It's typically done by women and people who don't have many resources. So, what the Carer Card does is to identify these people and value their work". These initiatives reflect the city's commitment to prioritizing care and fostering a more democratic and equitable distribution of domestic and care work, with inequalities in the private sphere increasingly visibilized and tackled.

Putting care at the center also means placing an emphasis on attenuating climate impacts on human health and supporting vulnerable groups (Barcelona, 2021a). For instance, Barcelona's Public Health Agency (ASPB) participates in all climate- and environment-related working groups and in the decision-making and monitoring processes of flagship projects such as the Superblocks (P4), the Low Emission Zone (P5), and the Climate Shelters (P1). According to interviewees, climate measures and actions are only launched after review by the main local health authorities, who also ensure that actions and measures are evaluated and monitored following specific health indicators. For instance, I21 revealed how the program Climate Shelters in Schools was monitored by tracking school environmental conditions (e.g., temperature, air quality, noise pollution), as well as student's wellbeing and opinion about the interventions. She explains that students "asked for a lot more greenery, which they liked a lot. Some were bothered because they had bits of their sports courts taken. But in general, it was very positive feedback."

Barcelona's focus on care and health shows that it is possible to address climate change while acknowledging and tackling social inequalities, such as those reinforced by the invisibility and feminization of care work. Furthermore, the case of Barcelona supports a current trend that promotes a more comprehensive perspective on care, which encompasses caregiving, receiving, self-care, and caring for the environment, thus recognizing care as a pervasive and multifaceted element of human life, and working to make it more democratic and rewarding.

4.4. Place-based: promoting community empowerment and redistribution

The fourth category of governance tactic guiding Barcelona's approach to climate governance is an initiative to ground justice in efforts to enable access to climate goods, services, and the built environment and empower communities in decision-making processes. As attested by I9, "we are beginning to create a very, very accurate symbiosis of the binomial "social justice -

climate justice", because there used to be a lot of resistance there". In this final subsection, we divide these efforts between (i) actions related to a more equitable distribution of climate goods and services, and (ii) actions to advance representative, procedural and recognitional justice through enhanced participatory processes.

4.4.1. Distributive: regenerating to better distribute climate goods and services

While large-scale projects such as the Superblocks (P4) and Climate Shelters (P1) offer promising solutions for climate resilience, their effectiveness is contingent on distribution and accessibility. Paradoxically, those most in need – marginalized populations grappling with precarious living conditions and energy poverty – often face barriers to accessing these interventions. Consequently, there is an imperative to protect these communities by retrofitting their homes and ultimately reducing the need to seek shelter elsewhere. As I14 said, "I envision a city that is so pleasant and thermally comfortable that the network of climate shelters becomes obsolete". To that extent, Barcelona has created an Urban Regeneration Program (P2A) to improve people's living conditions, their comfort at home, and access to public spaces. The program involves a broad definition of "regeneration" that goes beyond building rehabilitation to include greenspaces in general as well as public spaces for leisure and recreation. While various initiatives – including the Superblocks (P4) and the Urban Mobility Plan (P5) – are now encompassed under the umbrella term of "urban regeneration", much of the program focuses on retrofitting highly vulnerable buildings in poor neighborhoods. Besides, the city offers diverse financing options and subsidies to support low-income householders in retrofitting and facilitating a just energy transition, ranging from comprehensive building rehabilitations (P2B) and neighborhood renewal plans (P2C) to incentives for installation of solar panels (P3C). Moreover, the creation of Energy Advice Points (P3A) has helped prevent power cuts for vulnerable consumers by prohibiting supply companies from disconnecting services to households who can demonstrate social exclusion or an inability to pay.

While progressive climate initiatives improve human health and quality of life, they can affect housing prices and contribute to real estate speculation and green gentrification. In response, the Superblocks (P4) are now associated with a Land Use Plan that regulates the local housing market and "prevents commercial monocultures" (I18). However, the city has limited ability to regulate the economic market, as explained by I8, "we need other measures beyond municipal policy to limit housing prices. That is why we ask the state to regulate rents".

Interviewees also mentioned efforts to increase the stock allocated for public housing (currently at 1.7%) with a feminist approach that aims to allocate at least 20% of public housing for women and single-parent families. The city is also buying and rehabilitating existing buildings to turn into public housing, as in Eixample, the district with most Superblocks[8] (see Figure 3). Other councilors, however, believe that a change in the way the Superblocks are conceived and implemented is what can best address gentrification issues. In this direction, I18 describes how the city has adjusted the original Superblocks from a "9x9 model" to a new "Green Axes" model to distribute the benefits of the project more homogenously in the city:

> "Many people criticize us under the concept of 'green gentrification'. That is one of the reasons why we have changed the way of implementing the Superblock project, from blocks to axes. In other words, we don't want a super cool neighborhood next to an uncool one. It is a program throughout the city, so that everyone has green spaces within 200m […] With that, we manage to reduce car traffic in a more affordable way. We get much more powerful pedestrian routes because we can go from one end of the city to the other. So, we spread the benefit faster and avoid creating *ghettos*. Rather, we are creating a new green infrastructure throughout the city."

[8] https://ajuntament.barcelona.cat/eixample/es/noticia/mas-vivienda-protegida-con-la-compra-de-dos-fincas-en-el-eje-verde-del-eixample_1250278

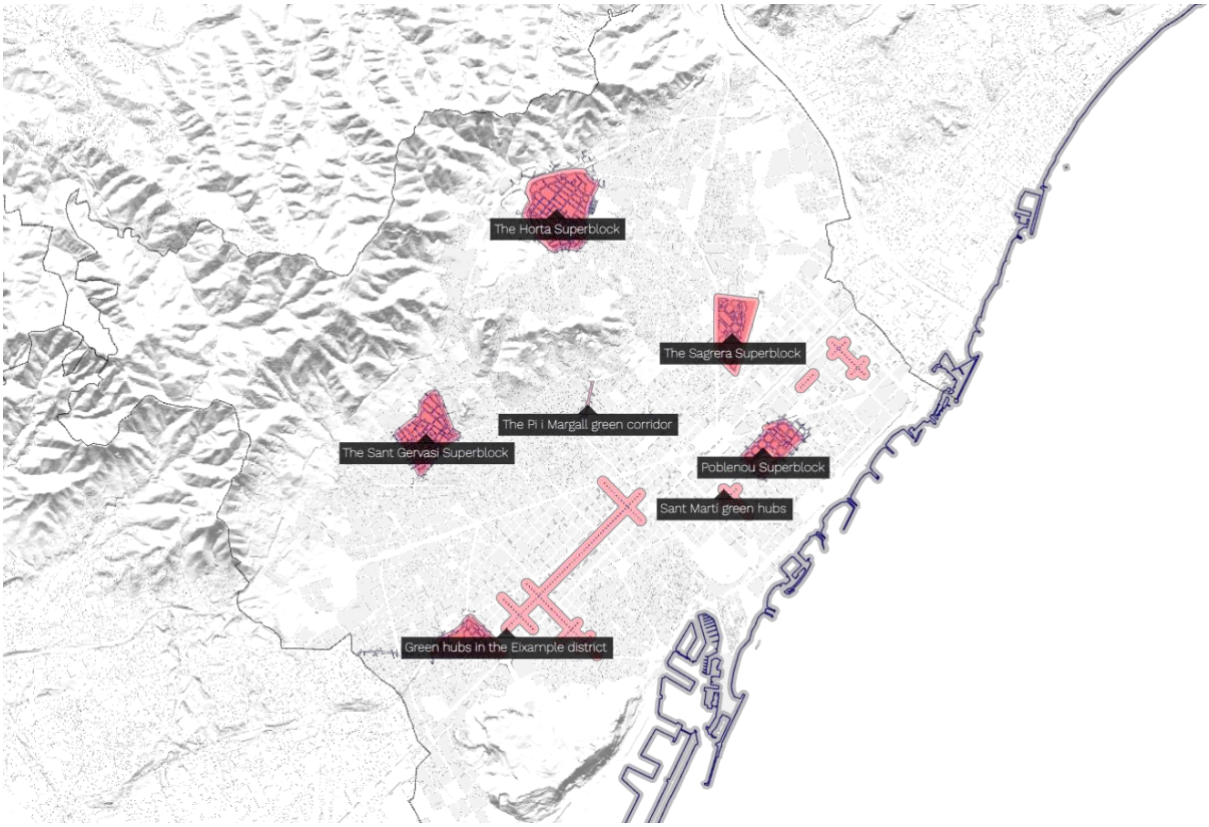

Figure 3 - Map of Barcelona showing the Superblocks (existing and in construction), as well as the green axes and hubs in the Eixample district. Source: Ajuntament de Barcelona.

A final distributive effort is a push towards new economic models. This is exemplified by the city's longstanding commitment to developing a Social and Solidarity Economy (SSE) and recent work towards Doughnut Economics (P6). The push towards SSE has a distinctive feminist approach by addressing gendered job insecurity and providing support to women-led entrepreneurship projects. To this end, the city has established Barcelona Activa, an agency dedicated to reviving the city's economy with a focus on proximity, environmental care, and social justice. As I2 explains, "social economy entities offer products and services that have certain added values, such as caring for the environment, strengthening territorial roots, and incorporating workers who are at risk of social exclusion, as well as principles such as horizontality, plurality, and cooperation". These actions reflect an understanding that, beyond alterations in the urban landscape, addressing the climate crisis requires substantial transformations in our current economic models.

4.4.2. Representative: striving to improve recognitional and procedural justice across historically excluded groups

A final enabler of governing intersectional climate justice relates to the ways in which the city is striving to maximize participation in climate politics, recognizing that mere provision of participatory spaces is insufficient to ensure representative and meaningful participation. The most important tool for public participation in Barcelona is the online platform DECIDIM. Launched in 2016, this free and open-source digital platform allows residents to consult, vote, and comment on city projects, programs, plans and budgets. Interviewees pointed out that DECIDIM has proved particularly valuable for individuals who lack time or feel uncomfortable participating in in-person sessions. However, they also acknowledged limitations due to pervasive digital divide. To counter that, the city council is seeking to provide technology support in neighborhoods that have higher levels of digital divide, as well as considering new methodologies to enhance participation of women, immigrants, and youth. This need came upon the recognition that those who typically participate both in online and in-person participatory processes generally have a similar profile: predominantly older men with high levels of education, who are members of existing environmental entities or neighborhood associations. As noted by I9, some groups might also be unaware that their opinion matters as "in the end, since they are subjected to so much discrimination, they don't understand that they are active subjects in building the city".

To diversify participation beyond well-established associations, she explains that Barcelona is "try[ing] to design strategies to reach groups that haven't usually participated because they don't feel called upon to decide or think about their own city". Actions to increase participation include reaching out to specific collectives and trusted focal people within communities; offering translation services and assistance to people who are hearing or vision impaired; and adapting session locations to diversify spaces of socialization. As I10 explains, "we are looking for the spaces where they are, rather than waiting for them to come to ours". Other actions crafted with a gender perspective include providing childcare services during participatory sessions and offering financial remuneration for participation. The Citizen's Assembly is a notable endeavor in fostering civic participation within the city. Designed the mirror Barcelona's diverse demographic composition, the initiative engaged 100 residents to deliberate on climate-related issues and generated 34 proposals to change energy, mobility, and consumption models.

The implementation of Climate Shelters in schools exemplifies participatory processes with pedagogical and place-based gains. As put by I13:

> "We wanted to make children aware of climate change firsthand. So, a professional training in climate change was carried out. And then the entire educational community, including children, was compelled to be part of this process. So, the solutions implemented came from an internal participatory process of children and teachers and were unique for each school, based on their local needs and preferences".

Similarly, the new generation of Superblocks, like those in Horta, Sagrera, and Sant Gervasi, serves as recent attempts of participatory urban innovation. The process is led by a steering group comprising neighborhood associations, civic centers, and community members, who collaborate to prioritize transformation proposals for street-calming and urban greening. Residents participate in ranking actions and co-creating implementation roadmaps which then receive feedback from the broader community via in-person sessions and online channels.

These experiences show that beyond offering spaces and platforms for participation, cities must take proactive steps to improve representation in decision- and city-making, fostering a greater sense of community, ownership, and belonging.

5. Discussion: lessons from concurrent waves of climate urbanism

Our results show that Barcelona is governing and implementing intersectional climate justice through efforts that are disruptive, transversal, care-centered and place-based. These governance arrangements define a new model of climate urbanism (Castán Broto, 2017), that aims to be more socially just and tackle other social concerns. We relate Barcelona's approaches to the three waves of climate governance (Bulkeley, 2021) and zoom in on the links between the 'third-wave' and intersectional climate justice (Amorim-Maia et al., 2022). We also highlight the fact that Barcelona's climate governance tactics do not conform to distinct waves, but rather manifest overlapping dimensions that concurrently coexist spatially and temporally in order to institutionalize them. Barcelona's experience therefore highlights the need to engage multiple stakeholders in a coordinated manner to lock in plans, programs, and actions to ensure the deployment of efforts that enable climate resilience over time. This manifests through grand, large-scale projects as well as less visible, smaller-scale physical and social projects.

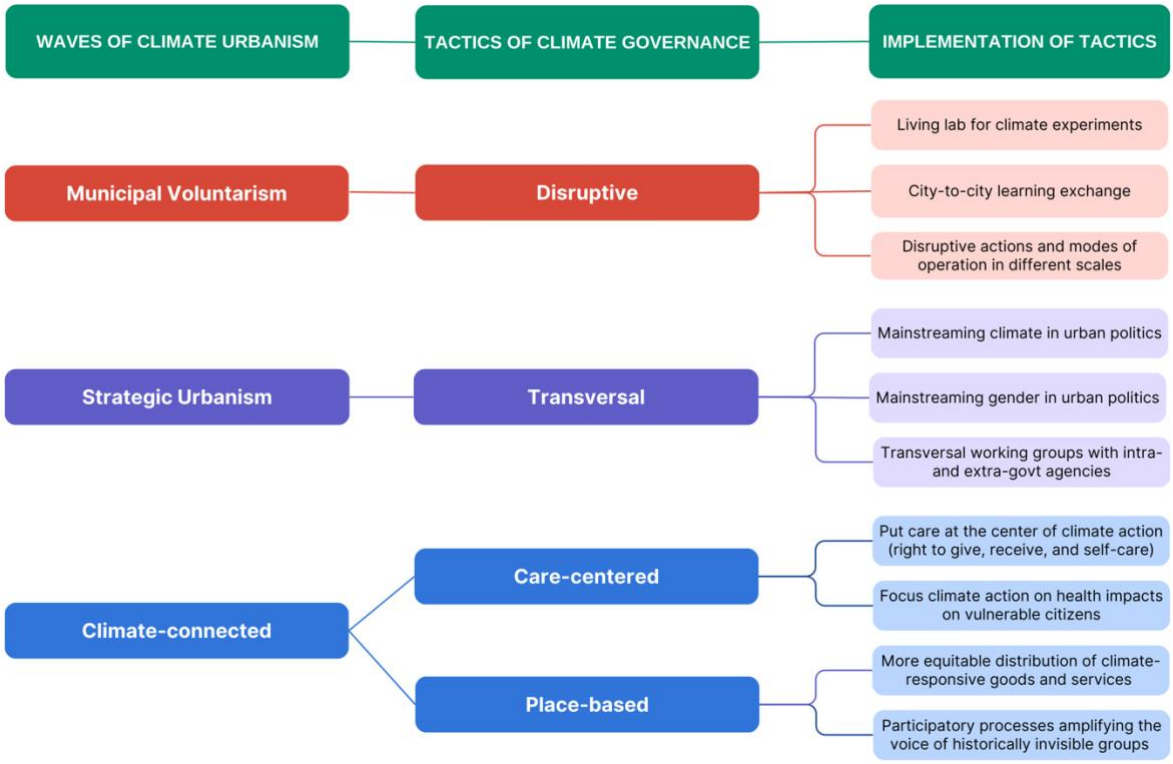

Figure 4 - Concurring waves of climate governance (based on Bulkeley's model), Barcelona's climate governance tactics, and the practical implementation of governing tactics.

