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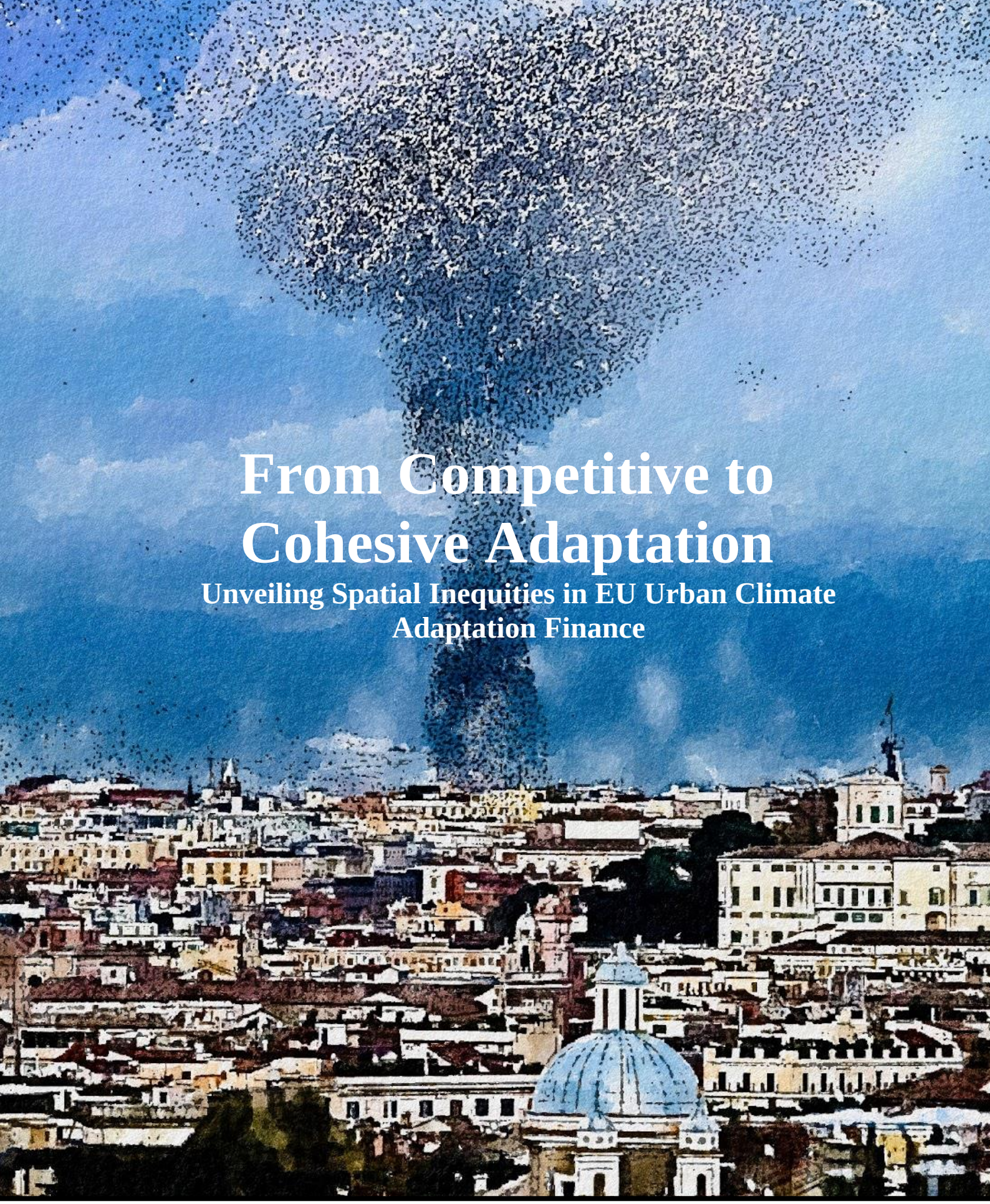
From Competitive to Cohesive Adaptation
Unveiling Spatial Inequities in EU Urban Climate Adaptation Finance

Kayin Venner



From Competitive to Cohesive Adaptation

Unveiling Spatial Inequities in EU Urban Climate Adaptation Finance

Kayin Venner - Ph.D. Dissertation
September 2024

Ph.D. in Environmental Science and Technology
Institut de Ciència i Tecnologia Ambientals (ICTA),
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Supervisors: Dr. Marta Olazabal & Dr. Melissa García-Lamarca
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Cover design: Starling murmuration over Rome, Italy. Image sourced from royalty-free Pickpik and transformed into a watercolour using QniPaint. Just as starlings coordinate to avoid predators, this dissertation will argue that addressing climate breakdown demands a shift from unilateral efforts to unified action; from a competitive to a spatially cohesive approach to funding and financing.

Note: British English is used in this work.

To those who came before me, and to those who will come after.

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Acknowledgements

Since I began writing my thesis, the world has witnessed an alarming surge in unprecedented climate events. On July 21, 2024, the highest global average temperature on record was recorded following 13 consecutive months of record-breaking monthly temperatures between May 2023 and June 2024. Equally concerning, from March 2023 to June 2024, global sea surface temperatures (SST) hit new monthly highs every single month. [1] These trends underscore the urgent need for investments in climate adaptation measures. This dissertation was written amidst the climate breakdown and the socio-economic challenges it is accompanied by. Yet, unlike much of the global population, it was written from a position of relative privilege, somewhat insulated from the immediate effects of this crisis. This disparity underscores a deeper, pressing issue: the unequal impacts of climate change. Confronting these inequities is central to my exploration of climate adaptation funding and financing.

My doctoral journey was shared with others, to whom I owe immense gratitude. I extend my deepest thanks to my supervisors, Marta Olazabal and Melissa Garcia Lamarca, who masterfully navigated both my insecurities and strengths, providing the confidence and space I needed to push my limits. I thank my tutor, Isabelle Anguelovski, and all my colleagues at BCNUEJ and BC3 for their kindness and support, particularly Helen Cole for her assistance with the statistical analysis, as well as the La Caixa Foundation for their generous fellowship (LCF/BQ/DR21/11880005). I owe deep gratitude to my parents and sister, who have patiently endured my often-pessimistic conversations about climate change—infamously known in my family as the "achterbankgesprekken." From a very young age (much to my parents' dismay), I vented my frustrations about the lack of prioritization of this critical issue, and they have been a constant source of love and support throughout. I want to thank Miriam and Bas, my incredible "loan parents", for their inspirational guidance that led me to this PhD. I thank Atti and Jacob, my dearest friends, whose kindness and support have been invaluable.

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[1] Copernicus. (2024, August 8). *Globally second-hottest month on record, only slightly behind July 2023*. https://climate.copernicus.eu/copernicus-globally-second-hottest-month-record-only-slightly-behind-july-2023#:~:text=July%202024%20was%20both%20the,high%20set%20in%20July%202023.

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My dissertation has endowed me with new skills, a valuable network, and moments of both tears and laughter. But perhaps most importantly, it brought me to Lisbon, where I met the kindest and most caring partner. Andre, while this journey may lead to a doctorate, the true highlight has been getting to know you—thank you for everything. If there is a force capable of steering us through the climate crises, it may not reside solely in the accumulation of knowledge or data, but in the values of empathy, love, care, and trust—principles often regarded as peripheral to scientific inquiry. Yet, their impact is unmistakably woven into the fabric of our shared human experience and essential to navigating the complexities of our world.

Summary

My dissertation examines spatial inequities in climate adaptation finance by analysing the socio-political factors affecting the accessibility and allocation of funding and finance. I deploy mixed-methods research, including a survey conducted with 148 municipalities across 17 European countries and qualitative research in the Lisbon Metropolitan Area, to unpack these relationships. Building on climate urbanism research, with a particular focus on critical geography and political ecology perspectives, I make four main contributions. First, I advocate for a shift in financing towards equity, emphasising the needs of marginalized communities through reparative approaches, the democratization of climate finance, and anti-displacement policies. Second, by contextualising intra-urban inequities within broader multi-scalar inequities in climate adaptation finance, I argue that climate finance operates within a dynamic arena as a political-ecological process, generating ripples that frequently fail to benefit vulnerable groups across scales. Third, I show how funding barriers in the EU disproportionately affect smaller municipalities and how climate risk levels do not correlate with funding accessibility or availability, proposing a nuanced understanding of financialization's role in climate urbanism based on the European experience to date. Fourth and finally, through a grounded case study of the Lisbon Metropolitan Area, I uncover how access to EU funding programmes depends on factors such as administrative capacities, track records, networks, and the commitment of municipal leaders and technical staff, rather than climate vulnerability or risk indicators, further shedding light on the unequal geographies of climate adaptation. I conclude the dissertation by critiquing the current competitive model for municipal climate adaptation funding and finance and proposing an alternative model centred around the concept of cohesive adaptation.