Through innovation and disruption, Barcelona navigated the *first wave* of urban climate governance – municipal voluntarism – to position itself as a leader in climate action. This was accomplished through city-to-city learning, partnerships with transboundary institutions, and leadership in transnational municipal networks, which conferred the city international support and recognition. Barcelona is still using its international reputation to reinforce its leadership and justify disruptive planning approaches, including those that require shielding from threats of judicial dismantling.

Then, by breaking institutional silos, Barcelona leveraged the *second wave* of urban climate governance – strategic urbanism – by incorporating climate and gender considerations into public policies with the goal of advancing climate action and social justice. During this process, the city integrated workplans across different jurisdictions and sectors, turning climate action into a central transformative driving force for urban change (Chu et al., 2019). Barcelona also utilized the climate-mainstreaming movement to promote urban experimentation (Bulkeley et al., 2014). The Superblocks and the Climate Shelters in Schools exemplify the city's ongoing

emphasis on experimentation as a means to implement various ways of thinking and designing the urban environment.

Last, the city has embarked on the *third wave* of urban climate governance – climate-connected – by prioritizing climate concerns alongside a commitment to social justice, particularly issues pertaining to care. For instance, our results show how the city has integrated the notion of care within urban regeneration efforts, incorporating localized and personalized care strategies (i.e., VilaVeïnas) into large-scale urban transformations (i.e., Superblocks) and aligning social and environmental services (such as healthcare, mobility, housing, and public spaces) around the notion of "everyday life". However, challenges arise in integrating projects with such diverse scopes and in reconciling conflicts with residents' personal interests and habits. The city's commitment to valuing care is also reflected in its efforts to support and visibilize carers, though obstacles persist in shifting entrenched gendered roles and relations. Barcelona's actions align with a growing trend that recognizes the importance of care in achieving justice in climate change planning and governance (Bond and Barth, 2020) and the need to focus on the wellbeing of carers in addition to those that are cared for (MacGregor et al., 2022). The focus of climate action on health impacts also reflects a recognition that climate change is not a standalone equalizing threat, but rather intertwined with historical injustices that contribute to unequal health impacts of climate change at local levels (Jurgilevich et al., 2023; Kotsila and Anguelovski, 2023).

Barcelona's efforts to regenerate the city with a focus on tackling pre-existing urban vulnerabilities and avoiding exclusionary land use planning acknowledge historic legacies of social and environmental injustices. However, we are cautiously optimistic about Barcelona's green distributive efforts: while recent studies show the potential for the green axes to transform disconnected urban green areas into a more interconnected infrastructure system (Magrinyà et al., 2023), research in Barcelona has shown that environmental sustainability initiatives may sometimes prioritize elite interests at the expense of providing essential services (Anguelovski et al., 2018b). The implementation of Green Axes (the new iteration of Superblocks) in Eixample – Barcelona's wealthiest and most touristy neighborhood – raises questions about the city's commitment to democratizing the benefits of green interventions. Despite Eixample experiencing poor air and noise pollution levels and a lack of green space, focusing efforts on less-privileged neighborhoods could lead to more environmentally and socially transformative outcomes (Anguelovski et al., 2023).

The city's efforts to expand local participation refer to the need to adopt place-based approaches to planning that recognize local knowledge and include marginalized residents in decision-making. Our results showcase different ways in which the city is advancing procedural justice by establishing diverse channels and means for citizens to participate in climate governance. However, there is a lag in efforts towards recognition and representation, as current participation efforts still tend to involve the same individuals and groups repeatedly. This shows that simply offering a platform is insufficient for meaningful participation without a genuine political will to transfer decision-making power to residents. Notably, participatory mechanisms have, at times, been exploited by undemocratic regimes to conceal their lack of freedoms (Ortega, 2022). Nascent initiatives are being undertaken to improve recognitional justice by making participatory processes more accessible and flexible to appreciate a greater diversity of voices, knowledges, and experiences. To increase participation, the city could benefit from innovative approaches, such as investing in visual tools for participatory scenario planning and future visioning approaches to support visualizing plausible and desired futures (López-Rodríguez et al., 2023; Nalau and Cobb, 2022; Oteros-Rozas et al., 2015a).

Barcelona's lessons demonstrate that to address intersecting systems of inequalities in climate governance, it is necessary to act at different scales and challenge dominant epistemologies through diverse forms of political action and channels for participation. These different scales of action can go from projects with prominent exposure like the Superblocks to retrofitting projects in often-overlooked peripheral areas. The transformative potential of such interventions relies on their equitable distribution and accessibility. As simpler measures that do not require major infrastructural transformations, it appears that Climate Shelters could be positively impactful in protecting residents who are vulnerable to extreme temperatures, because of their extensiveness and connection throughout the city (202 are currently in operation). However, recent research has shed light on concerns and equity implications associated with school selection criteria for the Climate Shelters in Schools, as well as challenges linked to the co-design process and subsequent project implementation (Baró et al., 2022). Besides, the population remains largely unaware of the network of Climate Shelters, and there is a degree of skepticism among residents that these spaces serve more as symbolic gestures to showcase the city's response to the climate emergency rather than bringing about transformative change (Amorim-Maia, forthcoming). Moreover, it is crucial for these spaces to be inclusive and culturally adequate to ensure that diverse populations feel welcomed and comfortable when utilizing them. Thus, future research could benefit from a better

understanding of climate shelter's accessibility and inclusiveness, as well as the extent to which they are addressing the intersecting needs of the city's most vulnerable populations.

6. Conclusion

Our study explains the emerging tactics and mechanisms implemented by Barcelona to govern and operationalize intersectional climate justice. The findings show how the city acted disruptively, challenging existing norms and breaking institutional silos to address climate change and tackle enduring inequalities. A clear intention to center care in climate action and spread the benefits of climate interventions was observed, along with place-based efforts to redistribute climate services and enhance representative participation. We connect empirical findings with theory, contributing to contemporary scholarship on climate urbanism and urban climate governance, and providing tangible outcomes and on-the-ground reflections on the tactics implemented to operationalize climate-resilient development while attending to intersectional justice.

While the tactics, mechanisms, and governing principles identified in Barcelona may not be entirely generalizable, they can serve as valuable insights for future research and cross-city assessments of practices on intersectional climate justice action. We recognize, however, that by studying Barcelona we may have reinforced a pervasive trend to focus on global cities as the primary sites of governance, neglecting medium-sized and smaller cities that may have fewer resources but an equal need for change. We encourage future research to investigate these tactics and mechanisms in different urban contexts, including "ordinary cities" (Castán Broto, 2019) or those outside the global, early-adapter spheres. We also suggest future studies to focus on the distribution and perception of climate action on residents' wellbeing through, for instance, documenting lived urban experiences to better identify local needs and vulnerabilities.

In conclusion, this study contributed to a nuanced and analytic understanding of the tactics employed to operationalize climate-resilient development while considering principles of justice and equity. We contributed to the growing field of urban climate governance, shedding light on the mechanisms and rationales behind climate strategies that aim to also address social injustices, and bridging theory and practice by providing practical insights within a broad theoretical framework. The tactics implemented by Barcelona showcase an understanding of the intersectionality between climate issues and diverse societal dimensions (i.e., reducing socioeconomic disparities, respecting cultural traditions, and safeguarding the rights of

communities) and the need to address them simultaneously. By uncovering the underlying mechanisms and justifications for Barcelona's perceived success, we identified enabling principles, ongoing challenges, and valuable lessons that hold relevance for application in diverse urban contexts.

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Supplementary data

Appendix A – Interview questions for city representatives (policy, planning, governance)

INTRODUCTION

1. Can you share a bit about your role and responsibilities in [your department]?

COORDINATION / COLLABORATION

2. How does your work (or the projects you work on) integrate with different sectors and agencies on issues related to climate change?

JUSTICE, EQUITY, VULNERABILITY, INTERSECTIONALITY

3. To what extent are social justice and inclusion dynamics considered in your work (including intersectionality, immigration, displacement and even gentrification)?

4. When designing climate strategies, programs, and policies, which social groups are prioritized? How are they prioritized? Who is considered vulnerable?

5. How is participation encouraged? How are these groups incorporated in the projects? How are minority needs and popular demands considered in policy making?

6. Is there a group that you think is not sufficiently or efficiently included?

IMPLEMENTATION AND FUTURE

7. What are the main obstacles? Where do you think there is room for improvement? What changes in strategy would be necessary to address more latent vulnerabilities?

8. How do you think the adaptation policies will evolve, improve, or expand in the future?

INSPIRATION

9. Which cities have influenced Barcelona's action plans? And who does Barcelona inspire? Is there peer-learning between cities in your area of concern?

CONCEPTION AND CONCEPTUALIZATION – CLIMATE SHELTER / SUPERBLOCK

10. Could you talk about the start of the Climate Shelter / Superblock project? Where did the idea come from? Was there inspiration from different cities? How were the criteria decided?

11. How is the Climate Shelter / Superblock project related to other adaptation actions in the city?

12. Is there an effort to adapt projects to the social, economic, and territorial, particularities of each neighborhood?
13. Are there post-intervention monitoring and evaluation processes?

Chapter 4 – Seeking refuge? The potential of urban climate shelters to address intersecting vulnerabilities[***]

Abstract

Climate refuges are critical urban infrastructures to support adaptation to extreme weather. They offer spaces – e.g., parks, libraries, and civic centers – where residents can take shelter during episodes of extreme temperatures. With over 200 public spaces designated as "Climate Shelters", Barcelona (Spain) serves as an emblematic example of whether these emerging spaces are meeting the needs, expectations, and everyday experiences of the most vulnerable residents. By applying an intersectional climate justice perspective and mixed-method approaches rooted in a survey of a particularly climate-exposed working-class neighborhood (La Prosperitat), we found that the intersecting vulnerabilities of marginalized populations remain poorly addressed, largely due to differences in access to coping mechanisms that overlap with intersecting social positions, exacerbating vulnerability to climate risks. We also found that housing inadequacy and energy poverty experienced by low-income residents and those originally from Global South countries made them the most affected and least able to cope with extreme temperatures. Women were also more affected by climate impacts and more concerned about current and future risks. We argue that unequal lived experiences of thermal (dis)comforts inform heat and cold inequalities, which, in turn, are attributed to intersecting social positions and structural vulnerabilities. These uneven lived experiences shape – and are reshaped by – limited adaptive capacity, culturally inappropriate approaches, and insufficiently inclusive public spaces, thus complicating an equity-driven provision of refuge infrastructures. Results call for developing refuge infrastructures that address the intersecting social and climate needs of residents who need them the most.

Keywords: Climate Shelters; Intersectionality; Climate Vulnerability; Critical Urban Infrastructures; Thermal Comfort

[***] This chapter corresponds to Amorim-Maia, A. T., Anguelovski, I., Connolly, J., & Chu, E. "Seeking refuge? The potential of urban climate shelters to address intersecting vulnerabilities" Submitted to: *Landscape and Urban Planning.* Under review.

1. Introduction

With climate impacts intensifying on the ground, several cities around the world are creating or reshaping public spaces as refuges for their most vulnerable residents to adapt to extreme risks. These refuges include greenspaces, as well as air-conditioned indoor facilities such as cooling centers (Berisha et al., 2017; Widerynski et al., 2017) and disaster relief sites that offer emergency shelter during episodes of storms, floods, and wildfires (Bashawri et al., 2014; Steer et al., 2017). Barcelona is one such example where a municipal network of "Climate Shelters" is being operationalized to provide thermal comfort to people who are especially vulnerable due to their socioeconomic situation, age, or health status (Barcelona, 2021a). The network covers open spaces of heat refuge, such as parks and gardens, as well as public indoor spaces (e.g., libraries, museums, civic centers) that provide protection from heat and cold extremes. Notably, the city aspires to have 100% of its residents live within a 5-minute walking distance to a climate shelter by 2030 (ibid). Questions around how outdoor spaces can serve as effective climate shelters will likely have a large impact on urban greenspace planning, especially on how to adapt existing design practices and maximize diversity of uses as the need for such refuge increases.

The pilot nature of climate shelters in early-adopter cities like Barcelona poses lingering questions over whether and to what extent these spaces account for the differential and intersecting vulnerabilities of marginalized communities in relation to climate change impacts. Within the literature on equitable urban climate adaptation and design justice (Anguelovski et al., 2016a; Goh, 2021; Piazzoni et al., 2022), the distribution, accessibility, and inclusivity of climate-adaptive interventions and infrastructures have been questioned. Recent studies have pointed to low-income and non-white populations experiencing disproportionate heat exposure *but* reduced access to refuge facilities (Fraser et al., 2017; Kim et al., 2021; Voelkel et al., 2018). These critiques might also be leveled at Barcelona since, as currently presented by the municipality, the climate shelters network could be interpreted as a simple repackaging of existing facilities with little consideration of the lived experiences and intersecting vulnerabilities of marginalized populations. However, if refuge spaces like Barcelona's climate shelters are to be scaled up into critical urban infrastructures that protect the most vulnerable groups, there is a need to unpack the push towards somewhat rushed adaptation projects like these to respond to immediate climate impacts, while addressing intersecting inequalities that underlie drivers of climate injustice (Amorim-Maia et al., 2022; Chu & Cannon, 2021).

Drawing on Barcelona's experience and data collected through a neighborhood-based survey, interviews, a focus group, and archival analysis, we ask: To what extent are adaptive urban infrastructures responding to the intersecting vulnerabilities and lived experiences of climate change of marginalized populations? To answer that question, we focus on a neighborhood deemed vulnerable to climate change and apply a feminist intersectional lens (S. Cho et al., 2013; Collins, 2015; Crenshaw, 1989), embracing the complexities of compounded experiences of discrimination and oppression (i.e., on the basis of gender, class, migrant status) and placing those who are marginalized at the center. This lens allows us to relate the lived experiences of heat and cold with residents' (in)ability to cope with temperature extremes and (in)accessibility to spaces of refuge, drawing a parallel between embodied feelings of thermal comfort/discomfort and intersecting structural inequalities.

Based on our findings, we identify principles for a more transformative operationalization of refuge spaces, pointing to the need for investments beyond process and towards more (re)distributive critical urban infrastructures that protect people from extreme events while recognizing local needs and addressing intersecting vulnerabilities. Our results also highlight the role that climate shelters can play in building adaptive capacity across the built landscape of Barcelona, where there are clear variations in heat and cold impacts. Before turning to the methods and results of our analysis, in the following section, we situate our study within broader debates on intersectionality and climate justice.

2. An intersectional lens to assess the justice outcomes of adaptive urban infrastructures

In this study, we apply the conceptual framework of intersectional climate justice to understand the extent to which climate shelters are addressing the intersecting vulnerabilities of Barcelona's marginalized groups. Intersectional climate justice proposes an analysis of the interconnected forms of socioenvironmental injustices that drive vulnerabilities in cities, paving the way for more concrete and integrated strategies of just urban adaptation and transformation (Amorim-Maia et al., 2022). We apply this lens to illustrate how the spatial variation of heat/cold risks relates to the accessibility of coping mechanisms and distribution of refuge spaces, with important implications for climate justice. Hence, this study addresses a deficit in theoretical and empirical connections between intersectionality and climate justice (Mikulewicz et al., 2023), and between climate justice and adaptive interventions that affect

the urban landscape (Mohtat and Khirfan, 2021), with key implications for distributive and recognitional justice.

First introduced in 1989 and rooted in Black Feminism and Critical Race Theory, the term intersectionality offered a critique of the marginalization of Black women within antidiscrimination law, feminist theory, and antiracist politics (Crenshaw, 1989). Over the years, the term has become a method, analytic tool, and lens to theorize the dynamics of overlapping axes of identity and power relations, such as gender, race, and class, and the ways in which they intersect creating different experiences of oppression and exclusion (Carbado et al., 2013; Lutz et al., 2016). Recent theoretical developments have advanced the intersectional approach within environmental and climate studies, notably using the intersectional lens to examine the oppressive systems and structures that reinforce social, environmental, and climate injustices (Ducre, 2018; Kaijser and Kronsell, 2014; Tuana, 2023).

An intersectional lens exposes how single-axis thinking undermines struggles for social justice and thus offers a broader understanding of vulnerability to climate change beyond essentialist analyses focused on single social categories (Arora-Jonsson, 2011; Djoudi et al., 2016). In this sense, intersectionality helps theorize climate vulnerability as multidimensional and dependent on historical, socioeconomic, and material conditions that affect the exposure, sensitivity and adaptive capacity of those deemed at risk to climate change (Adger, 2006; Ranganathan and Bratman, 2021; Vickery, 2018). Moreover, a feminist intersectional perspective on vulnerability recognizes that prioritizing the needs of the most vulnerable ultimately benefits society (Crenshaw, 1989). Recent studies attribute climate vulnerability to the intersection of axes of inequality – such as race, age, disability, and neighborhood affluence – with poor housing conditions and unequal access to coping strategies such as urban green spaces or climate-resilient infrastructures (Allegretto et al., 2022; Baró et al., 2019; Wong et al., 2022). Given that, in this study, we consider as "vulnerable" those who, due to social positions and structural inequalities, are temporarily more exposed and susceptible to and less able to cope with climate threats and intersectional precarity, hence our adoption of the term "intersecting vulnerabilities".

To help further theorize vulnerability with a particular focus on temperature extremes, and its inherent connections with intersecting social positions and structural inequalities, we introduce the concept of intersectional thermal (dis)comfort. We build upon Rodo-Zárate's (2022) innovative, multi-faceted, and feminist conceptualizations of "comfort" as embodied emotions

derived from experiences of privilege and relief, and "discomfort" as related to oppressed positions in power structures, which (re)produce social relations of inequality. We expand Rodo-Zárate's notion of (dis)comfort by considering thermal (dis)comfort as the relation between embodied experiences of heat and cold, household and socioeconomic conditions, and access to spaces of refuge. This approach contributes to ongoing discourses on the connections between embodied intersectionalities of emotions and lived experiences (in this instance, thermal (dis)comforts), sociopolitical differences (such as gender, class, and migrant status) and spatialities (in our case, access to climate shelters) (Sultana, 2020), and their broader implications for climate justice in cities.

Through an intersectional lens, climate justice approaches can better analyze the ways in which climate change impacts – and the responses to those impacts – affect people differently, as well as provide tools to redress the resultant injustices in more fair and equitable ways (Amorim-Maia et al., 2022; Mikulewicz et al., 2023; Sultana, 2022). In the absence of a universally-accepted definition of climate justice, we apply Schlosberg's (2001) three-pillared framework of environmental and ecological justice – distributive, procedural, and recognitional – to a climate change context to theorize which groups benefit, participate, and are recognized (or not) in climate-adaptive interventions. In urban adaptation, distributive justice is concerned with the distribution of material and social benefits and costs of adaptation responses; procedural justice relates to the fair inclusion of different voices, values, and needs in adaptation decision-making; and recognitional justice pertains to the legitimization of diverse social and cultural identities in adaptation processes and its outcomes (Chu and Michael, 2019b; Mohtat and Khirfan, 2021). While we acknowledge recent scholarly calls to expand the scope of justice towards abolitionist, postcolonial, and emancipatory approaches (Anguelovski et al., 2020; Ranganathan and Bratman, 2021; Robin and Castán Broto, 2020), we hold to the foundational three pillars as they help to analyze the distributive, accessibility, and inclusivity issues encountered by marginalized populations in relation to climate shelters in Barcelona.

To carry out this analysis, we consider climate shelters as critical urban built infrastructures meant to protect populations who are vulnerable to extreme temperatures. Critical urban built infrastructures are comprised of human-made networks, systems, and everyday spaces that produce and deliver services that are essential for protection, safety, and basic comfort in cities (Hendricks and Van Zandt, 2021). They shape and are shaped by urban landscapes, as well as by historical processes of power, control and access (e.g., segregation, racial zoning, gender

division of labor), inequitably providing environmental protection for some while exacerbating hazards and vulnerabilities for others (Steele and Legacy, 2017). Thus, the distribution and accessibility of critical urban infrastructures have acute distributional effects on environmental conditions, public health, and community vulnerability (Hendricks and Van Zandt, 2021; Steele and Legacy, 2017). In this study, we use an intersectional lens to empirically observe and theoretically reflect on the climate justice outcomes (i.e., distributive, recognitional) of one form of adaptive urban infrastructure (i.e., climate shelters) for a community deemed vulnerable to climate change in Barcelona.

3. Methods

In this study, we used mixed methods and citizen science approaches, combining archival analysis, a focus group, a neighborhood-level survey, and interviews. We combined these methods with an intersectional perspective through analyzing the interplay between historical evidence, lived experiences, and quantitative data with different axes of social identities and positions to explain intersecting vulnerabilities in La Prosperitat, a neighborhood in the district of Nou Barris in Barcelona. We followed feminist approaches by centering the voices of marginalized residents and prioritizing the everyday lived, private, and embodied experiences of participants to understand unique forms of vulnerability through a combination of research methods and approaches.

Going into greater detail about each method, between January 2021 and April 2022, archival analysis was conducted over several visits to the Historical Archive of Roquetes-Nou Barris to provide a historical overview of the case, contextualize the case-study analysis, and inform the survey. A list of documents and books inspected can be found in Appendix 1. The archival research also included virtual searches of the municipal archive of Nou Barris and the City Council's websites to further gather records of the historical development of the neighborhood.

We then designed a *needs assessment survey* with 35 questions to obtain a deeper understanding of the lived experiences, perceptions, and needs of residents in the context of climate change, mostly focusing on heatwaves but also on cold episodes, as those are reported to affect residents' wellbeing in Barcelona due to the number of unheated units in working-class neighborhoods. Questions were guided by prior climate change-related surveys developed by global organizations and research institutions (e.g., Carmin et al., 2012; University of Oxford & UNDP, 2021), adapted to the realities of the neighborhood, and informed by community

input and reflections. That is, in February 2021, we conducted a focus group with ten women residents of La Prosperitat during which, following citizen science principles with a feminist perspective (Listerborn, 2008), we worked collaboratively to design the survey taking into consideration the lived experience of women from different socioeconomic backgrounds in ways that resonated with their everyday realities.

Specifically, the survey aimed at understanding residents' (1) self-reported experience of extreme heat and cold; (2) use of cooling and warming refuges – both indoor and outdoor; (3) awareness of the "Climate Shelter" network; (4) use of municipal Climate Shelters; (5) ideal Climate Shelter characteristics; (6) climate change concerns; (7) current and future climate change impacts; (8) support of climate policies; (9) availability of home cooling/heating systems; (10) demographic information; and (11) experience with discrimination. Survey questions are available in Appendix 2. Section 5 of the survey aimed to gain insight into how residents' ideal climate shelter would integrate into the urban fabric – from the physical space, including outdoor greenspace characteristics like ventilation and shading, to further benefits that these spaces could provide, such as socioeconomic and care-related activities. With multiple choice and open-ended questions, this section was a central aspect of the citizen science approach. In section 11, we were interested in learning about how participants' experiences of discrimination related to other potential intersecting vulnerabilities. To gauge that, we asked whether and how often participants felt that they were treated unfairly due to their gender/sex, country of origin or habitual previous residency, age, race/ethnicity/skin color, religion, or sexuality.

Our survey included residents of La Prosperitat, and sampling strategy relied on a preliminary demographic study to identify the main socioeconomic characteristics of the neighborhood. Table 1 shows the relationship between key demographic indicators reported in municipal sources and those reported by the population included in the survey. We attempted to survey participants in ways that closely represented the composition of the neighborhood while acknowledging limitations. Following this goal of representativeness, we included a diversity of participants across genders, countries of origin, age, and education.

Table 1 – Key demographic data for La Prosperitat showing categories reported by municipal sources (total and percentage) and those reported by our survey participants (percentage). Source: Barcelona City Council Statistics Department, 2022, and survey data

Category		Total	Percentage	Surveyed
Gender	Female	14,357	53%	62%
	Male	12,646	47%	35%
Country of origin	Spain	20,215	75%	75%
	Foreigners	6,788	25%	23%
Age	18-50	11,044	48%	53%
	50+	12,025	52%	47%
Education	No univ. degree	19,520	85%	64%
	University degree	3,149	14%	31%

To achieve a sampling confidence level of 95% and margin of error of 5% for the neighborhood adult population, we conducted the survey with 380 adults living in La Prosperitat between February and May 2022. Survey responses were obtained in Spanish (314), Catalan (65), and English (1), and collected both in person (220) and online (160) using KoboToolbox. Recruitment for the online surveys was performed through community and neighborhood associations via existing community channels. In-person surveys were collected on tablets by a team of six people who roamed three focal points in the neighborhood as identified by local partners (Plaça Àngel Pestaña, Plaça de les Treballadores i Treballadors de la Harry Walker, and Plaça de la Zona Verda de La Prosperitat) as well as a one-block radius from those points (Figure 1).

Figure 1 - Survey anchor points in La Prosperitat. Source: Google Earth (2020) Scale: 300m. Perimeter and markers: author.

Thirty surveys were carried out at the local senior's social center to gather responses from older residents whose presence in the streets was reduced in comparison with other age groups. We also placed posters with QR codes pointing to the online versions of the survey in key spots across the neighborhood (e.g., bus stops, street poles, shop entrances), delivered flyers with the QR code in the street, and organized four events to gather responses. Participants gave their informed consent before participating in the study. The study also received ethics approval from our university ethics board.

To analyze survey results, we conducted descriptive statistics, bivariate analysis, and multivariate logistic regression modeling in R (version 4.2.1). We adjusted all models for gender, age, region of origin, level of education and income, and set statistical significance at p-value < 0.05. We applied an intersectional approach to the interpretation of our results, considering the associations and relationships found between different demographic variables and outcomes as indicators of intersecting social inequalities. Acknowledging that there is no commonly agreed quantitative method for empirically analyzing intersectionality that captures

the intricacies of the theory (Guan et al., 2021), we interpret our results as proxies for social and historical systems of power and oppression. We then apply mixed methods to move beyond proxies and contextualize our results within broader structures and power relations that create intersecting vulnerabilities. Even though survey questions tracked various categories for the variables above, those were dichotomized to form binary variables to facilitate statistical analyses. Region of origin was dichotomized into Global North and Global South following IMF's "advanced economies grouping" and "emerging and developing economies" respectively, as well as aid flows, as suggested by Hickel et al. (2022). We also draw on recent studies which highlight how immigrant status intersects with structural racism and day-to-day discrimination (Viruell-Fuentes et al., 2012) to constitute a category of continued vulnerability over time in Europe (Hemminki, 2014) and Barcelona, particularly in poorer districts such as Nou Barris (Anguelovski et al., 2018b). Level of income was dichotomized into "high" for residents who reported living comfortably and "low" for residents who reported finding it hard to make ends meet or having just enough to survive. Questions about climate change concerns and impact perception were assessed using a 5-point Likert scale and were also dichotomized to compare "positive" to "negative" responses. Probabilities were calculated using the results from the logistic regression for the questions that showed statistical significance.

Lastly, we conducted six *semi-structured interviews* with emblematic local actors including members of the neighborhood association and participants in historic social movements, as well as four informal conversations with climate shelter staff within the Barcelona Administration (library and civic center workers). The objective of these interviews was not to provide a parallel source of qualitative data but to contextualize the survey responses through oral histories and lived experiences, allowing us to triangulate some of our findings and collect additional targeted information of key residents and stakeholders with deep knowledge of neighborhood changes in La Prosperitat and of climate shelters and the policies that underpin them. Interviews with residents of La Prosperitat revolved around socioeconomic and environmental struggles and social movements over the years. Conversations with climate shelter staff covered protocols, preparedness of the spaces, and personnel to deal with a climate incident.

In terms of methodological limitations, in-person surveys were gathered mostly by foreigners (from Brazil, Germany, Italy, and the UK, apart from one Spanish/Catalan), all of whom spoke fluent Spanish and/or Catalan. However, this could have generated interviewer bias and

influenced interviewees' responses through, for example, mistrust or over-rapport. Conversely, online surveys could have caused non-response or selection bias, omitting populations who do not have or feel comfortable using electronic devices. We also faced some level of spectrum bias as our sample had more women and considerably more people with a university degree than neighborhood demographics. Moreover, we did not account for how long immigrants from Global South countries have been living in Barcelona, which limits our ability to formulate hypotheses on their changing socioeconomic background and vulnerability, although gathering such data would also involve its own set of assumptions and generalizations (e.g., about time of residence, integration, and vulnerability). However, as we seek an intersectional feminist approach, we still believe that our results present a reliable and representative portrait of local needs and wants.

La Prosperitat, Barcelona, a neighborhood at the center of climate vulnerability

Barcelona is a Mediterranean city with a historic lack of outdoor green public spaces due to its high density, poor availability of undeveloped space, and a particular lack of accessible neighborhood greenery in many of the more centrally located areas (Barcelona, 2020b). In 2022, Barcelona recorded its hottest summer since records began, with an average temperature of 28.2°C (+3.9°C compared to the 1961-1990 average) and exceptional heatwaves that started earlier, ended later, and lasted longer through the year compared to historical trends (Meteocat, 2022a, 2022b, 2022c). Extraordinary heatwaves are expected to increase in frequency, duration, and intensity (Altava-Ortiz and Barrera-Escoda, 2020; Meteocat, 2023). Recent reports conducted by the Barcelona Institute of Regional and Metropolitan Studies have shown that the most vulnerable areas to climate change are located in the historic central district of Ciutat Vella and the peripheral district of Nou Barris (the location of La Prosperitat neighborhood – see Figure 1). These areas are also among the most socioeconomically vulnerable (with aging populations and low levels of income and education), lacking access to green spaces, and having old and high energy-demanding buildings (Barcelona Regional, 2017), all working to exacerbate different landscapes of social and heat disparities. Figure 2 shows a map of the vulnerability to climate change index for Barcelona.

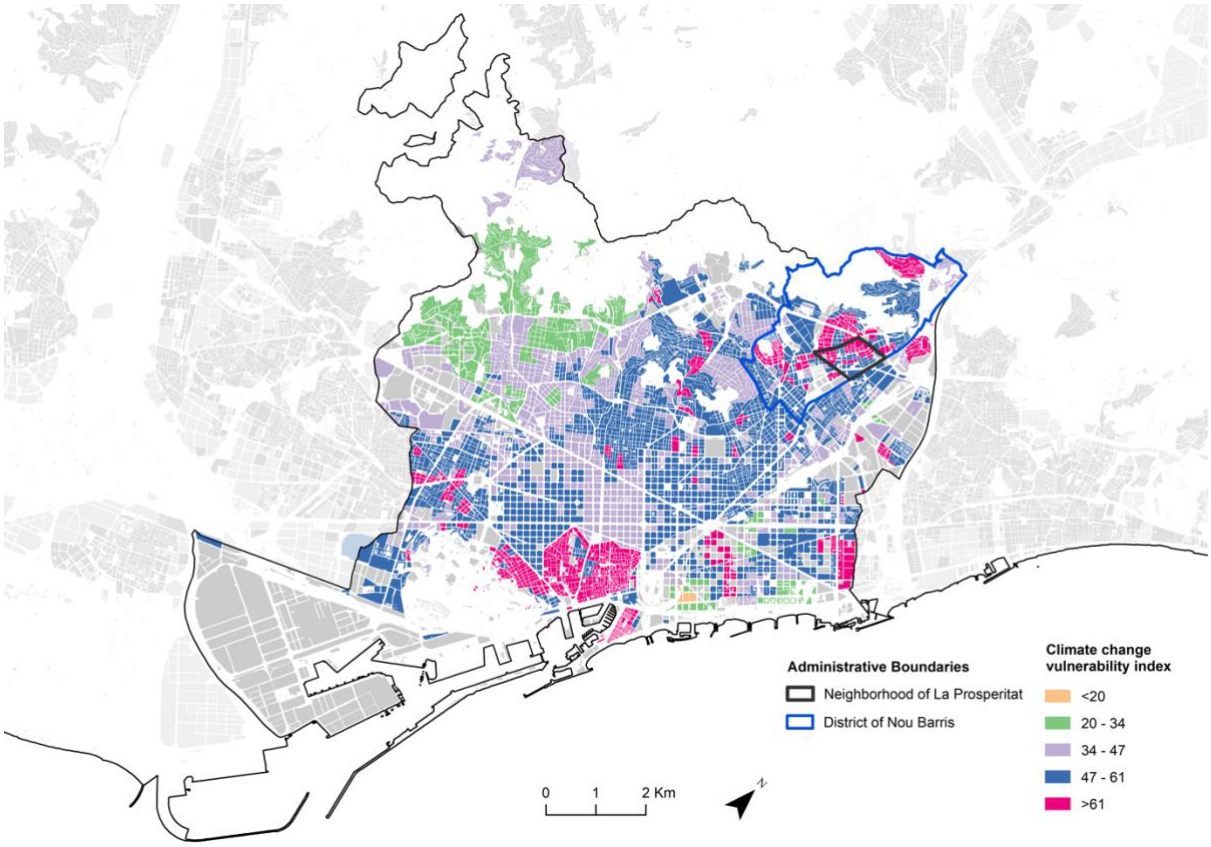

Figure 2 - Barcelona climate change vulnerability index. Source: Garcia-Sierra, M. and Domene, E. (2022). Heat in the future: Climate change vulnerability index (IVAC). Bellaterra, Barcelona Institute of Regional and Metropolitan Studies.