Published and Forthcoming Articles

García-Lamarca, M., Anguelovski, I., & **Venner, K.** (2022). Challenging the financial capture of urban greening. *Nature communications*, *13*(1), 7132. https://doi.org/10.1038/s41467-022-34942-x

Venner, K., García-Lamarca, M., & Olazabal, M. (2024). The multi-scalar inequities of climate adaptation finance: A critical review. *Current Climate Change Reports*, 1-14. https://doi.org/10.1007/s40641-024-00195-7

Venner, K., Olazabal, M., García-Lamarca, M., Treville, A., Arbau, L. C., & Bertoldi, P. (under review). Winners and losers in European urban climate change adaptation funding and finance. *Nature Communications*

Venner, K., García-Lamarca, M., & Olazabal, M. (under review). Optimising EU funding programmes for equitable urban climate adaptation: a view from below. *City Climate Policy and Economy*

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Glossary

CF:	Cohesion Fund
CoM:	Covenant of Mayors
EIB:	European Investment Bank
ERDF:	European Regional Development Fund
ESF+:	European Social Fund Plus
ESIF:	European Structural and Investment Funds
EU:	European Union
GDP:	Gross Domestic Product
Horizon:	The EU Research and Innovation Programme
IPCC:	Intergovernmental Panel on Climate Change
JASPERS:	Joint Assistance to Support Projects in European Regions
JRC:	Joint Research Centre
JTF:	Just Transition Fund
LIFE:	The EU Programme for the Environment and Climate Action
POSEUR:	Operational Programme for Sustainability and Efficient Use of Resources
RRF:	Recovery and Resilience Facility
SEIP:	Sustainable Energy Investment Programme
UNEP:	United Nations Environment Program

Chapter 1. Spatial Inequities in Competitive Adaptation: Setting the Stage

1.1. Introduction

As extreme weather events become increasingly frequent due to the climate crisis (*IPCC*, 2023), urban administrations worldwide are intensifying their efforts to invest in climate adaptation plans. However, the opportunities of accessing and allocating climate adaptation finance to implement these plans varies significantly among municipalities, reflecting diverse local realities and legal/political frameworks (Vandecasteele et al., 2024). While much research has addressed the so-called "adaptation finance gap"—the discrepancy between the projected costs to meet climate adaptation targets and the available financing for adaptation efforts (UNEP, 2023)—such studies have predominantly discussed (distributive) justice between developed and developing countries (Malik & Ford, 2024). Yet, finance gaps exist not just between developing and developed countries but also within the Minority World, such as in the EU, where certain vulnerable groups and municipalities are failing to benefit equitably from available funds and financial products (Vandecasteele et al., 2024).

To address these disparities and ensure that investments reach the areas of greatest need, it is essential to examine the deeper processes influencing the accessibility and allocation of climate adaptation finance. In this context, this dissertation seeks to explore the following research question: *How do socio-political and financial processes affect urban climate adaptation funding and finance and what are the implications for spatial inequities?* In this dissertation, I primarily focus on these issues within the EU, a region that remains under-researched in the climate finance allocation literature, despite the recent development of substantial investment opportunities for (urban) climate change adaptation under the *European Green Deal* and the post-pandemic *Recovery Plan for Europe*.

This first chapter provides a theoretical and conceptual framework to situate the research question within the literature and core concepts I deploy, drawing primarily from climate urbanism, political ecology and (critical) human geography literatures. Additionally, I incorporate insights from public administration to draw parallels with neoliberal processes beyond the urban level, and to European Union Studies to elaborate on the EU policy context. To this end, this introductory chapter is structured into four sections. In the first section (1.2), I position climate adaptation finance within the literature on climate urbanism and critical geography, highlighting key concepts such as financialization and competitive adaptation, as well as advocating for a broader definition of "finance." The second section (1.3) defines spatial equity by exploring the spatial turn in urban studies and its connection to social and spatial justice. In the third section (1.4), I engage in the debate on funding and financing successful adaptation by exploring the concept of transformative adaptation

and identifying gaps in how spatial and scalar processes are integrated into transformative adaptation models. Finally, in section four (1.5), I focus on the EU context, discussing key policies related to climate adaptation and spatial planning and arguing that funding and financing mechanisms in EU adaptation planning lack a territorial cohesion perspective. In the final section, I return to the main research questions, provide an overview of the research gaps, objectives and hypothesis and overarching methodology of the thesis.

1.2. Situating Climate Adaptation Finance within Climate Urbanism and Critical Geography

Critical (human) geographers have argued climate adaptation planning is unfolding within a "climate urbanism" paradigm, which positions cities as central to tackling climate change. As a policy orientation, it merges sustainability with growth, emphasizes technological solutions, promotes global investment frameworks, and offers a political narrative that simplifies the related environmental and social complexities (Long & Rice, 2019). Although the underlying logic of global and EU climate policy discourse tends to depoliticize climate adaptation (Long, 2021; Remling, 2018), both adaptation planning and its financing are inherently political processes. Unlike climate mitigation measures that provide widespread, global benefits, adaptation measures primarily yield localized effects, resulting in unequal benefits (Dolšak & Prakash, 2018; Holland, 2017). It is within this context that researchers have highlighted the need to investigate the power dynamics and vested interests shaping urban climate actions (Bulkeley, 2021), while also considering the broader political-economic context in which they occur, including the financial processes accompanying them.

To understand the emergence of climate urbanism, it is essential to consider the historical context that led to its rise. Climate urbanism emerged against the backdrop of significant transformations in urban governance since World War II, starting with Keynesian or managerial urbanism, characterized by state-led planning, social welfare and strong public sector involvement (Pike et al., 2019). David Harvey demonstrated how, from the late 1970s to the early 1980s, urban governance shifted from welfare-oriented management to entrepreneurial urbanism, marked by the privatization of public services and increased competition among cities to attract business investment for urban development and economic growth (Harvey, 1989; Ward, 2003). The decline of Keynesian urbanism coincided with a retreat by governments from their responsibility to mitigate the negative social impacts of market economies characterized by uneven development (Gott, 2016).

Building on entrepreneurial urbanism, scholars have shown how urban governance has increasingly become financialized in recent years, with entrepreneurial strategies becoming more intertwined with financial instruments, debt, and speculative capital (Aalbers, 2020; Bracking & Leffel, 2021;

Christophers, 2015; Cousins & Hill, 2021; Taylor & Aalbers, 2022). Scholars such as Peck and Whiteside (2016) argue that this entrepreneurial urbanism has evolved into new regimes of “austerity” and "financialized urbanism," where financial actors and imperatives, particularly those rooted in debt logics, now dominate urban development (Peck & Whiteside, 2016; Wu, 2023). These forms of governance are furthermore characterized by cities' increasing reliance on competitive funding mechanisms, or "tournament financing" as Peck (2012) calls it, where a lack of structural government support forces cities to pursue bid-driven, project-based financing.

The focus on neoliberal development in urban governance aligns with public administration literature, which depicts New Public Management (NPM) reforms since the 1980s—emphasising competition, decentralization, market-based approaches, cost-effectiveness, and efficiency—as having profoundly shaped public policy and governance (Funck & Karlsson, 2020). Recent insights in public administration argue that New Public Management has since evolved into New Public Governance (NPG). The latter emphasizes collaboration, participation, and public value creation alongside efficiency, with its value base being described as “neo-corporatist” (Dickinson, 2016). Despite the rise of the multi-actor New Public Governance model, some argue that the older New Public Management continues to set the prevailing norm in public administration and is deeply ingrained in prevailing ideas about how to manage public administration (Funck & Karlsson, 2020).