Barcelona is acutely affected by extreme heat during the summer but also episodes of extreme cold during the winter. In both cases, marginalized populations struggle the most to maintain their houses at a comfortable temperature or to afford cooling/heating bills apart from having limited access to outdoor spaces that might provide thermal comfort. A report by Barcelona's Public Health Agency revealed that 11.1% of the population cannot afford to maintain adequate temperatures during warm months and 9.4% during cold months, although cold has a greater impact on mortality than heat (Marí-Dell'Olmo et al., 2022). Women, seniors, and residents originally from Global South countries are identified as being particularly affected; and low-income neighborhoods present a high percentage of residents with no heating or cooling systems at all or an inability to use them when necessary (Marí-Dell'Olmo et al., 2022).

To cope with temperature extremes, in 2019, Barcelona launched a flagship network of "Climate Shelters", repurposing existing public facilities with the aim to provide thermal comfort to vulnerable groups while maintaining their usual functions and services. Barcelona's Climate Shelters include specially-conditioned indoor facilities (such as public libraries, civic centers, and schools) but also a wide network of green infrastructures with sufficient greenery,

shade, and availability of water fountains and resting areas (Barcelona, 2021a). Thus, climate shelters are tightly woven into (yet not limited to) the notion of increasing urban greening in the city (Barcelona, 2021b). Recently, the city expanded the scope of the program beyond heat refuges to use some of the spaces (indoor facilities, particularly) as refuge from cold spells – acknowledging that residents' vulnerabilities are not only related to heat but also cold. As of early 2023, the City of Barcelona had a total of 202 Climate Shelters, covering 95% of the population with a shelter within 10 minutes on foot from their homes. The Metropolitan Area of Barcelona (AMB) has an additional 43 Climate Shelters in seven other locations, which are part of the 2018-2030 AMB Climate Change Adaptation Plan (AMB, 2018). Besides climate shelters, Barcelona has other measures in place to deal with high temperatures such as the Action Plan to Prevent the Effects of Heatwaves on Health (ASPCAT, 2022); a new plan to increase the amount of shade in public spaces; and the Energy Advice Points which offer information and technical advice to support the energy rehabilitation of homes and guarantee universal access to electricity.

La Prosperitat, a densely populated working-class neighborhood (444 people/hectare) in the northeastern portion of Barcelona (see Figure 2), has a history of underservice and poor infrastructure access. As of 2023, La Prosperitat has a diverse population of around 27,000 inhabitants, comprised of historically marginalized yet strongly mobilized residents. One quarter of residents come from abroad, with significantly more immigrants from middle/low-income countries (such as Honduras, Armenia, Ecuador, Peru, and Romania) and significantly fewer immigrants from high-income countries (such as Sweden, Switzerland, Belgium, the USA, and UK) than the Barcelona average (A. de Barcelona, 2022). It is a socially and culturally active neighborhood, with most activity congregating at the civic center, *Casal de Barri La Prosperitat*. Other noteworthy facilities include the neighborhood association, youth center, and a senior's daycare center. In comparison with Barcelona demographic indicators, La Prosperitat has a low percentage of people with a university degree (13% vs. 33% for Barcelona) and a high percentage of older people (65+) living alone (55% vs. 44% for Barcelona) (Barcelona, 2022b). Of particular interest is also the female profile of unemployment (55%) and precarious employment, with a notable presence of young people, foreigners, and workers with little academic qualification undertaking part-time jobs and temporary contracts. The surface area of the homes is lower than the city average, the housing density is higher, and the buildings are on average 49.5 years old (Barcelona, 2021c). The topography of the neighborhood is marked by narrow streets and a lack of buildable lots and

green spaces. There are no climate shelters in La Prosperitat. To access green or less densely urbanized areas, residents need to go to adjacent neighborhoods, where access can be hindered by the local hilly topography.

Our archival and secondary data analysis reveals a relatively recent shift toward urbanization and the infrastructural improvements that came with it for La Prosperitat. The neighborhood started forming around the 1920s, with waves of migrants from southern Spain who built their own informal settlements and barracks in an area without basic street and housing infrastructure. Throughout the decades, the neighborhood continued to grow through self-construction, unaccompanied by sufficient facilities or public services, thus remaining largely unserved and poorly connected with the rest of the city. Throughout most of La Prosperitat's history, neighborhood mobilizations played a crucial role in obtaining infrastructure and service improvements to meet the needs of the growing community (Abeyà, 2019; Barcelona, 2019). This history is an essential component of understanding the roots of the social and cultural strengths of the neighborhood, which has a cohesive associative fabric still vibrant today. Figure 3 shows the main squares and a typical street in La Prosperitat.

Figure 3 – Key land features. Clockwise: Plaza Angel Pestaña, the central square in La Prosperitat, with the civic center at the back; Plaza de la Zona Verda; Plaza de les Treballadores y Treballadors de la Harry Walker; Sant Francesc Xavier Street, on the southwest flank of the central square. Photos by the author.

4. Results

4.1. Intersecting experiences of discrimination and unfair treatment

According to our survey analysis, the historic marginalization of the neighborhood is expressed today through feelings of discrimination reported by residents. Those who reported being most discriminated against were Global South and low-income residents, particularly due to their country of origin ($p<0.001$; 0.004), skin color ($p<0.001$; 0.012), and religion ($p = 0.003$; 0.048),

respectively. A total of 17% of women reported having been treated unfairly on the grounds of gender ($p < 0.001$) compared to less than 2% of men. Frequent open-ended responses included unfair treatment based on accent, physical appearance, and disability. Notably, Nou Barris (the district where La Prosperitat is located) has the highest rate of people with disabilities in the city (10,3%). This experience of unfair treatment reported mainly by Global South, low-income, and women residents highlights the intersecting nature of social identities and positions in La Prosperitat, which overlap to create different experiences of discrimination and marginalization in the neighborhood.

4.2. Lived experiences of extreme heat and cold at home

The historic and discriminatory trend is superposed to an overall poor access to climate regulating mechanisms and the role that social differences play in how extreme climate conditions are managed in La Prosperitat. Figure 4 shows the frequency in which homes were reported to be too hot or cold to stay inside during recent events of extreme heat/cold and usage of heat/cold refuges. Responses suggest that most houses are ill-prepared to handle extreme heat at least some of the time. In terms of usage of heat refuges by population, immigrants from the Global South were more likely to use open green spaces ($p = 0.017$), and less likely to use indoor spaces with air conditioning ($p = 0.042$) than Global North residents. Women were more likely than men to stay at home ($p = 0.032$). Open-ended questions revealed that residents generally also go to the beach (the nearest being 6km away), the swimming pool (at Can Dragó Sports Center, 750m away from the Square Àngel Pestaña), and to the mountains to seek refuge from extreme heat. Seven people also mentioned going to bar and café terraces, as they offer shade and fresh drinks.

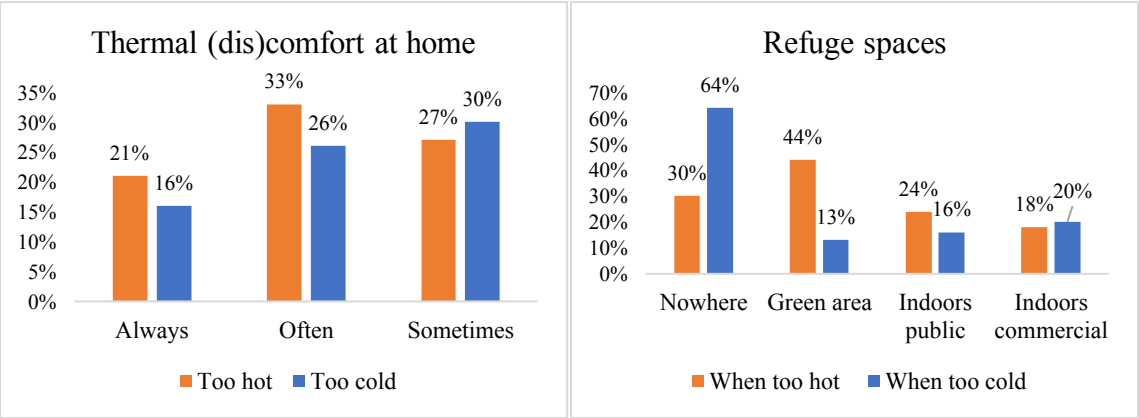

Figure 4 – Frequency of thermal (dis)comforts experienced at home due to extreme heat and cold and used spaces of refuge from extreme heat and cold

A large majority of residents also reported experiencing extreme cold at home (see figure 4). We found statistical significance that low-income residents and those from the Global South face colder conditions than high-income ($p = 0.014$) and Global North neighbors ($p = 0.034$), pointing to poor insulation and energy poverty inequalities faced by these groups. Residents originally from the Global South were significantly less likely to use indoor spaces to seek protection from cold than those from Global North countries ($p = 0.040$). Open-ended questions showed that residents also use bars and cafes to seek refuge from cold weather, pointing to the important role that these spaces play for socialization and even public health in the neighborhood.

Of the people surveyed, half have air conditioning, although low-income residents are less likely to have air conditioning units at home than high-income residents ($p = 0.012$). Global South ($p = 0.029$) and low-income residents ($p < 0.001$) are half as likely to have heating systems at home (i.e., heat pumps and central heating) than Global North and high-income residents. Low-income residents are also more likely to have no heating or cooling systems at all than high-income residents ($p = 0.031$).

4.3. Experience and perception of climate change impacts

The conditions reported above occur within the context of a neighborhood where residents already feel the impacts of climate change in their daily lives, mainly in terms of higher cooling and heating bills and more expensive food. Survey results and interviews show that respondents expect these to get worse in the future. Women and low-income residents reported being more impacted by current climate hazards and women were generally more apprehensive about future hazards than men. Women were three times more likely to be impacted by increasing food prices ($p = 0.002$) and twice as likely to be impacted by increased health effects and diseases compared to men ($p < 0.001$). Women were also more apprehensive about damage to their homes ($p < 0.001$). Low-income residents were more likely to consider relocating as a result of housing inadequacy, particularly younger ones ($p = 0.001$). From an intersectional perspective, people who identified as women *and* low-income were markedly more impacted by climate impacts, particularly those related to costs of living (e.g., heating bills, food prices) and health problems. Table 2 shows the differences by gender, region of origin, and income level for current climate impacts.

Table 2 – Climate impacts reported by La Prosperitat residents with frequencies, odds ratio coefficients, confidence intervals and p-values from the logistic regression models for the responses that presented statistical significance

Climate Change Impact	**Frequency**	**Group**	**Coef.**	**95% CI**	***P-value***
Higher cooling bills	F: 201; M: 105	Gender	3.13	(1.28, 8.04)	p = 0.014
Higher heating bills	L: 196; H: 80	Income	0.36	(0.17, 0.75)	p = 0.006
	F: 201; M: 107	Gender	2.62	(1.02, 6.97)	p = 0.047
More expensive food	F: 199; M: 103	Gender	3.32	(1.56, 7.30)	p = 0.002
Increased health effects and diseases	F: 173; M: 77	Gender	2.83	(1.65, 4.89)	p < 0.001
	L: 163; H: 62	Income	0.57	(0.33, 0.10)	p = 0.048
Increased risk of heat injuries	N: 177; S: 42	Region	2.00	(0.43, 3.70)	p = 0.027
	F: 183; M: 98	Gender	2.04	(1.01, 4.14)	p = 0.046
Damage to home	N: 251; S: 63	Region	2.58	(1.40, 4.87)	p = 0.028
	F: 152; M: 71	Gender	2.78	(1.58, 4.92)	p < 0.001
Damage to infrastructures	F: 134; M: 64	Gender	1.85	(1.12, 3.05)	p = 0.016
Relocations or considerations on moving house	L: 99; H: 68	Income	0.40	(0.23, 0.68)	p = 0.001

Legend: F = Female; M = Male; N = Global North; S = Global South; L = Low-income; H = High-income

In terms of governmental policy support, residents generally prioritize (1) more public green spaces, (2) more investment in wildfire prevention, and (3) improved energy efficiency of houses and buildings. Women were more supportive than men across all categories. Other than gender, no group showed relevant statistical differences for climate policy support.

4.4. Awareness and use of public refuge spaces

Reflective of the lack of climate shelters in the neighborhood, most survey respondents (85%) were unaware of the municipal climate shelter network. Residents originally from the Global North were seven times more likely to be aware of the program than those from the Global South (p = 0.005). In particular, immigrant women and those with little academic qualification were significantly less likely to know about the network. After sharing further details about the climate shelter network and indicating the location of nearby shelters just outside the neighborhood on a map, 81% of the surveyed people reported never having used a climate shelter to purposely seek protection from extreme weather. Despite that, 75% of respondents had used the shelters for other purposes (such as recreation), showing that these spaces are known and used by residents in general. Furthermore, 59% reported that they would use a climate shelter in the future to seek protection from extreme weather, with younger dwellers (p

< 0.001), people with a university degree (p = 0.012), and low-income residents (p = 0.028) more likely to use it than their counterparts.

4.5. Ideal climate shelter

Based on residents' elected priorities, the ideal climate shelter for La Prosperitat is deeply connected to the greenspace network of the city. It is a mostly outdoor space that provides access to nature and protection from extreme heat and cold through natural thermal comfort and shading designs (e.g., vegetation, water), and which would be used mostly with family members and friends for additional recreational, cultural, and social activities. Figure 5 shows a graphic representation of the "Ideal Climate Shelter" for La Prosperitat residents prepared by a prominent member of the neighborhood association and civic center and based on the neighbors' needs and envisioned characteristics stated in the survey. Percentages represent the proportion of individuals who selected a particular option out of all of those who responded to that question. Participants could choose multiple options per question. Colors identify answers to the same question.