Rather than experiencing full "shifts" in governance, scholars argue that urban governance is better understood as a hybrid of overlapping approaches, with new paradigms building on existing ones (Pike et al., 2019). Peck (2014) reinforces this view, suggesting that recent developments like financial and austerity urbanism are not entirely new, but rather variations of entrepreneurial urbanism that operate within a broader neoliberal spectrum. It is within this context that climate urbanism has been criticized for effectively representing "business-as-usual capitalism with climate characteristics" (Shi, 2020, p. 59) and for adhering to a “technocratic, neoliberal approach to development” (Long, Rice & Levenda, 2020, p. 44).

It is precisely this technocratic approach to (urban) governance that drives the depoliticization of adaptation (Eriksen et al., 2015). Relatedly, the idea that green and adaptive solutions are universally beneficial has only recently begun to face detailed scrutiny (Anguelovski et al., 2016; Fainstein, 2015). Over the last years, and in contrast to the depoliticization and the oversimplification of socio-political complexities within climate urbanism, researchers have increasingly started to problematize how urban climate adaptation investments produce selective spatial benefits and socio-spatial exclusion (Anguelovski et al., 2022; Keenan et al., 2018; Oscilowicz et al., 2020; Rice et al., 2020; Robin et al., 2020; Shokry et al., 2022). This body of work shows climate adaptation investments frequently prioritize affluent residents over vulnerable populations or displace marginalized

communities through gentrification, resulting in inequitable outcomes and uneven climate protection within cities (Anguelovski et al., 2016; Anguelovski et al., 2022).

Finance is a crucial component of these processes and is playing an increasingly significant role in global and regional climate governance (Long, 2021); however, the effects of financial processes on equity across different spatial levels are just starting to be explored. Research has shown that such socio-spatial exclusion of adaptation investments intersects with race, gender, and other axes of inequality. For example, recent findings show how entrenched property and social hierarchies in the U.S. disproportionately shape access to climate finance, privileging certain groups—such as white property owners—while marginalising others, such as renters and informal land holders (Wagner et al., 2024). Likewise, others have shown how through a process of *bluelining* financial institutions deny or limit access to services for individuals/households or communities based on their geographic location and climate risks, disproportionately affecting low-income communities and communities of colour (Claussell, 2022; Keenan & Bradt, 2020; Montgomery & Palmeira, 2023). Indeed, climate finance is compounded by various systems of oppression and embedded within a framework of climate apartheid—a system marked by multi-scalar segregation that establishes a global divide between the climate-privileged and the climate-vulnerable, deeply embedded in the historical legacies of colonization and racial capitalism which deem certain populations as disposable (Rice et al., 2022).

Despite growing recognition of socio-spatial exclusion and the role of financial processes in its creation (García-Lamarca et al., 2022; Parish, 2023; Taylor & Aalbers, 2022), there is still a limited understanding of how to finance climate adaptation investments in a more equitable manner. Notable exceptions include the work of researchers at BCNUEJ and the Creative Initiative, which advocate for anti-displacement measures by regulating land use, development, and investment in urban green adaptive infrastructure (Klein et al., 2020; Oscilowicz et al., 2021). However, under the current technocratic and market-oriented approach to climate governance, equitable financial schemes have yet to be widely adopted in practice. More efforts are needed to raise awareness of the challenges in financing urban adaptation and to explore potential solutions, a topic I explore in greater detail in Chapter Two of this dissertation.

Apart from intra-urban inequities caused by spatial benefits and socio-spatial exclusion, mediated through financial processes such as increasing house prices following (green) climate adaptation projects, research has shown that the logic of climate urbanism and the emphasis on strategic urban areas can lead to the neglect of less strategic sites. These may include rural, semi-urban, and secondary cities, leading to inequalities between local administrations (Shi, 2020; Shi et al., 2021). In practice, it is argued that many aspects of entrepreneurial urbanism, including inter-urban

competition, remain dominant and have become the prevailing norm (Lauermann, 2018). McClure and Baker (2013) discuss competitive adaptation as a byproduct of neoliberal planning, which contributes to an uneven distribution of adaptation capacity across different regions. They argue that this competition, driven by factors such as the uneven spread of financial resources and technical expertise, can exacerbate geographic inequalities, particularly disadvantaging smaller or less equipped local authorities, and ultimately leading to increased socio-spatial disparities in adaptation efforts. Outside the field of climate adaptation, scholars indeed suggest investments tend to concentrate in major urban areas, often to the detriment of smaller cities (Medeiros & Rauhut, 2020). Kim (2020) highlights this competitive dynamic in a case study on urban regeneration in Greater Manchester, noting that local governments are motivated by self-interest and rivalry. This self-serving mentality is further emphasized by Hackworth (2019), who argues that "cities are increasingly on their own, as it were, to come up with revenue tools. They must compete with one another for capital rather than rationally plead their case with a central government" (p. 4).

Despite increasing inter-municipal competition following decades of neoliberal governance, little research explores sub-national inequities in climate finance allocation (Barrett, 2022; Incerti & Barnett, 2024). Aside from notable exceptions (Hilbrandt & Grafe, 2023; Keenan, 2019; Ponder, 2021; Shi et al., 2021; Shi & Varuzzo, 2020), inequities are usually addressed at the inter-state scale, and, as this introduction has shown, increasingly at the intra-urban scale. Inequities discussed at the inter-state scale mostly focus on multilateral climate finance between developing and developed countries (Ciplet et al., 2013; Garschagen & Doshi, 2022; Khan et al., 2020; Roberts et al., 2021). In contrast, a significant body of work examines the socio-economic effects of climate adaptation investments at the urban level, analysing who benefits and who does not (Anguelovski et al., 2022; Garcia-Lamarca et al., 2021; García-Lamarca & Ullström, 2022; Shokry et al., 2022). Additionally, there is research focused on specific components of the (global) financial system, such as financial products like property insurance (Collier & Cox, 2021; Taylor, 2020; Taylor & Weinkle, 2020), mortgage finance (Knuth et al., 2023), and especially (municipal) green bonds (Bigger & Millington, 2020; Cox, 2022; Ferrando et al., 2021; García-Lamarca & Ullström, 2022; Herrera, 2024; Jones et al., 2020). A significant gap in the literature on climate adaptation finance is the relative isolation of these distinct bodies of literature, and efforts to bring them together are necessary to uncover what I call multi-scalar inequities, a topic that will be examined in greater detail in Chapter Three.

Although I recognize that there is substantial theoretical depth and debate concerning scale and scalar processes (Barron et al., 2020; Kythreotis et al., 2023; MacKinnon, 2010), and that some literature on urban climate finance employs a multi-scalar approach in examining how specific global processes manifest in local contexts (Bigger & Webber, 2021; Christophers et al., 2020; Webber et al., 2022), my argument is that even when processes at other scales (e.g., global) are considered,

inequities in climate adaptation finance are usually assessed within a single governance scale (local, sub-national, inter-state). Aside from notable exceptions in the urban climate finance literature mentioned earlier, I argue that this omission, especially in the global climate adaptation allocation literature, restricts our understanding of how power dynamics and local and national politics influence who ultimately benefits from climate finance, undermining efforts to effectively tackle inequities in climate adaptation.

To address the multi-scalar inequities of climate adaptation finance, it is essential to conceptualize finance as an inherently spatial process and to move beyond traditional perspectives on finance that focus on "markets, prices and rates" (Wójcik et al., 2024, p. 2). Wójcik et al. (2024) demonstrate the male and US-centric bias in financial research, noting that of the 195 authors of the 100 most cited finance publications, 184 were male and 172 were based in the US. In their Finance & Space Manifesto, Wójcik et al. (2024) approach finance as a spatially and temporally articulated system of human-environment interactions, highlighting its role as both a mechanism of intense exploitation and a source of uneven development patterns. They critique the historical dominance of transnational institutions and major financial centres—such as New York, London, and Tokyo—which perpetuate values and norms that hinder justice and equity. Their approach advocates for a broader, interdisciplinary engagement with finance, incorporating insights from social sciences, humanities, and the arts to challenge, politicize, and potentially transform financial practices.