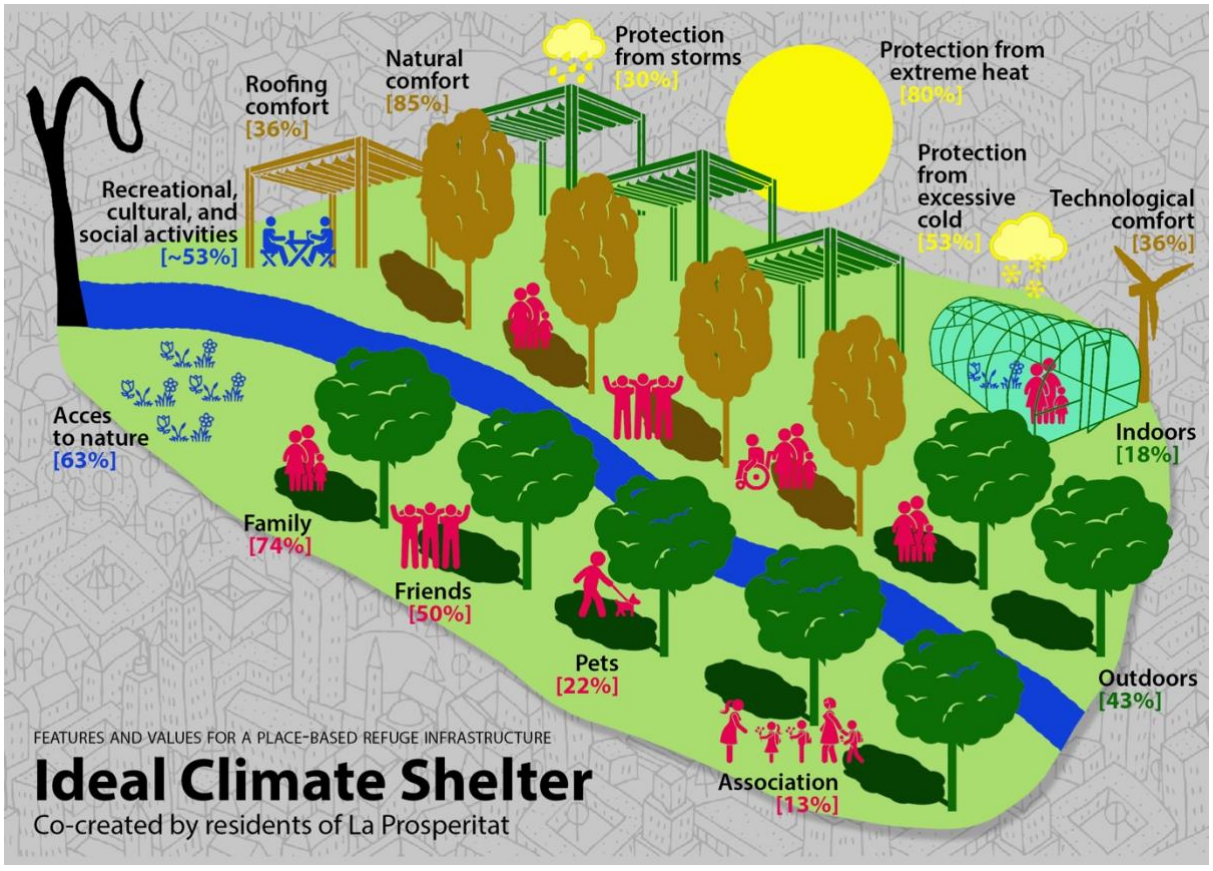

Figure 5 – Ideal Climate Shelter as per residents of La Prosperitat. Prepared by Roger Costa Puyal, member of the Neighborhood Association of La Prosperitat and Casal de Barri La Prosperitat, based on survey responses.

While the general preference was for outdoor spaces, women were more likely than men to prefer an indoor space ($p = 0.045$) and to use it with family members ($p = 0.048$), particularly younger women, whereas men, particularly from the Global North, were more likely to go with colleagues ($p = 0.001$). Recurring open-ended responses included water features such as fountains, sprinklers and pools, spaces to play sports, and urban gardens.

Survey results did not address the spatial distribution of ideal climate shelters, which is particularly challenging in a densely urbanized neighborhood like La Prosperitat where there are limited undeveloped and/or green spaces. Thus, the location and distribution of climate shelters in neighborhoods like La Prosperitat is a matter worth exploring in future research, as it would require more creative and resourceful approaches that take advantage of existing, privately owned, or community-operated spaces that fulfill the criteria of climate shelters, such as community centers, sports centers, schools, food and beverage outlets, and local urban gardens. Moreover, the neighborhood could benefit from tactical urbanism initiatives in public spaces, such as planter boxes, bench seats, and gazebos, to create mini-refuges in harder-to-reach locations.

4.6. Continued processes of socio-ecological improvements

Lastly, interviews with key stakeholders elicited important themes about the neighborhood mobilizations to combat intersecting and enduring social and environmental injustices in the past and present. Activism in La Prosperitat was historically intersectional, with different movements (e.g., housing, labor, anti-fascist) coalescing around the neighborhood association to fight for better living conditions for all residents and many of them led by women. Residents especially highlighted the historic struggle for clean water (mainly driven by women over the decades) and a remarkable 62-day strike for workers' rights at the Harry Walker factory, which mobilized the entire neighborhood in 1970. They also spoke about the fight against polluting industries, including a chemical plant which was shut down following local complaints of contamination and an asphalt plant which was forced to close after strong neighborhood mobilizations and which was later transformed into a community-run sociocultural center (*Ateneo Popular 9 Barris*). Interviewees also emphasized the demand for green areas, including years of struggle to open the first "Green Zone of La Prosperitat", where residents blocked the construction of a condominium by camping on site, and the opening of the central square,

Àngel Pestaña, in 1986, following 10 years of neighborhood mobilization to turn an area occupied by shacks into a community square. As the president of the association of elderly residents of La Prosperitat puts it, "we had to start from scratch. Schools, squares, green areas, nurseries… we had nothing, nothing. And everything was conquered through neighborhood struggles, with solidarity". Her words are complemented by those of a neighborhood historian, "I would say that every square in the neighborhood has been the product of a struggle. There was no free square, not one. In fact, almost all the services and infrastructures were products of struggles. They didn't give us anything".

Current demands include more green spaces and shade, a new public complex for a library, an auditorium, and a new space for the youth center. The historic movements and contemporary demands of La Prosperitat residents emphasize opportunities for climate shelters to address intersecting social-ecological needs (beyond protection from extreme heat), including more access to nature, and community spaces to conduct recreational and cultural activities. Moreover, despite the lack of climate shelters in the neighborhood, interviewees pointed to the resourceful usage of existing infrastructures and facilities as refuge. As the president of the Center for Popular Studies and Historical Archive of Roquetes-Nou Barris explains, "People already use many spaces as climate shelters, without knowing the name, 'shelter'. But they already use them, of course they do. If you want to know where the climate shelters are, you just need to follow the path of the *yayos* (grandparents)".

Finally, responses from the climate shelter staff evoked important considerations about the commitment to the program but lack of training and protocols. In libraries and civic centers surrounding La Prosperitat, staff reported that facilities had been branded by the City Council as "Climate Shelters" due to their existing characteristics but without significant material investment or staff training to deal with a possible heat emergency. For instance, a civic center worker reported having "nothing to offer" for shelter-seekers to spend the time and staff at two libraries reported receiving no protocol, training, or material beyond reusable cups and stickers. Moreover, many shelters had reduced opening hours during the summer holidays of 2021, which was the hottest period of the year. This seems to have been addressed by the summer of 2022 when climate shelters had prolonged opening hours between June and September as well as clearer protocols for staff.

5. Discussion: addressing heat and cold inequalities with critical urban infrastructures

This study analyzed experiences of thermal (dis)comfort – or the unequal lived experiences of heat and cold – as well as climate risk perceptions, needs, and expectations of a community deemed vulnerable to climate change (La Prosperitat) through an intersectional climate justice lens and using a citizen science approach. The analysis showed how different social identities and positions affect residents' adaptive capacity and informed the extent to which current adaptive urban infrastructures address intersecting vulnerabilities.

Our intersectional analysis identified an essential role for the greenspace network of the city to respond to the needs of those most affected by thermal (dis)comfort, especially women, low-income residents, and those originally from Global South countries. These thermal (dis)comforts were attributed to structural vulnerabilities related to housing precariousness and energy poverty and were compounded by the effective unavailability (until recently) of adaptative built infrastructures – i.e., climate shelters – in the neighborhood. The high number of people over 65 years old living alone in the neighborhood compounded by the findings that a third of respondents – particularly women – prefer not to leave their homes in case of extreme heat and that women are especially impacted by rising costs of living show how vulnerability in La Prosperitat is the result of intersecting social and economic factors. In fact, research shows that risk of death due to extreme heat is higher among women and older adults in Barcelona (Ingole et al., 2020) and among residents of areas with little green space (Xu et al., 2013), which is the case in La Prosperitat. Notwithstanding, our results also point to cold (dis)comforts experienced mostly by low-income and immigrant residents. This, combined with the finding that two thirds of residents prefer not to go anywhere in case of extreme cold, is worrying, as cold temperatures have a greater impact on mortality in Barcelona than warm temperatures (Marí-Dell'Olmo et al., 2022, 2019). This is possibly reflected in the historic conditions of Barcelona, which have seldom been faced with extended cold weather. Thus, because it was not a necessity, lower income households did not account for cold, but higher income households did as a matter of accessing high degrees of comfort. This may point toward an important strand of thinking for climate shelters in cities wherein those with intersecting vulnerabilities are especially disadvantaged when it comes to conditions that shift from being questions of (dis)comfort to questions of basic wellbeing and survival that have long remained invisible. This underlines the need to invest in home retrofitting and energy efficiency incentive

programs to prevent disadvantaged residents from being further isolated if refuges are inaccessible or do not respond to their intersecting needs and vulnerabilities. While Barcelona is supporting associations of neighbors in their application to EU Next Generation funds for energy-retrofit and solar panel programs, the administrative burden and time commitment of such applications tends to discourage people from applying.

We also unveiled unequal patterns of usage and accessibility of existing refuge infrastructures, with certain populations (especially immigrants from the Global South) less likely to know about and/or willing to use such spaces than others. We relate that difference to inadequate promotions, unequal distribution, and insufficient accessibility, including in terms of cultural appropriateness, of climate shelters for La Prosperitat residents. In Barcelona, immigrant groups have been less vocal, recognized, or formally organized than working-class Spanish residents, which could explain a possible lesser sense of belonging and participation in certain contexts and settings (Kotsila et al., 2021; Oscilowicz et al., 2020). Municipal documents also acknowledge a lack of participation by residents from diverse origins and cultures in the organized community fabric of La Prosperitat (Barcelona, 2021c). This finding more broadly reveals the presence of social divides in people's accessibility and familiarization with refuge infrastructures, indicating that the presence of a climate shelter may not do much for those with entrenched intersecting vulnerabilities. These groups require much more specific, regular, and culturally- or socially-adapted engagement in the context of a new adaptation program like a climate shelter.

Our results illustrate patterns of intersecting climate vulnerabilities with important implications for climate justice. In terms of distributive justice, the unfair allocation of climate shelters and uneven patterns of usage across social tracts means that these spaces are not reachable or welcoming enough to groups experiencing intersecting vulnerabilities. With respect to recognitional justice, our study brings attention to feminist epistemologies through, for instance, embodied knowledges that translate awareness of environmental and climate changes (i.e., thermal (dis)comforts) and everyday experiences of climate impact and vulnerability (Chu and Michael, 2019a; Fricker, 2017). Moreover, the significant socioeconomic and gendered differences in perception of climate risk, experience of impact, and policy support, compounded by the reported experiences of discrimination by these same populations point to the need to question whose identities, cultural values, and perspectives count in the design of

climate-adaptive infrastructures and to better support those more invisible and marginalized ones.

Finally, our empirical results outline a place-based, grassroots proposal for climate shelters to address the intersecting environmental and social needs of historically marginalized residents. As per their stated preferences, these infrastructures of refuge must provide access to nature and protection from extreme heat and cold, while also addressing other social, cultural, and recreational needs. This citizen-science driven exercise responded to recent calls for engaging with the diversity of everyday lives and accommodating multiple forms of knowledge, cultural norms, and identities in urban transformation (Patricia Romero-Lankao et al., 2018). Moreover, these findings more broadly contribute to recent discourses on the design of climate-adaptive built environments (Liu et al., 2023), and green infrastructure planning practices focused on inclusion, community consent (Grabowski et al., 2023), and citizens as expert knowledge holders (Anguelovski et al. 2020). Fundamentally, this practice highlighted the importance of facilitating citizen science methods that focus on operationalizing feminist intersectional principles to identify social-ecological needs and co-create place-based solutions to address intersecting climate vulnerabilities.

6. Conclusion

This study aimed to understand how urban communities deemed as climate-vulnerable are experiencing climate change – particularly their lived experiences of thermal (dis)comfort and access to spaces of refuge – in order to evaluate the extent to which climate-adaptive infrastructures simultaneously provide protection from extreme events and address entrenched intersecting vulnerabilities. By applying an intersectional climate justice perspective, we unveiled uneven experiences of thermal (dis)comfort and access to coping mechanisms, with some social groups significantly more impacted than others. Moreover, we found that current climate shelter infrastructures are not effective, well known, or even used by La Prosperitat residents – at least not for the purpose of finding refuge from climate extremes. We suggest ways for climate shelters to fulfil the potential to address intersecting vulnerabilities through place-based and community-led approaches. We draw attention to the need for future researchers and city planners to better address the different barriers to accessibility (distributive, recognitional, physical) of climate-adaptive infrastructures and to explore the ways in which their potential benefits can be more inclusively distributed.

Beyond La Prosperitat and Barcelona, our paper highlights a general need for cities to conduct deeper analyses of intersecting vulnerabilities in the delivery of climate-adaptive urban infrastructures, to better understand and tackle the entrenched barriers faced by marginalized populations in adapting to extreme climate. By examining the local dynamics of one city, this case study provides valuable insights into the challenges and opportunities that other early-adopter cities may face in tackling similar issues. Although this case is focused on Barcelona, it highlights how class, gender, and migrant status intersect as compounded characteristics of vulnerability, as shown in prior urban climate justice studies (e.g., Sultana, 2020). The Barcelona case refers to a particular historic, social, and political trajectory of immigration, racialization, and gendered-driven discrimination and vulnerability, but its broader characteristics are reminiscent of other urban contexts of climate vulnerability in global cities.

The study highlights the potential for climate shelters and related infrastructures to address and link up with historic intersecting vulnerabilities by offering culturally-appropriate and welcoming spaces of refuge from extreme temperatures that meet other social needs of vulnerable residents. This shift is necessary to protect the most heat- and cold-vulnerable groups and tackle other intersecting vulnerabilities brought on by inadequate housing conditions, unequal access to spaces of refuge and socioeconomic inequalities. This way, climate-adaptive urban infrastructures can more effectively and strategically address intersecting climate and social vulnerabilities and move cities towards greater climate justice.

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Supplementary data

Appendix A - Books and documents reviewed at the Historical Archive of Roquetes – Nou Barris

Books inspected:

1. Abeyà, M. (2019). *La Prosperitat: arrels històriques*.
2. Ajuntament de Barcelona. (2019). *Harry Walker: lluita obrera, victòria veïnal.*
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4. Fabre, Jaume. (1991). *Nou Barris, la penultima Barcelona (Historia dels districtes de Barcelona)*.
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9. Serrat., M. G., Ruiz, J. S. (2017). *Nou Barris Desaparegut.*
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Documents inspected:

1. Historical documents such as newspaper articles, posters, and invitations to demonstrations and street events (eight boxes)
2. Local magazines (five boxes)
3. Historical photographs (four albums)
4. Historical maps (one folder)

Appendix B - La Prosperitat needs assessment survey

Note: Questions 1 and 2 refer to the consent form

Time in La Prosperitat

3. For how long have you lived in La Prosperitat?

- Less than 1 year
- Between 1 and 9 years
- 10 – 19 years
- 20 – 29 years
- 30 – 39 years
- 40 – 40 years
- 50 – 59 years
- 60 – 69 years
- 70 – 79 years
- 80 years or more

Extreme heat and heatwaves

*4. During recent events of **extreme heat** or **heatwaves**, how often did you feel like your home was too hot to stay inside?*

- Always
- Often
- Sometimes
- Rarely
- Never

*5. How do you cope with **extreme heat** and **heatwaves**?*

Please describe a couple of your personal strategies

_____

_____

6. In case of extreme heat or heatwaves, where do you normally go, if anywhere, to keep cool?

Check all that apply.

- A commercial space with air conditioning A commercial space with air conditioning (e.g., mall, restaurant)
- A park, garden, or green area with shade
- A public building with air conditioning (e.g., library, civic center)
- A covered public space (e.g., awning or other shade structures)

- I don't go anywhere
- I don’t know
- Prefer not to say
- Other (please specify)

Extreme cold and cold waves

*7. During recent events of **extreme cold** or **cold waves**, how often did you feel like your home was too hot to stay inside?*

- Always
- Often
- Sometimes
- Rarely
- Never

*8. How do you cope **with extreme cold** and **cold waves**?*

Please describe a couple of your personal strategies

_____

_____

9. In case of extreme cold or cold waves, where do you normally go, if anywhere, to keep cool?

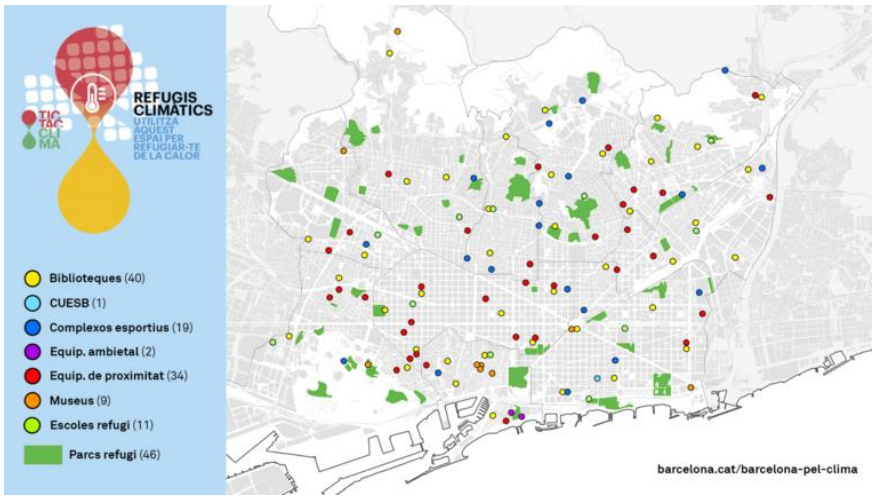
Check all that apply.