In this dissertation, I adopt a similar comprehensive perspective on finance to examine how the accessibility and allocation of climate adaptation finance impact different spatial scales—such as neighbourhoods, local authorities, and countries—in varied ways. For clarity and operationalization, albeit recognising Wókcik et al. (2024) approach, I define climate adaptation finance as financial resources accessed and allocated for implementing climate adaptation actions (Shishlov & Censkowsky, 2022; Watson et al., 2023). This encompasses both public and private finance, as well as various instruments, including, inter alia, grants, equity, debt, household savings, and insurance (IPCC, 2023). In Chapters IV and V, I make a clearer distinction between funding, which implies direct expenditure and non-repayment (e.g., grants, subsidies), and finance, which refers to the use of market-based instruments to draw in third-party resources, and typically requires repayment (e.g., loans) (IPCC, 2023).

Unlike the work of other adaptation finance scholars (Ayers, 2009; Doshi & Garschagen, 2020; Garschagen & Doshi, 2022), the focus in this dissertation is not on the United Nations Framework Convention on Climate Change (UNFCCC) or official development assistance (ODA). Although I draw certain parallels with UNFCCC climate finance in Chapter Three, I aim to primarily engage with local government-led adaptation funding/financing, specifically in the context of the European

Union, addressing its socio-political dimensions and exploring how it can be redirected to promote equity and justice in climate adaptation efforts. Looking in finance in this broad way and explicitly including small and medium-sized cities within the European Union—an area that has been underexplored in the context of climate adaptation finance—I aim to address the need for a deeper understanding of climate urbanism. As I will argue, this deeper understanding requires sensitivity to the spatial turn in urban studies and a differentiation between equity and justice. The next section of the theoretical framework will investigate these concepts in greater detail.

1.3. The Spatial Turn: Introducing Spatial Equity in the Shift from Social Justice to Spatial Justice

Throughout history, from the era of Homer and Confucius to Plato, Aristotle, and influential female thinkers such as Christine de Pizan and Sor Juana Inez de la Cruz, humanity has wrestled with the concept of justice (Forhan, 2017; Miller, 1991; Pirie, 1983; Sim, 2010). Work on justice extends beyond formal legal frameworks to include the informal underlying moral principles guiding economic, social, and political interactions (Pirie, 1983). Climate change, described by Gardiner (2011) as a 'perfect moral storm,' has sparked significant theoretical advancements in the field of justice. For instance, recent discussions on the Anthropocene—denoting the proposed geological epoch in which human activities have a significant impact on Earth climate systems—advocate for an expanded view of justice, integrating intergenerational justice, interspecies justice, and justice in adaptation into the evolving concept of 'planetary justice' to confront the unique challenges posed by earth system transformations (Biermann, 2022). There has also been increasing research on intersectional justice within adaptation and climate urbanism, which draws on feminist perspectives and acknowledges how multiple positionalities—such as migration status, gender, race, and age—affect privilege and socio-spatial exclusion in adaptation processes (Amorim-Maia et al., 2022; Amorim-Maia & Olazabal, 2024; McArdle, 2021; Osborne, 2015). Amid these important broader discussions, this dissertation will deploy the term spatial equity as a key aspect of justice in adaptation funding and financing, while also acknowledging the relevance of other forms of justice. Originating from ideas of social justice and David Harvey's theory of territorial social justice (Pirie, 1983), spatial justice has been a focus since the 1970s. However, it remains ambiguously defined, frequently debated, and often misunderstood in comparison to social justice (Madanipour et al., 2022)

Some scholars view spatial justice as a derivative of social justice (Marcuse, 2009; Moroni, 2020), whereas others argue that spatial justice holds equal importance alongside social justice (Soja, 2009, 2011; Soja et al., 2011). Soja (2009) underlines the "spatial turn" in urban studies and human geography, a theoretical shift that highlights the critical role of spatial dimensions in understanding justice and societal issues. This perspective asserts that spatial factors are crucial for grasping justice

and injustice across various levels, from urban settings to broader geographical scales. Building on Lefebvre and to a lesser extent Mandel, Soja (1980) elaborated on what he calls the socio-spatial dialectic, the theorization that the social shapes the spatial and the spatial shapes the social. Building on Soja's work, Israel and Frenkel (2018) define spatial justice as "institutions, policies, discourse, and practices involved in formulating the organization of space, thus shaping human interactions that define (un)just geographies" (p. 650). Essentially, they argue that spatial justice focuses on how justice is manifested in physical space, while social justice addresses justice among social groups, highlighting their interconnected yet distinct nature. Historically, spatial justice, intersecting with the right to the city, has primarily focused on urban dynamics (Madanipour et al., 2022), influenced by key theorists like David Harvey and Henri Lefebvre. However, recent EU reports on territorial cohesion reveal rising inter-urban and intra-regional disparities across Europe (Weck et al., 2022). Consequently, broadening the concept of spatial justice to address spatial inequities within countries and across the EU is a timely and necessary endeavour. This dissertation builds from the spatial turn in human geography and urban studies to argue that examining climate adaptation finance through a spatial lens is both relevant and essential.

Just as there are significant distinctions between social justice and spatial justice—historically, conceptually, and in terms of their emphasis—there are also important differences between justice and equity. Few studies clearly define and differentiate between justice and equity, prompting calls for specificity in how these terms are defined (Walker et al., 2024). Here, I follow the work of Chu and Cannon (2021), who define equity as the "equal and fair distribution of opportunities, resources, and environments free from climate hazards and risks regardless of individual/ group identities or background" (p. 87), while justice involves recognising the structural and intergenerational disadvantages faced by minority groups in cultural, political, and socioeconomic rights. Following this conceptualization, it can be argued that the concept of justice requires more radical scholarly approaches, such as ethnographic methodologies, to explore historical, procedural, and recognition-based inequalities, which typically involve direct engagement with marginalized communities (Kotsila et al. 2023)—an aspect not covered by my research. While I recognize the importance of such an approach and occasionally engage with (spatial) justice work in this dissertation, the unit of analysis of my study is local governments, primarily focusing on socio-political factors affecting municipal finance, local government decision-making, and the mechanisms for accessing and allocating climate adaptation funds. Consequently, equity emerges as a more suitable analytical framework for my work, complementing the broader and significant work on various forms of justice. This dissertation therefore adopts the term spatial inequity—a concept inspired by urban studies and critical (human) geography—to address a significant research gap in climate finance: the insufficient consideration of spatial dimensions in EU adaptation funding and financing. Building on the spatial

turn and the concept of equity in adaptation as defined by Chu and Cannon (2021, p.87), I define spatial equity in climate adaptation finance as:

> "Ensuring equal and fair opportunities across different geographies and governance scales (local, regional, national, supranational, etc.), regardless of individual or group identities or backgrounds, to access and benefit from public investments and financial products, thereby facilitating *successful* adaptation to climate change and creating environments free from climate hazards and risks".

As an ideal, I define the concept with a verb phrase ("ensuring"), thereby highlighting the active continuous efforts needed to achieve spatially equitable adaptation (which are likely never complete).

1.4. Funding and Financing Spatially Equitable Adaptation? From Incremental to Transformative Adaptation

Defining spatial equity in the context of climate adaptation finance in this way raises an important question: what constitutes successful spatial adaptation? A potential clue can be found in Chu and Cannon's (2021) reference to "creating environments free from climate hazards and risks" (p.87). However, the debate over what constitutes successful adaptation is ongoing, with scholars providing varied definitions (Adger et al., 2005; Moser & Boykoff, 2013), often contrasting it with maladaptation (Schipper, 2020). Despite significant progress over the years, including the development of metrics to assess successful adaptation, a consensus on a definition for successful adaptation has not yet been reached (Guillén Bolaños et al., 2022; Olazabal et al., 2017). One of the first attempts includes the work of Adger et al. (2005), who outline four key criteria for successful adaptation: effectiveness, economic efficiency, equity, and legitimacy, though they acknowledge these are complex and hard to measure. Moser and Boykoff (2013) expand on this by describing successful adaptation as involving clear communication and public engagement, deliberate planning, alignment with other policies, justified spending, accountability, and support for ongoing learning and adaptation.