- A commercial space with air conditioning A commercial space with air conditioning (e.g., mall, restaurant)
- A park, garden, or green area with shade
- A public building with air conditioning (e.g., library, civic center)
- A covered public space (e.g., awning or other shade structures)
- I don't go anywhere
- I don’t know
- Prefer not to say
- Other (please specify)

Barcelona Climate Shelters

The Barcelona city council is creating a network of Climate Shelters, which are facilities and urban parks that provide good thermal comfort conditions, and which can shelter vulnerable people (elderly, people in poor health, etc.) in the event of heat waves.

Climate Shelters in Barcelona



10. Were you aware of the Barcelona "Climate Shelters Network"?

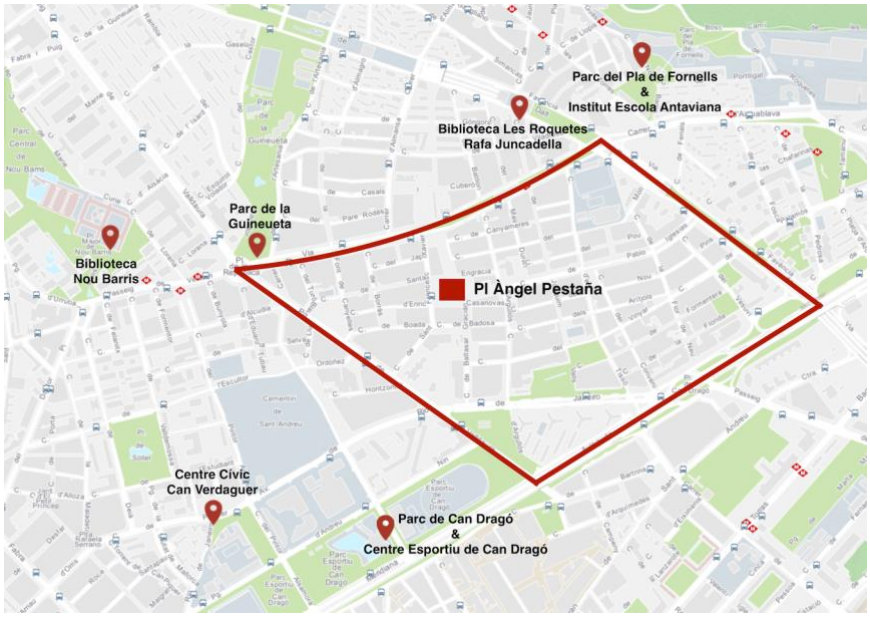
- Fully aware
- Somewhat aware
- Not aware
- Prefer not to say

Climate Shelters near La Prosperitat

There are no climate shelters in La Prosperitat, but there are 8 climate shelters in the vicinity (up to 15 minutes' walk from Plaça Àngel Pestaña): Parc de la Guineueta, Biblioteca Les Roquetes – Rafa Juncadella, Parc del Pla de Fornells, Institut Escola Antaviana, Biblioteca Nou Barris, Parc de Can Dragó, Centre Esportiu Municipal Can Dragó, and Centre Cívic Can Verdaguer

You can see a map of these climate shelters below.

Climate Shelters near La Prosperitat



11. Have you used any of the nearby climate shelters to protect from extreme weather (heat, cold, rain)?

- Yes
- No
- I don't know
- Prefer not to say

12. Which spaces on the map have you used as a climate shelter?

Check all that apply

- Parc de la Guineueta (La Guineueta)
- Biblioteca Les Roquetes – Rafa Juncadella (Les Roquetes)
- Parc del Pla de Fornells (Les Roquetes)
- Institut Escola Antaviana (Les Roquetes)
- Biblioteca Nou Barris (La Guineueta)
- Parc de Can Dragó (Porta)
- Centre Esportiu Municipal Can Dragó (Porta)
- Centre Cívic Can Verdaguer (Porta)
- I don't know
- Prefer not to say

13. Have you used any of the nearby climate shelters for any other purpose? (That are NOT to protect from extreme weather)

- Yes
- No
- I don't know
- Prefer not to say

14. Which spaces on the map have you used for any purposes other than as a climate shelter?
Check all that apply.

- Parc de la Guineueta (La Guineueta)
- Biblioteca Les Roquetes – Rafa Juncadella (Les Roquetes)
- Parc del Pla de Fornells (Les Roquetes)
- Institut Escola Antaviana (Les Roquetes)
- Biblioteca Nou Barris (La Guineueta)
- Parc de Can Dragó (Porta)
- Centre Esportiu Municipal Can Dragó (Porta)
- Centre Cívic Can Verdaguer (Porta)
- I don't know
- Prefer not to say

15. Would you use any of the nearby climate shelters to protect from extreme weather in the future now that you know more about them?

- Yes
- No
- I don't know
- Prefer not to say

16. Which other spaces on the map would you use as a climate shelter?
Check all that apply.

- Parc de la Guineueta (La Guineueta)
- Biblioteca Les Roquetes – Rafa Juncadella (Les Roquetes)
- Parc del Pla de Fornells (Les Roquetes)
- Institut Escola Antaviana (Les Roquetes)
- Biblioteca Nou Barris (La Guineueta)
- Parc de Can Dragó (Porta)

- Centre Esportiu Municipal Can Dragó (Porta)
- Centre Cívic Can Verdaguer (Porta)
- I don't know
- Prefer not to say

17. Please choose 1 image that depict a climate shelter you would like to use, create, or build.

- None of these

Ideal Climate Shelter

If you were to create an ideal climate shelter, or a place where you and your community (family, friends, neighbors) can take shelter during extreme weather (heat, cold, rain, fire) that is also open to the neighborhood year-round, what would it look like?

18. The space would be…

Check all that apply

- Indoors
- Outdoors
- Don't know
- Prefer not to say
- Other (please specify)

19. The cooling/heating would be…

Check all that apply

- Natural (vegetation, trees)
- Technological (air conditioning, ventilation, heating)
- Roofing (green roof, reflective roof, awnings)
- Don't know
- Prefer not to say
- Other (please specify)

20. You would use this space to protect yourself from which extreme weather events?

Check all that apply

- Excessive cold and cold spells
- Excessive heat and heatwaves
- Heavy rain, storms, and floods
- Wildfires
- I don’t know
- Prefer not to say
- Other (please specify)

21. With whom would you go to the climate shelter?

Check all that apply

- Co-worker(s)

- Colleague(s) (of an association, organization, or course)
- A dependent person
- Family member(s)
- Friend(s)
- Pet(s)
- I don't know
- Prefer not to say
- Other (please specify)

22. Apart from protection from extreme weather, which other benefits do you think the climate shelter could bring to your daily life?

Check all that apply

- Access to green space and nature
- Cultural and/or artistic activities (e.g., dancing, drawing, playing instruments, going to concerts)
- Recreational activities (e.g., dog walking, exercising, playing with kids, reading, relaxing)
- Activities and resources related to care (e.g., support groups, community care projects)
- Social activities (e.g., eating, drinking, meeting people, partying)
- Socioeconomic initiatives (social and solidarity economy, local development)
- Training activities and programs (e.g., environmental education, social entrepreneurship)
- I don't know
- Prefer not to say
- Other (please specify)

23. Any other features, characteristics, or conditions?

_____

Climate Change

24. How worried are you about the following climate change-related concerns?

	Not at all	A little	Moderately	Very	Extremely	I don't know
Erosion and loss of	○	○	○	○	○	○

natural spaces like beaches						
Increased risk of wildfires	○	○	○	○	○	○
More diseases, health problems, and allergies	○	○	○	○	○	○
More frequent and intense droughts	○	○	○	○	○	○
More frequent and intense storms and episodes of flooding	○	○	○	○	○	○
More frequent and intense winters or episodes of excessive cold	○	○	○	○	○	○
Rising temperatures, more frequent and intense heatwaves and episodes of excessive heat	○	○	○	○	○	○

*25. To what degree do you feel that climate change is already having an impact **on your everyday life**?*

	Not at all	A little	Moderately	Very	Extremely	I don't know
Damage to my home (e.g., caused by storms, excessive heat, fire)	○	○	○	○	○	○
Impact on infrastructures and services (e.g., roads, railways, electrical & telecommunications networks)	○	○	○	○	○	○
Higher cooling bills (e.g., air conditioning, fan)	○	○	○	○	○	○
Higher heating bills (e.g., heat pump, gas heater, radiator)	○	○	○	○	○	○
Increased health effects and diseases	○	○	○	○	○	○
Increased risk of heat	○	○	○	○	○	○

injuries (heat exhaustion, heat stroke)						
More expensive food	○	○	○	○	○	○
Relocation or considerations on moving house	○	○	○	○	○	○

*26. Looking ahead, to what degree do you think climate change will affect you personally **in the future**?*

	Not at all	A little	Moderately	Very	Extremely	I don't know
Damage to my home (e.g., caused by storms, excessive heat, fire)	○	○	○	○	○	○
Impact on infrastructures and services (e.g., roads, railways, electrical and telecommunications networks)	○	○	○	○	○	○
Higher cooling bills (e.g., air conditioning, fan)	○	○	○	○	○	○
Higher heating bills (e.g., heat pump, gas heater, radiator)	○	○	○	○	○	○
Increased health effects and diseases	○	○	○	○	○	○
Increased risk of heat injuries (heat exhaustion, heat stroke)	○	○	○	○	○	○
More expensive food	○	○	○	○	○	○
Relocation or considerations on moving house	○	○	○	○	○	○

27. How important for you are each of these actions, thinking about your neighborhood needs in relation to extreme weather?

	Not at all	A little	Moderately	Very	Extremely	I don't know
Improved energy	○	○	○	○	○	○

efficiency of houses and buildings						
Improved flood resilience of houses and buildings	○	○	○	○	○	○
More investment in wildfire prevention and suppression	○	○	○	○	○	○
More public indoor facilities to protect people from extreme weather	○	○	○	○	○	○
More public green spaces to protect people from extreme weather	○	○	○	○	○	○

Demographics

28. How old are you?

- 18-29
- 30-39
- 40-49
- 50-59
- 60-69
- 70-79
- 80+
- Prefer not to say

29. With what gender do you identify?

- Female
- Male
- Non-binary
- Prefer not to say
- Other (please specify)

30. Where were you born?

- _____

31. What is your maximum level of completed studies?

- No formal schooling / Never attended
- Primary
- Secondary
- High school
- Vocational Training
- University – Undergraduate (degree, diploma)
- Post-university – Postgraduate (masters, doctorate, etc.)
- Prefer not to say
- Other (please specify)

32. How would you describe your financial situation?

- I can't make ends meet
- I have just enough to survive
- I live comfortably
- It changes from month to month
- Prefer not to say

33. What is your current work situation?

Check all that apply

- Working full time
- Working part time
- Casual jobs
- Self-employed
- Paid student internships
- Unpaid student internships
- House worker (looking after the house / family)
- Unemployed
- Retired
- Unable to work for health reasons
- Prefer not to say

34. Do you have air conditioning / heating system in your home?

Check all that apply

- Air conditioning
- Heat pump
- Boiler
- Central heating
- Electric radiator
- Solar-thermal system
- Prefer not to say
- Other (please specify)
- None of the above

*35. Have you ever felt that people treated you unfairly due to your… (**Check all that apply**)*

	Never	Rarely	Sometimes	Often	Always
Age?	○	○	○	○	○
Country of origin or former habitual residence?	○	○	○	○	○
Gender and/or sex?	○	○	○	○	○
Race, ethnicity, or skin color?	○	○	○	○	○
Religion	○	○	○	○	○
Sexuality	○	○	○	○	○
Other (please specify)					

Anything else you'd like to add?	

Chapter 5 - Conclusion

Make plans with people, not for them.

In this concluding chapter, I briefly synthesize the key themes and findings presented in this dissertation, discuss limitations of the study and of my own positionality and put forth suggestions for future research directions. In my research, I explored: (i) the ways in which the application of an intersectional lens in urban climate planning can inform and guide justice-oriented adaptation actions on the ground; (ii) the tactics and mechanisms employed to implement and govern intersectional climate justice in the city; and (iii) the extent to which adaptive urban infrastructures are responding to the intersecting vulnerabilities and lived experiences of climate change of marginalized populations. In answering these questions, this work has provided conceptual, policy, and social contributions to improve our understanding of how cities can more comprehensively address the challenges posed by climate change while simultaneously confronting deeply rooted historical inequalities. My argument throughout this work is that intersectional climate justice goes beyond physical climate-resilient infrastructures and technologies. It requires investment in policies, services, social infrastructure and protection that are tailored to the needs of frontline communities. Above all, it necessitates acknowledging and addressing underlying causes of injustice – including interconnected oppressions such as sexism, racism, and classism – and the processes that (re)produce inequality, precarity, and marginalization – including maladaptive processes.

1. Synthesis of findings

Chapter 1 provided a brief overview of the state-of-the-art of global and local adaptation and emphasized the importance of adopting an intersectional approach in devising effective adaptation strategies. Chapter 2 presented an urgent call for a conceptual shift towards intersectionality in urban climate adaptation, bridging planning theory with justice-driven action. To address the fragmented and scattered nature of current adaptation strategies, I proposed an intersectional climate justice framework encompassing five key components: 1) reducing the effect of *socioeconomic conditions that reinforce racial and gender inequalities* through feminist and antiracist policies aimed at dismantling systems of oppression; 2) redressing the drivers of *differential vulnerabilities* defined by social group by focusing action

where climate impacts intersect with spatial inequalities; 3) taking *ethics and politics of care* seriously, putting care at the center of urban planning; 4) adopting *place-based and place-making approaches* rooted in existing population preferences, valuing local knowledges and lived experiences; and 5) promoting *cross-identity and -vulnerability forms of activism*, empowering local communities to lead the change. These five subcomponents emerged from a combination of narrative and analytical review methodologies which involved synthesizing, prioritizing, and analyzing the literature to identify key themes, scholarly critiques, and theoretical gaps. This study provided a comprehensive overview and conceptual foundation for getting to intersectional climate justice through urban climate action. While the subcomponents of intersectional climate justice represent a conceptual frame rather than a clear roadmap for action, Barcelona's initiatives exemplify progress towards integrated and socially transformative approaches to climate adaptation.

Chapter 3 explored how Barcelona is governing and implementing intersectionality and justice principles into climate action in policy, practice, and on the ground. My findings showed that the tactics employed rely on disruptive and transversal governance approaches that place care at the center of urban interventions. The findings also presented place-based efforts to improve distributive justice by allocating benefits and costs of adaptation interventions in a more equitable manner and advancing procedural and recognitional justice by including marginalized populations in decision-making and planning. I relate the city's actions with three distinct waves of urban climate governance, while highlighting the concurrent nature of these efforts, as a strategy to better ground and institutionalize them inside and outside the city. In other words, elements from the first and second wave, such as city-to-city learning, international partnerships, and urban experimentation continue to be present and reinforce recent 'third wave' efforts characterized by the integration of justice into climate action. I also demonstrate that while efforts have been made to redress historical vulnerabilities and promote citizen participation, challenges remain in ensuring equitable distribution and inclusivity, and encourage further research to address the accessibility and effectiveness of the city's initiatives (such as the Superblocks and Climate Shelters). Despite these caveats, Barcelona's experiences offer valuable insights for governing climate-resilient development with an intersectional climate justice lens.