As discussed in the first section of this theoretical framework regarding gentrification, adaptation initiatives are often poorly designed and may inadvertently exacerbate the vulnerabilities they seek to address (Schipper, 2020). This issue stems from a prevailing approach known as "incremental adaptation," which focuses on short-term vulnerabilities but frequently leads to maladaptive outcomes and fails to create lasting change (Barnett & O'Neill, 2010; Fedele et al., 2020). Conversely, a growing body of literature supports a transformative perspective on adaptation that addresses the socio-economic root causes of vulnerability instead of merely mitigating the immediate climate change impacts (Schipper, 2020), emphasising the need for initiatives that drive systemic change and fostering long-term resilience (Colloff et al., 2017). This proactive approach, as opposed

to the reactive (incremental) one (Novalia & Malekpour, 2020), enhances resilience by utilising anticipatory and co-created strategies to build resilience across scales (Colloff et al., 2017; Rickards & Howden, 2012). One specific aspect of transformative adaptation involves adopting a place-based approach that integrates local needs and priorities, which can strengthen resilience against climate impacts while fostering cultural identity and community meaning (Clarke et al., 2018; Murtagh & Lane, 2022). Much like Schipper's (2020) maladaptation vs. effective adaptation scale, transformative adaptation can be conceptualized on a spectrum ranging from low to high levels of transformation (Filho et al., 2022). This perspective thereby challenges mainstream depoliticising trends in varying degrees (Schulz & Siriwardane, 2015).

The debate over how far adaptation should go in transforming social-ecological systems is ongoing, with some scholars advocating for "deep adaptation." Rooted in post-sustainability thinking, deep adaptation argues that personal and collective changes are necessary to prepare for and cope with an inevitable climate-induced societal collapse, positing that our current systems, including the financial system, are incapable of dealing with, and withstand rapid climate change (Bendell, 2018; Bendell & Read, 2021). This perspective, which emphasizes the need to manage collapse in the most successful way possible, rather than the potential for reform of the status quo, has also begun to explore the implications for spatial equity, considering how space and geography will be affected in a post-collapse world (Radulova-Stahmer, 2024; Zwangsleitner et al., 2022).

Amid the diverse perspectives on successful adaptation, this dissertation builds on the concept of transformative adaptation, broadly defining successful adaptation as the capacity to address the socio-economic root causes of climate vulnerability (Schipper, 2020). Connecting back to the previous discussion on justice, embracing this perspective necessitates a reflection on a fundamental question that is often overlooked: effectiveness or success “for whom?” (Biermann, 2022). These inquiries are furthermore deeply intertwined with issues of spatial equity and scale, as transformative adaptation is inherently multi-scalar. In other words, for adaptation efforts to be truly effective, they must consider their impacts across various levels (Adger, 2005). This requires coordinated responses across multiple governance layers, economic systems, and technological frameworks (O’Brien, 2012). Despite this recognition, much of the existing research and theoretical discourse on transformative adaptation neglects the critical importance of scale and spatial dimensions (Lonsdale et al., 2015). Notable exceptions include the work of Shi and Moser (2021), who emphasize the necessity of cross-scale and cross-sector coordination in transformative adaptation. However, much of the academic debate around the concept, including works by Ajulo et al. (2020) and Wilson et al. (2020), neglects multi-scalar perspectives in their models of transformative adaptation, leading scholars to argue for the need for “a critical perspective on spatial scale” in transformative adaptation (Few et al., 2017, p. 6). This oversight, perhaps stemming from the ambiguity surrounding

transformative adaptation (O'Brien 2012), underscores the need for further theoretical and policy advancement to define what successful adaptation looks like at different scales, facilitating funding and financing that promotes spatial equity in adaptation efforts. Part and parcel of this effort is understanding how the socio-political and economic dimensions of adaptation finance can resist transformative adaptation. By gaining insights into these structures and processes, researchers and practitioners will be better equipped to develop effective and equitable solutions (Warner & Kuzdas, 2017).

1.5. European Union: Territorial Cohesion Governance Gaps in Adaptation

Having examined the theoretical foundations of this dissertation and clarified how I understand finance, spatial equity, and successful adaptation, I now shift focus to elucidate the EU policy context. In this section, I explain the importance of the EU as a case study by examining how the concepts I explored in this dissertation intersect with EU policies and by highlighting a territorial cohesion governance gap in adaptation policy and practice.

Local administrations' ability, or inability, to invest in climate adaptation is shaped by regional, national, and supranational processes, underscoring the cross-scalar nature of adaptation finance. As previously mentioned, decentralization, driven by New Public Management reforms, has had a direct impact on local governments' capabilities, particularly their ability to generate revenue and access financial markets. National governments (or states in some federal systems) set the fiscal transfers and allowable taxes, charges, and fees that sub-national governments can collect (IPCC, 2023). While decentralization and local autonomy are shared values in the EU (Ladner et al., 2016; Savy et al., 2017), the degree of decentralization varies significantly among and within member states. This variation, shaped by factors beyond federalist structures, leads to differing levels of municipal autonomy, including financial autonomy, even within unitary systems (Ladner & Keuffer, 2023). For example, while local governments in Sweden encounter minimal borrowing restrictions, many Southern European countries impose stricter limitations, a situation exacerbated by the European financial crisis (Ladner et al., 2016). What is more, local governments' capacity to generate revenue and meet expenditure needs varies significantly based on diverse local socio-economic realities. In Europe, efforts to redress these disparities between local governments through fiscal equalization vary significantly, resulting in an unbalanced territory of fiscal health among EU municipalities (Blair, 1992; Dougherty & Forman, 2021; Moisio & Bover, 2023).

Territorial cohesion, closely linked to spatial equity, is officially recognized in the Lisbon Treaty (2009) and emphasized in the EU Territorial Agenda as a key objective for promoting balanced territorial development (Medeiros & Rauhut, 2020). This entails fostering solidarity, reducing inequalities, and encouraging convergence between more and less prosperous regions (Territorial

Agenda 2030, 2021). Although often considered somewhat ambiguous (Demeterova et al., 2020), territorial cohesion comprises at least four essential elements: (i) addressing socioeconomic disparities; (ii) advancing environmental sustainability; (iii) enhancing territorial cooperation and governance; and (iv) promoting a more polycentric urban structure (Medeiros, 2016, p.10). In this context, polycentrism refers to a model that supports a network of interconnected urban centres, fostering synergies and complementarities across various scales—European, national, regional, and local. The aim is to reduce imbalances by enhancing the development of peripheral regions and creating alternative hubs to traditional centres of wealth and power (Gil et al., 2011). This approach ensures equal access to services and opportunities through place-based investments that allow all regions to leverage their unique strengths (Territorial Agenda 2030, 2021).

Despite incorporating many of these principles, the EU Territorial Agenda 2030 lacks the necessary financial mechanisms to effectively implement territorial cohesion, functioning primarily as a soft policy tool without adequate financial backing (Evrard & Schmitt, 2024; Weck et al., 2022). What is more, building on the work of Medeiros and others, the concept of territorial cohesion is insufficiently integrated in key EU policies related to urban adaptation. In the EU context, Newell's (2024) connection of the finance gap to critical governance gaps holds true. Building on Newell's argument that improved regulation is essential for aligning the global financial system with climate objectives, I contend that a significant governance gap in EU climate adaptation policies, and related funding and financing mechanisms, is the lack of an integrated and effective territorial cohesion perspective. This is particularly concerning given the EU's acknowledgment that climate change exacerbates spatial inequities (European Commission, 2024a; Territorial Agenda 2030, 2021). As I will elucidate, these spatial inequalities are further compounded by the very programmes and policies designed to address climate change, due to the competitive spatial logic underpinning them, which often disadvantage small and medium-sized cities and towns.

My aim in this section of Chapter One is not to provide a detailed analysis of territorial cohesion but to highlight one key point: in addition to the theoretical gap concerning the insufficient focus on multi-scalar spatial equity in successful adaptation models (discussed earlier), there is an urgent policy gap and need to incorporate this sensitivity into EU policies and funding mechanisms. Table 1.1 outlines some of the key policies surrounding urban adaptation and territorial cohesion, pinpointing the main concerns for each. The subsequent text elaborates on how the limited integration of territorial cohesion principles in key climate policies raises important questions about how such policy gaps affect the progress toward spatially equitable adaptation outcomes across EU urban areas, linking directly to the research gaps of Chapters Four and Five.

Table 1.1: The EU Territorial Governance and Policy Gap in relation to EU adaptation

Policy	Funding Mechanism	Territorial Governance Gap
EU Green Deal (EGD)	SEIP, EIB, ESIF, RRF, LIFE, Horizon Europe	The European Green Deal has faced criticism for its neoliberal focus on market mechanisms (Khoury, 2023; Knapp et al., 2024), uncertain commitments to mobilizing private-sector capital (Varoufakis & Adler, 2020), greenwashing through the EU taxonomy (Knapp et al., 2024), and the use of public funds to support and de-risk investments that primarily benefit the relatively wealthy (Bouzarovski, 2022; Kolinjivadi & Kothari, 2022). As such, despite its transformative language, it perpetuates current models of infrastructural and economic development (Castán Broto, 2022). Moreover, while emphasising the principle of leaving no place behind and enhancing urban opportunities through cohesion policy, the Green Deal does not explicitly acknowledge the critical need for improved territorial cohesion (Medeiros & Caramelo, 2023). Relatedly, the implementation of the European Green Deal (EGD) through the Recovery and Resilience Facility (RRF) has faced criticism for its largely spatially blind approach, where the allocation of resources is primarily guided by performance metrics (Conte & Molica, 2022), generating a tension between efficiency-driven and equity-focused local climate adaptation (Neidig et al., 2024).
EU Adaptation Strategy	ESIF (mainly CF and ERDF), RRF LIFE, Horizon Europe, EIB	While emphasizing the necessity for financial support, closing insurance gaps and integrating climate resilience into national fiscal frameworks, the EU Adaptation Strategy lacks explicit reference to territorial cohesion or the principles of the European Territorial Agenda 2030. Moreover, it lacks reference to the EGD principle of "no person and place left behind," referencing it only once in point 17 on international action, indicating that it is viewed as an external priority rather than an internal concern within the EU (European Commission, 2021). The EU Adaptation Strategy is heavily influenced by the smart growth narrative, with "smartness" highlighted as a key guiding principle (European Commission, 2021). This competitive discourse may divert attention away from equity principles (Artelaris & Mavrommatis (2020). Relatedly, the implementation of the EU Adaptation Strategy through the Recovery and Resilience Facility (RRF) has faced criticism for its largely spatially blind approach, where the allocation of resources is primarily guided by performance metrics (Conte & Molica, 2022), generating a tension between efficiency-driven and equity-focused local climate adaptation (Neidig et al., 2024).
EU Climate Adaptation Mission	Horizon Europe	Scholars have pointed out that the mission-oriented approach of the EU fails to adopt a comprehensive territorial perspective, limiting its effectiveness in addressing the unique challenges faced by different regions. It lacks a place-based approach, prioritizes innovation clusters, and selectively empowers certain regions over others (Cappellano et al., 2024). The Mission also struggles with insufficient alignment with the EU Cohesion Policy (Directorate-General for Research and Innovation, 2023).
EU Cohesion Policy	ERDF, ESF+, CF, JTF	Scholars have criticized the EU Cohesion Policy, which accounts for almost one-third of the total EU budget, for shifting its focus from addressing broad inter-regional inequality and redistribution to prioritizing intra-regional development and competitiveness. This shift has resulted in a fragmented approach, prioritizing economic concerns over spatial justice and disconnecting it from social and economic cohesion (Madanipour et al., 2022; Weck et al., 2022). Evidence suggests that EU Cohesion Policy has historically concentrated growth around specific poles or clusters (Rauhut & Humer, 2020), contributing to uneven national development, particularly in monocentric countries like Spain and Portugal (Medeiros & Rauhut, 2020). However, the 2021–2027 framework indicates a shift toward closer alignment with territorial cohesion objectives (Medeiros et al., 2023). Despite this, varying absorption rates among local governments continue to limit the policy's potential to fully address inequalities (Crescenzi & Giua, 2020; Mendez & Bachtler, 2024).
EU Urban Agenda	SOFT	While aiming to enhance cooperation among EU institutions, improve urban quality of life, and recognize polycentric and place-based urban development (Medeiros, 2019; Medeiros & Rauhut, 2020), the EU Urban Agenda has faced criticism for its focus on metropolitan economic growth areas and functional urban areas, thereby neglecting the specific needs of smaller cities (Medeiros & Rauhut, 2020).
Territorial Agenda 2030	SOFT	Lacks the financial mechanisms required for effective implementation, functioning as a soft policy tool that lacks financial teeth (Evrard & Schmitt, 2024; Weck et al., 2022).

The European Union has set an ambitious goal to become the world's first climate-neutral continent and achieve climate resilience by 2050. This vision is articulated through the European Green Deal (EGD), the European Climate Law, and the EU Strategy on Adaptation to Climate Change (Castán Broto, 2022; European Commission, 2021; European Union, 2021). Central to the EGD is the Sustainable European Investment Plan (SEIP) [2], which aims to mobilize 1 trillion euros in public and private investments for sustainability, including both climate mitigation and adaptation efforts (Abdullah, 2021; European Commission, 2024b). The EU Adaptation Strategy, adopted in 2021, complements the EGD by emphasizing the importance of financial support for enhancing climate resilience at the local level, e.g. through the European Structural and Investment Funds and the LIFE Programme (European Commission, 2021). In support of this vision, Europe's post-pandemic recovery plan introduced an investment package exceeding 720 billion euros, with at least 37% earmarked for climate-related initiatives (Neidig et al., 2024). Since adaptation is inherently a local concern, a substantial share of these EU funds is anticipated to be directed toward local-level investments, positioning local administrations as key players in implementing the objectives of the European Green Deal and the EU Adaptation Strategy.

As illustrated in Table 1.1, critiques of the territorial cohesion governance gap reveal a common theme: the prioritisation of competitive growth narratives over equitable spatial development. This underscores the urgent need to evaluate the real-world impacts of these policies and funding programmes on adaptation progress across EU regions. Despite the substantial funding opportunities provided by the SEIP and the post-pandemic Recovery Plan for Europe, there remains a significant research gap in the adaptation community regarding how these initiatives and the mobilisation of finance affect local adaptation efforts.

The emphasis on market-based strategies and private finance in climate urbanism literature has overshadowed the role of funding mechanisms in climate adaptation, which has received relatively little attention (August et al., 2022). The EU presents an intriguing case; unlike the USA and many countries in the Majority World, where state investment in adaptation is minimal (Shi & Moser, 2021), it can be hypothesised that the EU and its member states play a more substantial role in financing adaptation due to their historical welfare state tradition (Laurent, 2021). This tradition fosters greater state involvement in public services and a reliance on public funding rather than loans.

[2] A key element of the Sustainable European Investment Plan (SEIP) is the EU Taxonomy, which governs the private sector through a classification system to ensure alignment with sustainability objectives. However, the influence of industry has led to criticism of the EU Taxonomy, with particular concerns that labelling gas and nuclear power as "green" constitutes greenwashing (Knapp et al., 2024).

While the literature suggests that finance plays a critical role in climate change governance, scholars have rarely examined the underlying determinants influencing how urban adaptation actions are financed (Keenan et al., 2019). The variety of financial instruments available to cities often leads to confusion (Keenan et al., 2019), and our understanding of the key actors involved in urban climate finance remains limited (Robin, 2022). The extent to which financialisation is occurring on the ground in the European context requires further scrutiny. Although some studies in Europe focusing on climate mitigation indicate that municipalities rarely utilise financial products (Economidou et al., 2024; Ulpiani et al., 2023), there is still a significant lack of empirical data regarding the financing of local climate adaptation efforts, particularly in small and medium-sized cities, which collectively accommodate over half of the EU population (Fila et al., 2023; Fünfgeld et al., 2023; Ricciardi et al., 2023). This empirical gap will be addressed in Chapter Four.

Furthermore, the absence of a territorial rationale in key EU adaptation policies and funding mechanisms—such as the Cohesion Policy and the Recovery and Resilience Facility, which account for a significant portion of the EU budget—raises concerns about uneven effects regarding access to EU funding programmes, as well as overall adaptation progress between local governments. Theoretically, climate vulnerability indicators should guide the allocation of adaptation funding. However, literature outside the adaptation field suggests that the absorption of EU funds is influenced by factors such as administrative capacity and political stability (Bachtler et al., 2024; Crescenzi & Giua, 2020; Mendez & Bachtler, 2024; Tiganasu & Lupu, 2023). In light of varying local realities, this raises critical questions about equity in access to funding among local administrations facing diverse climate change challenges. This topic will be explored further in Chapter Five of this dissertation, contributing to the growing body of literature on sub-national inequities in climate adaptation finance, as discussed earlier in Section 1.2 (Barrett, 2014, 2015, 2022; Incerti & Barnett, 2024; Seong et al., 2022; Shi, 2020; Shi et al., 2021).