Chapter 4 examined the experiences of thermal (dis)comfort and climate impacts in a Barcelona community deemed vulnerable, in the neighborhood of La Prosperitat, through an

intersectional climate justice lens and a citizen science approach. The analysis revealed how social identities and positions influence residents' adaptive capacity and highlighted the importance of inclusive refuge spaces in addressing thermal (dis)comfort, particularly for women, low-income residents, and immigrants from Global South countries. It also uncovered unequal patterns of accessibility and usage of existing refuge infrastructures, particularly among immigrant populations. The study identified structural inequalities related to housing precariousness and energy poverty, underscoring the need for broader home retrofitting and energy efficiency programs. The findings also emphasized the need for culturally sensitive and socially adapted engagement in urban adaptation programs to prevent further isolation of disadvantaged residents and address broader thermal (dis)comfort needs. I concluded by highlighting the implications of the study for climate justice, calling for more inclusive and culturally appropriate design of climate-adaptive infrastructures and offering a grassroots-driven climate shelter proposal based on residents' own design, to address intersecting climate vulnerabilities in historically marginalized communities.

2. Synthesis of theoretical contribution: What is intersectional climate justice after all?

Urban intersectional climate justice is a guiding principle for climate action that integrates insights from intersectionality theory into urban climate scholarship and politics to achieve greater social justice. It recognizes how social identities and positions, such as race, gender, class, and nationality, intersect with climate change vulnerabilities to (re)create historical and ongoing inequalities. Intersectional climate justice aims to not only identify climate vulnerabilities, but also challenge the oppressive systems and structures that perpetuate these vulnerabilities. Thus, the concept of intersectional climate justice emphasizes the need to focus on and empower local communities, their knowledge, and voices. Beyond rhetoric, intersectional climate justice offers insightful and actionable recommendations for cities to operationalize intersectional thinking in urban climate action. These include tactics and governance approaches that are boldly disruptive, transversal, place-based, and distinctly committed to politics of care. On a policy level, these tactics translate into political efforts to provide fair and secure housing and access to green and climate-resilient amenities, measures to mainstream gender and democratize care work, and initiatives to improve participation and recognize diverse knowledge and experiences in decision-making.

The findings from this research contribute new knowledge, insights, and perspectives to the fields of intersectionality, urban climate adaptation and climate justice. Most importantly, this study identifies and responds to scholarly calls (e.g., Anguelovski et al., 2020; Mikulewicz et al., 2023; Perkins, 2018) across three areas: first, to adopt an intersectional lens in urban adaptation; second, to address the fragmented and normatively scattered nature of current adaptation strategies; and, third, to connect planning theory with justice-driven action on the ground. First, the findings are used to develop a conceptual framework to guide the pivot in climate action to intersectionality and position Barcelona's tactics vis-à-vis distinct (though concomitant) waves of climate urbanism. Going beyond rhetoric and theory, the study reveals practical tactics implemented to operationalize intersectional thinking in city planning. These tactics can be adapted to other urban contexts to inform fairer adaptation strategies elsewhere. Second, using Barcelona as an illustrative case study, the research provides conceptual insights and practical approaches to implement intersectional climate justice principles through planning. These contributions can guide scholars, practitioners, and policymakers in addressing social and environmental injustices in urban contexts in a more integrated manner. Third, the study provides insights into the lived experiences and intersecting needs of marginalized urban residents, contributing to growing empirical scholarship on intersectionality and climate vulnerability. By incorporating residents' preferences and utilizing a citizen science approach, the study contributes to ongoing discussions on inclusive green infrastructure planning, community consent, and the recognition of diverse forms of knowledge and identities in urban transformation. In agreement with other studies, this research underscores the significance of grassroots and place-based approaches to address intersecting environmental and social needs (Oteros-Rozas et al., 2015b; Qi et al., 2020; Zuniga-Teran et al., 2021). The work thus advocates for a shift towards community-oriented, culturally sensitive, climate-resilient infrastructures that recognize and respond to intersecting vulnerabilities through regenerative and collaborative practices that engage with marginalized peoples and spaces (Steele, 2023). In turn, this shift allows for imagining alternative possibilities within local urban environments that enhance (more-than) human wellbeing and prioritize caring for one another and our life-sustaining systems (Yates et al., 2022).

This finding brings up what has been, much to my surprise, the underlying theme of my research and many of its findings: *care*. From the need to "take ethics and politics of care seriously" in Chapter 2 to it emerging as a fundamental governing tactic for intersectional climate justice in Chapter 3, to taking care of vulnerable residents by ensuring access to thermal

comfort… care has consistently surfaced as a unifying motif and guiding tenet throughout my investigation.

2.1. Care as a foundational theme and guiding principle

Feminist perspectives have long emphasized the crucial role of care as labor that sustains human life, emphasizing how it extends beyond reproductive capacities and encompasses all actions taken to maintain, continue, and repair our world to enhance our collective wellbeing (Fisher and Tronto, 1990). In the face of impending climate chaos, the urgency of care has become increasingly apparent (Kern, 2020). Vulnerable communities on the frontlines of climate change are demanding socioecological transformations that guarantee their right to live, to stay in place, and to have a future. Recognizing and responding to these calls is a form of care – an ethical and political commitment to climate justice for those most at risk (Levenda et al., 2023).

Thus, an important conclusion of my work is that in order to ensure social justice in responding to climate change, climate interventions must be care-sensitive and care-centered. Cultivating a care-sensitive approach to climate action involves conducting a comprehensive analysis of how climate change impacts the demand for and distribution of care work (and self-care) as well as the working conditions associated with it. It also entails recognizing the essential role of care work in urban society and economy, and including the perspectives, experiences, and expertise of carers in planning processes, and how unequal urban development undermines and undervalues care (Binet et al., 2022; MacGregor et al., 2022). Of course, the mere increase in participation in governance spaces is insufficient for achieving transformative change unless it is accompanied by structural adjustments that facilitate and support it.

Feminist climate experts have long established that climate initiatives can place additional demands on women's time without alleviating their care responsibilities, thus neglecting or worsening existing disparities and burdens of care work (e.g., see MacGregor et al., 2022; Tovar-Restrepo, 2017). Thus, beyond acknowledging disparities and including carers in decision-making spaces, climate interventions should actively work to alleviate the unequal burdens of care and promote more equitable distribution of caregiving responsibilities. An approach proposed by feminist climate scholars to integrate climate interventions and strategies for transforming the multifaceted dimensions of care inequalities is to leverage insights from

the "5R framework": recognizing, reducing, redistributing, representing, and rewarding care work (MacGregor et al., 2022).

Barcelona is taking some steps in that direction by, for instance identifying, connecting, and supporting carers through the Carer Card, making care-related centers, services, and resources available across the city, conceiving Superblocks as space of care and self-care, and providing childcare services during participatory processes. By acknowledging and appreciating the value of care work, an alternative narrative is presented that challenges the prevailing assumptions that perpetuate the feminization and invisibility of care and presents it as a collective necessity that underpins economies and human survival and must thus be equitably shared within households and society at large (MacGregor et al., 2022). Although Barcelona's efforts to integrate care into city planning are not fully integrated into climate mitigation and adaptation strategies, they represent encouraging efforts to value care and address underlying causes of inequality.

3. Limitations

First, this study was confined to a densely populated European city with a history of progressive climate policy, which may have contributed to funnel adaptation knowledge and awareness toward flagship cities and away from urban areas whose climate action and practice are much more invisible or undervalued. In fact, climate governance scholarship have predominantly revolved around climate-resilient practices of affluent, globally interconnected cities recognized as innovation leaders (which is the case of Barcelona), which can inadvertently perpetuate epistemic colonial legacies and overlook the experiences of cities considered ordinary or less prominent (Castán Broto, 2019).

Second, it is important to acknowledge that the statistical generalizability of this study's findings is limited due to its focus on a single city and the use of qualitative methods. Although efforts were made to extract principles, tactics and lessons that can potentially inform other cities and help scholars theorize about processes, incentives, opportunities, and constraints related to intersectionality in climate practice, I recognize that the applicability of these lessons may not be universal.

Third, measuring the effects of intersecting identities and social positions is difficult to operationalize in research and practice. Apart from a general lack of widely accepted methodologies for analyzing intersectionality and determining which social and political

"identities" to consider, the act of categorizing identities itself carries the inherent risk of essentializing individual's experiences or invisibilizing certain groups and characteristics once again. My approach hence aimed to center on individual, lived experiences as a means to comprehend patterns, which were subsequently connected to broader systemic and structural forms of oppression. However, I acknowledge that the manifestations of oppression and privilege are intricate, making it challenging to transition from localized outcomes to broader societal issues and to subsequently formulate strategies and approaches for social change.

Fourth, although I directly interacted with community members (through interviews, surveys, focus group, and informal conversations), my approach did not sufficiently involve grassroots organizing or co-production of more subversive visions of urban climate justice. Consequently, my analysis fell short in encompassing more radical research methodologies that collaborate with climate-vulnerable communities, rather than merely conducting research with/about them. That said, I consider the community studied not as mere subjects of domination but active agents and 'quiet activists' in climate change (Steele, 2022; Steele et al., 2021), who are capable of resisting subjugation and envisioning more radical futures from below. Thus, I emphasize the need for future research to engage with local communities to imagine alternative pathways for conceiving and establishing more equitable climate action from the grassroots level, as shown, for instance, by Apostolopoulou & Kotsila (2021). Part of my research (Chapter 3, in particular) relied on citizen science and participatory research principles, in an attempt to bring in the voices and needs of residents considered vulnerable and marginalized in formulating needs assessment survey questions, for example. That said, I also acknowledge that the COVID-19 pandemic significantly hindered my ability to carry in-depth and prolonged community-led research, as it did more broadly in relation to my project, (re)shaping and constraining much of my research plan and forcing me to reorient case sites and research approaches.

Fifth, while I attempted to embrace practices of representational justice that amplify the epistemologies of individuals on the frontlines of climate change, it is important for me to acknowledge and reckon with my own positionality, which includes recognizing the intricate and intersecting privileges and limitations I hold (as a white researcher from a middle-income country studying a low-income neighborhood in a high-income country, for instance). This included reflecting upon important questions such as my right to represent the lived experiences of these individuals and the decision-making process involved in selecting which stories to

recount and which ones to omit. By engaging in this introspective exercise, I was able to better understand the risks associated with potentially misrepresenting the experiences of those I attempt to represent. Although my external positionality inevitably restricts candid representation, I made a concerted effort to understand, value, and elevate the perspectives, principles, and worldviews of those who generously shared them with me. Rather than avoiding action out of fear of imperfect representation, I aimed to amplify the voices of a community particularly affected by climate change, approaching the visibility of marginalized epistemologies with a firm commitment to representational justice.

Finally, I recognize the privilege of speaking about climate change with relative scholarly authority while being insulated from the severe impacts of the climate crisis. Despite that, I made efforts to utilize my privilege to challenge the oppressive institutions that contribute to climate change and amplify the voices that struggle with it. I aimed to do that by incorporating theories from diverse perspectives (e.g., Black and Brown female scholars), critically evaluating prominent climate governance institutions, and fostering a deeper engagement with the experiences and expertise of marginalized and oppressed individuals and communities at the forefront of climate change.

4. Future research

Barcelona served as a laboratory to establish the components of intersectional climate justice, providing a foundation for future research to test and apply it in other locations, including cities with diverse political and economic landscapes. Hence, future research could explore intersectional climate justice action in governance contexts that are divergent from Barcelona's. Furthermore, a promising avenue for future research lies in connecting the experience from Barcelona to ongoing efforts at the Spanish state and/or European Union levels, including existing European Green New Deal initiatives. Moreover, future research could examine the potential impact of the Barcelona experience on cities around the world that are similarly engaged in equity and justice-oriented endeavors. This "upscaling" would enable comparative learning, monitoring, and evaluation for fostering more equitable urban climate futures. This, in turn, raises the need to develop metrics and benchmarks to monitor and evaluate intersectional climate justice.

Future research could also employ innovative intersectional methods to amplify the voices of marginalized groups, including carers, and document their valuable knowledge and expertise

in the pursuit of more equitable climate solutions. Moreover, there is a need to explore the role of social movements and grassroots organizations in contesting dominant narratives of climate justice in the city. Furthermore, future research could focus on the specific needs and experiences of less-studied marginalized communities, such as LGBTQI+, going beyond deeply ingrained assumptions that have led to the neglect of their experiences in climate policies and practices. Lastly, future research could delve into the ways in which climate-related impacts such as heat, flooding, and extreme weather events, manifest differently within intersectional lenses, considering identified intersecting vulnerabilities of various social groups.

5. Policy and planning recommendations

These recommendations aim to address climate change and social inequalities in a more integrated manner at the city scale and empower marginalized and frontline communities. Overall, it is essential to steer clear of simplistic, one-dimensional approaches to climate planning, and recognize that the goal extends beyond focusing solely on climate itself, but on climate and all its proximate dimensions.

1. Adopt an intersectional lens: Incorporate intersectionality theory into urban climate politics to address historical and ongoing inequalities. Consider how social identities and positions, such as race, gender, class, and immigrant status, intersect with climate change vulnerabilities.
2. Adopt place-based approaches: Prioritize place-based approaches to urban adaptation that take into account the specific characteristics and needs of local communities. Engage with grassroots organizations and community-led initiatives to promote social cohesion and wellbeing. Support community-driven resilience initiatives that address multiple intersecting forms of discrimination.
3. Empower local communities: Prioritize the voices and knowledge of local communities in decision-making processes related to climate change. Ensure that historically marginalized communities have the opportunity to participate and influence policies and plans.
4. Improve participation and recognize diverse knowledge: Foster inclusive participation in decision-making processes by actively seeking diverse perspectives and experiences.

Recognize and value different forms of knowledge, including local knowledge and citizen science, in shaping climate policies and plans.

5. Promote accessible and inclusive climate interventions: Foster climate-resilient infrastructures that are community-oriented and culturally sensitive. Engage with local communities in the planning and development of climate solutions. Emphasize the importance of caring for both human and more-than-human wellbeing.
6. Enhance access to green and climate-resilient amenities: Invest in the development and maintenance of green infrastructure that provides multiple benefits, including climate adaptation, recreational opportunities, and spaces for caring activities. Ensure that these amenities are accessible to all residents, regardless of their social identities or positions, and do not generate exclusionary processes that contribute to gentrification.
7. Provide fair and secure housing: Develop policies that ensure equitable access to housing, particularly for marginalized communities. Consider the impact of climate change on housing vulnerabilities and implement measures to make housing more climate-resilient.
8. Democratize care work: Recognize and value care work as essential labor and promote policies that address the unequal distribution of care responsibilities. Support initiatives that provide support and resources for caregivers, including affordable childcare and eldercare options.
9. Prioritize care as a guiding principle: Incorporate care as a fundamental governing tactic in climate action. Consider the ethical and political dimensions of care in policies and plans, ensuring that carers have access to necessary resources and support.
10. Challenge existing norms and institutions: Encourage disruptive tactics that challenge business-as-usual structures and conventional climate governance approaches. Foster transnational connections and leverage international research networks to advance innovation and learning.

6. Final thoughts

At the onset of my PhD journey, I set out a few motivating questions I wanted to answer: Can climate policy, planning, and action align with communities' needs and demands, particularly frontline communities? Can cities respond to the urgent needs of marginalized communities while sustaining our physical environment? Can city planning be used to reestablish relationships with each other and the environment? Through my work, I have managed to answer a cautiously optimistic 'yes' to these questions, arguing that a simultaneous consideration of climate change *and* social justice is possible through 'intersectional climate justice'. I hope that the chapters in this dissertation presented valuable insights and actionable approaches that can lead us towards the realization of intersectional climate justice.