1.6. Revisiting The Research Question: Connecting Research Gaps to Research Questions, Hypotheses, and Overarching Methodology

This chapter has thus far established the socio-political paradigm and policy context in which climate adaptation finance is unfolding—including considerations of (urban) governance paradigms, climate urbanism, and important processes like financialization—and explored the connections between finance, spatial equity, and successful adaptation. I have also explained why the EU is an important case to consider such issues due to the lack of a territorial logic underlying EU adaptation despite a discourse around an equitable approach (no one/place left behind). Finally, I clarified the connections

of many of the key concepts to what is happening on the ground in terms of adaptation (finance) policy.

From this exploration, four key knowledge and empirical gaps in the literature emerge, each corresponding to a chapter of this dissertation:

1. Although urban greening is widely celebrated for its benefits, policy and practice frequently disregard how financial processes around it negatively impacts vulnerable groups. Understanding how financial processes associated with urban greening contribute to these adverse outcomes is crucial for developing more equitable urban greening.

2. Existing research on climate adaptation finance, as noted by Incerti and Barnett (2024), largely focuses on the international level, creating a significant gap in understanding how climate adaptation finance is accessed and allocated at sub-national and local scales. By failing to critically examine sub-national inequities, the literature on inter-state climate adaptation finance allocation depoliticizes country-level politics and overlooks the complexities of scalar and territorial politics. This oversight limits insights into how finance "moves" through space and impacts climate-vulnerable communities across scales, ultimately hindering efforts to address inequities in climate adaptation effectively.

3. Various authors have highlighted a critical gap in the literature regarding the need to explore "which financial relations, instruments, and actors are involved" in urban flows of climate finance (Robin, 2022, p. 5). Additionally, there is a call for more research into the theorized shift of urban power towards financial actors and institutions (Bracking & Leffel, 2021).

4. While EU funds play a critical role in implementing adaptation efforts, their effects on spatial inequalities among local administrations remain underexplored in the literature on climate adaptation finance.

Table 1.2 illustrates these gaps and their articulation in the subsequent chapters of this thesis. It shows how they connect to the broader questions driving the thesis, as well as the hypotheses, methods and journals where the chapters have been published or are under review as papers.

Table 1.2: Overview of research gaps, questions, hypotheses, methods and journal articles

Main RQ: How do socio-political and financial processes affect urban climate adaptation funding and finance and what are the implications for spatial inequities?

Main Hypothesis: Socio-political and financial processes—such as elite capture, vested interests, and weak institutional frameworks—shape the accessibility and allocation of climate adaptation funding and finance across scales, leading to spatial inequities that disproportionately benefit resilient countries, larger cities, and elite urban groups, intensifying disparities not only within cities and across states but also between cities.

Ch.	Research gap	Research question	Hypothesis/Argument	Method	Journal
2	A limited understanding of the risks associated with financial processes and interests in urban adaptation, along with a lack of awareness of how to finance more spatially just urban (green) adaptation.	How do financial processes and interests pose risks to urban (green) adaptation, and what strategies can be implemented to finance urban (green) adaptation in a more spatially just manner?	Elite capture in urban greening exacerbates intra-urban inequities by driving displacement, gentrification, and inflated property prices.	Critical review structured along the main argument of the commentary.	*Nature Communications*
3	The insufficient focus on sub-national inequities within a comprehensive multi-scalar analysis of climate adaptation finance, along with a lack of recognition of scalar and territorial politics.	How do financial and political dynamics impact the accessibility and allocation of climate adaptation finance across various scales, and what insights can a multi-scalar perspective provide regarding the role of finance in the emergence of spatial inequities?	Institutional capacities and financial and political interests, rather than climate vulnerability alone, significantly impact the accessibility and equitable allocation of climate adaptation finance, leading to inequities across scales.	A critical review method (Snyder, 2019).	*Current Climate Change Reports*
4	There is a lack of empirical data regarding how EU urban areas, especially small and medium-sized cities, utilize climate adaptation finance and funding mechanisms, as well as the impact of socio-political factors on this use and what it indicates about their adaptation progress.	What financial instruments and funding mechanisms do European cities and towns use to implement climate adaptation plans, what barriers and factors influence access to and allocation of these resources, and how do these aspects impact inter-urban progress in adaptation?	If EU cities and towns are increasingly financialized, they will rely more heavily on market-based instruments such as green bonds and public-private partnerships for climate adaptation funding. Moreover, small and medium sized urban areas may lag behind in their adaptation progress due to difficulties in accessing funding and finance.	Cross-Sectional Survey with 26 questions, analysed using descriptive statistics and statistical analysis.	*Nature Communications* (under review)
5	The socio-political determinants affecting the accessibility of EU funding programmes.	How do EU funding dynamics affect inter-urban inequities in climate adaptation efforts in Portugal?	The rules of EU funding programmes create competitive dynamics among local administrations, contributing to spatial inequalities in climate adaptation efforts between cities/towns.	This study employs a case study approach (Yin, 2009) based on semi-structured interviews and document analysis.	*The Journal of City Climate Policy and Economy* (under review)

Methodologically, the thesis deploys a mixed methods approach to address the research questions and gaps outlined in Table 1.2. While a more detailed explanation of the data collection and analysis methods is provided in each of the three empirical chapters, they include roughly the following:

Chapters Two and Three employ a critical review method (Snyder, 2019) and adopt a pragmatic approach centred on the main research question, drawing insights from various disciplines. Chapter Two concentrates on urban greening as a form of climate adaptation, focusing on intra-urban inequities and grounded in research from critical geography, political ecology, and urban planning. Subsequently, Chapter Three broadens the scope to examine climate adaptation more generally, both conceptually and in terms of the scales analysed. This chapter addresses, in addition to intra-urban inequities, sub-national and inter-state inequities in climate adaptation finance, expanding the literature to encompass development studies and international relations. This pragmatic, interdisciplinary approach allows for a comprehensive exploration of spatial and inequities in climate adaptation finance.

Chapter Four builds on a cross-sectional survey method (Connelly, 2016) conducted in collaboration with the Covenant of Mayors (Europe Office) and the Joint Research Centre (JRC). These collaborators provided invaluable feedback on the survey design, participated in pilot testing, and assisted with the dissemination of the survey. The survey consisted of 26 questions (typically less due to skip logic) and was distributed to 587 urban local governments. This process required compiling over 900 institutional email addresses and engaging in email correspondence to facilitate dissemination. For data analysis, I used descriptive statistics and simple statistical methods, employing tools such as Excel, Tableau, RStudio, and MAXQDA.

Chapter Five adopts a case study approach (Yin, 2009), using semi-structured interviews and document analysis to explore the specific context of EU funding accessibility in the Lisbon Metropolitan Area. Fieldwork was conducted intermittently from October 2023 to February 2024, and the qualitative data collected were analysed through document and discourse analyses using MAXQDA.

Having provided an overview of the research gaps, questions, hypotheses, and a general summary of the methodology, I will now outline the structure of the remaining chapters of the thesis. In the next chapter—Chapter Two—I will address the threat of elite capture in urban adaptive greening initiatives and advocate for a shift in financing to promote intra-urban justice. Chapter Three contextualizes these intra-urban inequities within the broader arena of multi-scalar inequities in climate adaptation finance, exploring the determinants of accessibility and allocation at local, sub-national, and international levels. In Chapter Four, I contribute to the debate on inter-municipal

inequities by presenting empirical data on urban funding practices, derived from our EU-wide survey. Chapter Five further investigates these patterns through a case study of the Lisbon Metropolitan Area, analysing how access to EU funding programmes is influenced by various socio-political factors. In the final chapter, I synthesize the findings of my thesis and discuss how to effectively address spatial equity in funding and financing across different scales. More concretely, I elaborate the concept of cohesive adaptation as a strategy to address the lack of territorial cohesion in adaptation funding and financing governance.