This dissertation represents a brief and neat summary of the work done and undoubtedly simplifies the messy, dynamic, and emotional process this PhD journey entailed. It included, among other things, navigating a pandemic that shut down the world 6 months into my PhD, as well as constant changing, moving, adapting, rerouting, rushing, waiting, learning, accepting, writing, rewriting, viewing, reviewing, and re-reviewing. Despite that, I hope that the work (re)presents a step towards a more equitable (urban) future. Each of us – as academics, practitioners, and activists – have a role to play in promoting this more equitable urban future. Each of us can (and should) be a quiet (or loud) activist and contribute to shaping a future that acknowledges and strives to rectify the damage inflicted by long-standing histories of underdevelopment, poverty, and social exclusion. As Charlene Carruthers (2018, p.28) noted in her book, Unapologetic: A Black, Queer, and Feminist Mandate for Radical Movements: "We are practicing and theorizing as we go. We are seeking to eradicate oppressive systems in the world. And all our effort is worth it."

It really is.

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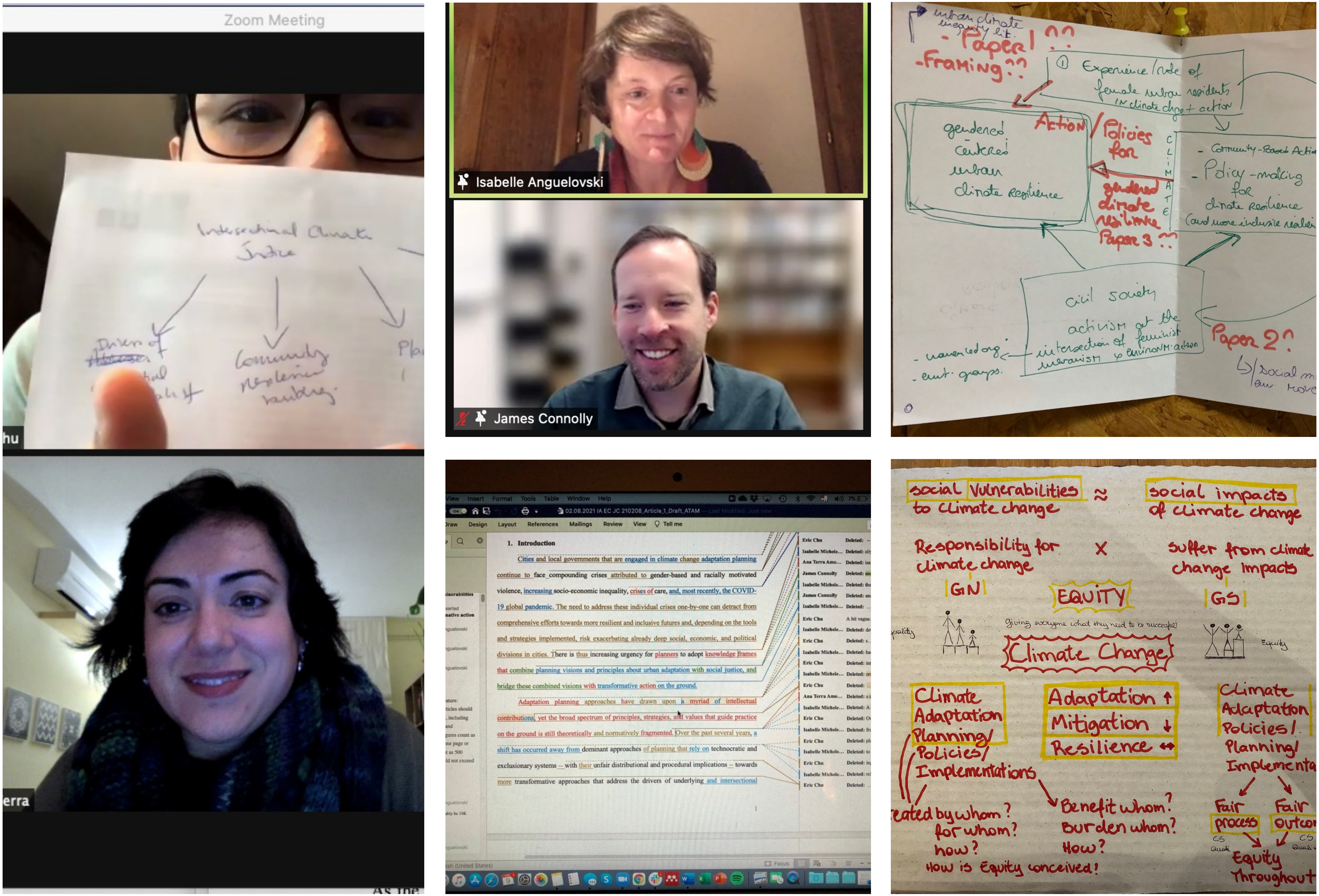
Everyday Ph.D.'ing

(Clockwise)

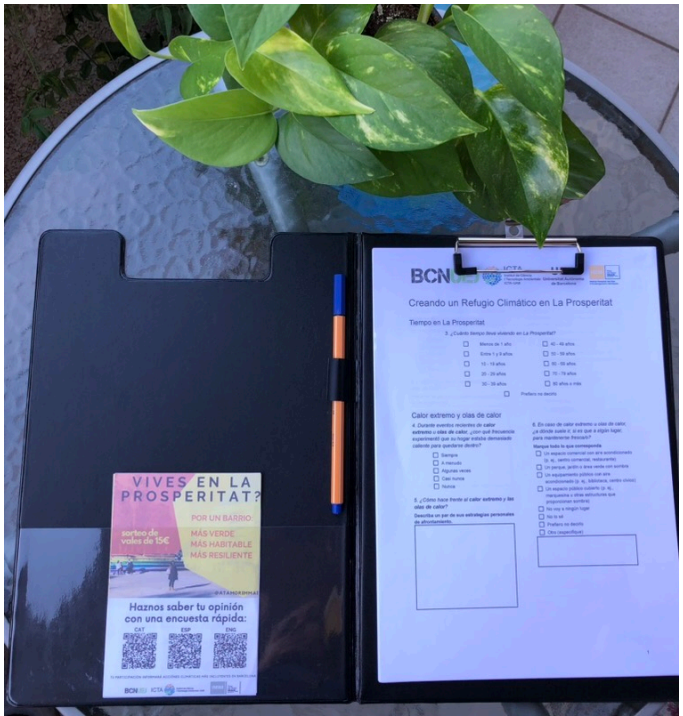
1. Workplaces and spaces
   1.1. Plaza Ángel Pestaña, La Prosperitat
   1.2. ICTA-UAB
   1.3. BCNUEJ office at PRBB (inside)
   1.4. Home office
   1.5. BCNUEJ office at PRBB (outside)
2. Working with amazing supervisors
   2.1. Organizing thoughts on Zoom with Eric
   2.2. Zooming with Isabelle and James
   2.3. Organizing thoughts on paper with Isabelle
   2.4. Organizing thoughts on a cardboard (me)
   2.5. "Here are some (600) edits"
3. Fieldwork
   3.1. Event in La Prosperitat to gather survey responses
   3.2. Archival analysis at the Historical Archive of Roquetes Nou-Barris
   3.3. Poster with QR codes pointing to the survey on a utility pole
   3.4. Focus group at the Youth Center (Casal de Joves) in La Prosperitat
   3.5. Fieldwork notes
   3.6. Printed surveys to apply at the retirement home and printed flyers
4. Dissemination activities
   4.1. Being interviewed live on a Catalan TV channel about COP26
   4.2. Presenting my research at the C40 Inclusive Climate Action Academy to representatives from seven cities
   4.3. Presenting my research at the Christchurch Central Library to members of the City Council and academia
   4.4. (Briefly) presenting my results to members of the Barcelona City Council
   4.5. Coordinating a workshop at CUIMPB about the climate emergency
   4.6. Presenting my research at the RC21 conference (Harokopio University, Athens)
5. Amazing people I met along the way
   5.1. Arnaldo, president of the Historical Archive of Roquetes Nou-Barris giving me a "lecture" about the history of La Prosperitat
   5.2. Maruja, the most amazing woman I've met (Chapter 1, p. 19)
   5.3. In Christchurch with Bronwyn Hayward and her team during my research stay at the University of Canterbury
   5.4. M Dolors, Barcelona Cuida and Carer Card program coordinator with a Carer Card
   5.5. Being a fan girl (with Vanesa Castán Broto and Gina Ziervogel) at a workshop on "Equitable Urban Climate Adaptation" in Cape Town
6. My team: colleagues, friends, family
   6.1. Visiting my parents in Brazil
   6.2. Picnic at the Barceloneta park
   6.3. Greg and I in our new home, Bilbao
   6.4. Office work (at ICTA) in times of Covid
   6.5. Picnic at a Superblock in Barcelona
   6.6. With my dears, Amalia and Fulvia, seeking refuge from the heat by sitting on the floor at our office at ICTA

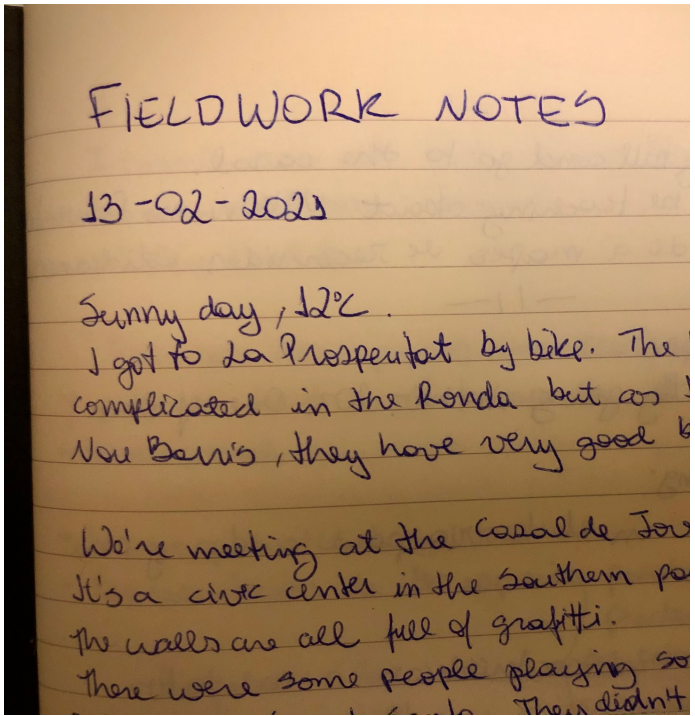

Zoom Meeting
Isabelle Anguelovski
James Connolly
Intersectional Climate Justice
Paper 1 ??
-Framing ??
① Experience/role of female urban residents in climate chge + action
gendered centred urban climate resilience
Action/Policies for
gendered climate resilience
Paper 3 ??
- Community-Based Action
- Policy-making for climate resilience
civil society activism at the intersection of feminist urbanism & environm. action
Paper 2 ?
1. Introduction
social vulnerabilities to climate change ≈ social impacts of climate change
Responsibility for climate change × suffer from climate change impacts
GN
EQUITY
GS
Giving everyone what they need to be successful
Climate Change
Climate Adaptation Planning/ Policies/ Implementations
Adaptation ↑
Mitigation ↓
Resilience ↔
Climate Adaptation Policies/ Planning/
Benefit whom? Burden whom? How?
for whom? how?
How is Equity conceived?
Fair process
Equity Throughout


1 CAFÉ POR 1 ENCUESTA


L'Institut Sant Andreu Valldaura: Els fruits d'una llarga lluita
Roser Solà i Montserrat
JOAN FONT
LA VAGA DE L'HARRY WALKER DE BARCELONA
(DESEMBRE 1970 - FEBRER 1971)
EDICIONS CATALANES DE PARIS
Harry Walker: lluita obrera, victòria veïnal
TOTS ELS BARRIS DE BARCELONA
J. FABRE - J. M. HUERTAS CLAVERIA
EDICIONS 62
LA VERNEDA I LA PAU
ELS BARRIS DEL BESÒS
ELS TRES "LUMPEN" BARRIS
ELS NOU BARRIS
EL DISTRICTE V


A LA PROSPERITAT
PER UN BARRI
MÉS VERD
MÉS HABITABLE
MÉS RESILIENT
sorteig de vals de 15€
Fes-nos saber la teva opinió amb una enquesta ràpida:
CAT
ESP
ENG
LA TEVA PARTICIPACIÓ INFORMARÀ ACCIONS CLIMÀTIQUES MÉS INCLUSIVES
BCNUAB
ICTA


BCN
Creando un Refugio Climático en La Prosperitat
Tiempo en La Prosperitat
Calor extremo y olas de calor
VIVES EN LA PROSPERITAT?
POR UN BARRIO
MÁS VERDE
MÁS HABITABLE
MÁS RESILIENTE
sorteo de vales de 15€
Haznos saber tu opinión con una encuesta rápida:
CAT
ESP
ENG


FIELDWORK NOTES
13-02-2021
Sunny day, 12°C.
I got to La Prosperitat by bike. The
complicated in the Ronda but as
Nou Barris, they have very good
We're meeting at the Casal de Jov
It's a civic center in the southern pa
the walls are all full of graffiti.
There were some people playing so


HEINEKEN


Ana Terra Amorim-Maia
investigadora doctorat UAB


3. Take politics of care seriously
Intersectionality builds on an ethics of care, breaking away from historic care hierarchies and inequalities
Proposal: recognize socially and economically care, domestic, and reproductive work, which is gendered and racialized. Rethink urbanism from a care perspective, putting daily life at the center.
Policy recommendations: set measures, systems, and services that ensure the right to care and be cared for under fair conditions.
Barcelona: Democratization of Care & Caring City
68 initiatives towards the co-responsibility of all social actors in guaranteeing the right to dignified and quality care.
Aim: to turn Barcelona into a pioneering Caring City, recognizing care as a central part of the city's socioeconomic life.
Time Agreement and Economics of Care: initiatives for better organizing time use to reduce social inequalities and foster a plural economy at the service of people.
Mesura de Govern per una Democratització de la Cura
Ciutat Cuidadora
BCNUEJ
Ajuntament de Barcelona
C40 CITIES

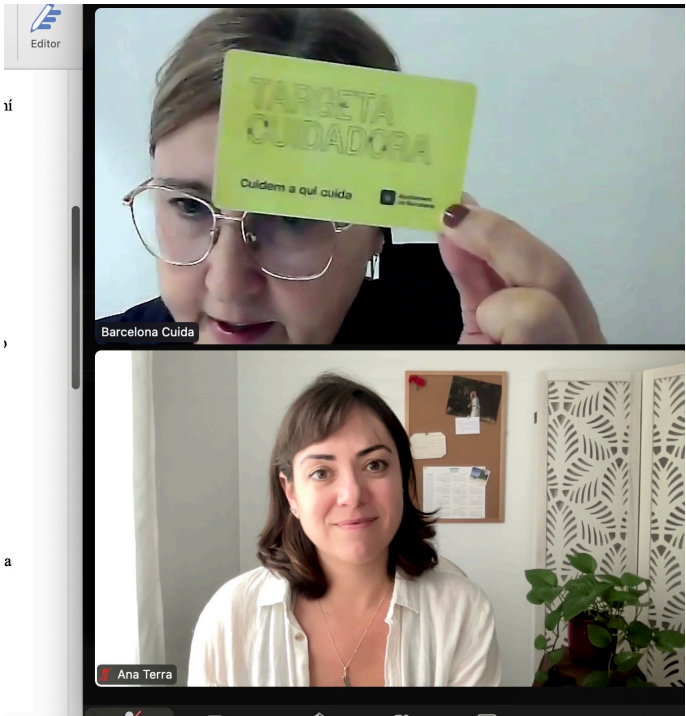

REFUGIS CLIMÀTICS
UTILITZA AQUEST ESPAI PER PROTEGIR-TE DE LA CALOR I DEL FRED
"HOW CAN WE LIVE WELL WITH LESS CARBON?"


ΧΑΡΟΚΟΠΕΙΟΝ


Interseccionalidad
Lente para comprender cómo las características sociales se cruzan para impulsar y exacerbar la desigualdad, la vulnerabilidad y la injusticia.
Madre soltera con renta baja que no habla bien inglés
Hombre de una minoría étnica que vive en un hogar hacinado
Niño con una condición de salud cuyos padres están desempleados
Mujer racializada de 75 años con discapacidad
¿Cómo podemos asegurarnos de que sean vistos, escuchados, re
UIMP Barcelona Centre Ernest Lluch


CAFE 101


ANA


Editor
TARGETA CUIDADORA
Cuidem a qui cuida
Barcelona Cuida
Ana Terra