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Chapter 2. Challenging the Financial Capture of Urban Greening[3]

Urban greening is critical for human health and climate adaptation and mitigation goals, but its financing tends to prioritize economic growth imperatives. This often results in elite value and rent capture and unjust greening outcomes. We argue that cities can, however, take action to ensure more socially just impacts of green financing.

2.1. Elite Financial Capture of Urban Greening

Urban areas have long been depicted as growth machines (Molotoch, 1976), today accounting for 80% of global Gross Domestic Product but also 75% of global carbon emissions (World Economic Forum, 2022). Urban greening—referring to the physical greening and renaturing of cities through green infrastructure interventions like rail-to-trail parks, remediated waterfronts or canals, large-scale parks, or greenways and green streets—has a wealth of positive effects on mental and physical health and generates improved environmental outcomes. The many green infrastructure interventions that cities have been actively deploying over the last decade or so have climate mitigation and adaptation co-benefits like carbon sequestration, reduced urban heat island effects, and improved flooding risk management. As part of this green mission, cities are mobilising green branding to visualize their work and compete to be the greenest city among national and international peers. Greening has also become a strategy to improve quality of life and attract private capital through direct investments or public-private partnerships which tend to increase housing prices and rents and reduce affordability (García-Lamarca et al., 2021). Despite the latter's negative impact on working class and racialized urban residents, the climate emergency is driving calls to policymakers and planners to expand the scope and range of urban greening interventions, often framed as ways to unlock value and stimulate green growth.

But we must ask: Unlocking value and green growth for who? The "new" value that is generated in the process of creating urban greening comes from the metabolic relationship between capitalist societies and the biophysical world (Heynen et al., 2006). No matter how it is financed, urban greening tends to increase the value of land and property, operating as an accumulation strategy (Smith, 2008, 2009), benefiting elite groups and reinforcing existing social and environmental inequalities. For example, research on land politics shows that extensive wetlands in Colombo, Sri Lanka have been turned into parks, canals, and real estate in recent decades, benefiting local and international investors, urban development agencies, real estate developers, and the urban upper-

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middle class, while low-income and marginalized populations have suffered from eviction, dispossession, and environmental hazards (Hettiarachchi et al., 2019).

In our research, we use the term "urban green grabbing" to depict how real estate developers and the financial processes surrounding them partially or completely appropriate the financial and social benefits generated by new or planned urban green amenities through building a commodity (housing developments, often large-scale ones) to be bought and sold next door (García-Lamarca et al., 2022). They extract extra rent, surplus value, social capital, and/or prestige from locating or financing projects adjacent to new or up-and-coming green amenities, with benefits passed onto their investors and high-end clients. Such projects take a prudential, "safe" approach to financial risk, with return on investment assured by the attractiveness of green real estate development as an asset class whose value will grow in the future (Knuth, 2016). Done in the name of green city-making, bolstered by an increased emphasis on urban climate adaptation and resilience, these developments often exclude working-class and racialized residents (Dooling, 2009).

More financing for urban greening in the context of global climate adaptation and mitigation strategies is critical, but to date it is insufficient and unevenly available (Knuth & Krishnan, 2021) Faced with budget shortfalls, cities are increasingly financing green interventions through municipal (green) bonds, tax increment financing, sale of development rights, and other direct and indirect value capture strategies (Jones et al., 2020). These schemes embody the financialization of urban governance: city governments increasingly come to directly or indirectly rely on financial products and land markets to govern the city. Simultaneously, private capital sees public infrastructure or services as a site of accumulation, as financial interests secure revenues through the commodification and privatization of public goods (O'Neill, 2017). Recent research has shown how green bonds, for example, tend to prioritize interventions that feed into urban economic growth logics and often reinforce existing social and environmental inequalities or create new ones (Bigger & Millington, 2019; García-Lamarca & Ullström, 2020). Moreover, the financing of adaptation is so far not geared towards addressing recent or historic injustices, with recent research pointing out how financing institutions often deny credit to racialized neighbourhoods exposed to climate impacts (Keenan & Bradt, 2020).

2.2. Green Gentrification Deepens Urban Injustices

Elite financial capture of urban greening can produce a variety of injustices. The unequal distribution of access to green infrastructure primarily occurs because of the higher land and property values new greening has been shown to produce—for the benefits of a few and the exclusion of many (Bockarjovaa et al., 2020; Heckert & Mennis, 2012). The term green gentrification is used to depict how green urban interventions attract investment and higher income and often White residents, while

displacing historically marginalized groups to less green and unhealthier, climate exposed areas where they can afford to live (Gould & Lewis, 2016; Shokry et al., 2020).

Our recent study of 28 North American and European cities identified that 17 out of 28 cities experienced these green gentrification dynamics between 1990 and 2016, whereby new green spaces—especially high-profile parks and greenways—in one time period contributed to subsequent city-wide gentrification (Anguelovski et al., 2022; Triguero-Mas et al., 2022). For example, in Atlanta, property values increased 18%-27% more for homes located within a half-mile of the Beltline greenway than elsewhere from 2011 to 2015 (Immergluck & Balan, 2018). In Barcelona, green gentrification trends started in the 2000s and have accelerated in the past decade, with more highly educated and higher-income residents moving into traditionally working-class areas like Sant Martí while existing working-class residents had to move out. During the 2000s, the area immediately surrounding the Port Olímpic parks and Poblenou Park already saw a 26.7% and 20.5% increase in family income respectively over 5 years, compared to a 2.8% increase in the rest of Sant Martí over the same time period (Anguelovski et al., 2018).

Urban greening can also directly remove vulnerable residents from their neighbourhoods through dwelling illegalization and land grabbing, rezoning residential neighbourhoods into other uses, or labelling specific neighbourhoods as high climate-risk areas, at the same time that luxury residential developments often do not have to abide by the same rules. In New Orleans, for example, the release of the Green Dot Map just a few months after Hurricane Katrina in 2005 already outlined the conversion of racialized neighbourhoods such as the Lower Ninth Ward into green areas, while higher-income, yet low-lying areas, such as Lakeview were to be rebuilt (Fields, 2009). Almost 20 years later, this practice of unjust environmental expropriation is still visible through contentious relocation or property buy-out programmes (and subsequent re-naturing initiatives) throughout the United States. Recent research shows that the criteria and processes used in buy-outs tend to lack transparency and fairness: Low-value homes—those owned largely by working class and racialized groups—are more likely to be designated as “substantially-damaged” and thus bought out (Siders, 2019). Differential treatment in the location of urban greening by race and class and protection of low-income homes is especially noticeable in the Global South (Torres et al., 2022). In Medellín, Colombia, as the Green Belt initiative was rolled out in the early-mid 2010s, high-end residential developers in El Poblado were granted permission to build in an ecologically risky and protected area while low-income and indigenous self-built housing residents were physically, socially, and ecologically displaced in the name of nature conservation and through elite and exclusive green space use (Anguelovski et al., 2019).

Such examples are evidence for the idea that the financing and/or construction of green infrastructure and renaturing projects by private developers or by private-public partnerships—even when meant to be open and public—is increasingly creating privatized and enclosed spaces with unequal and limited elite access to ecological, health, or social benefits. These financial processes for new green spaces instigate new rules, norms of use, and practices that often undermine those of historically marginalized groups, and racialized groups in particular. In Barcelona, gentrification has meant that new green spaces in the Ciutat Vella (city centre) have become appropriated by tourists and expat workers, mostly for entertainment and consumption purposes, in turn compromising the use of green spaces by North African and Latin American residents as well as their trust, sense of community, and place attachment (Oscilowicz et al., 2020). When exclusive greening intersects with racialized development, cities are additionally faced with threats to emancipatory and abolitionist justice, unable to challenge deep social and racial hierarchies and guarantee the right to a "sense of place" for racialized groups (McKittrick, 2011).

2.3. Moving Towards More Socially Just Urban Greening Financing Practices

We have made clear the processes and outcomes of the predominant paths to finance urban greening and the ways in which they may reinforce or create new inequalities and injustices. While there is no silver bullet to solve the problem of urban green grabbing, elite capture, and green gentrification, action can be taken so that the ecological and social benefits of urban greening investment reach populations normally left behind. If we are to avoid future "climate apartheid" that will entrench privilege and precarity within and between cities, in both the Global North and South (Rice et al., 2021), a shift in approach to finance urban greening and the implementation of various tools and policies is paramount.

First, financing needs to be considered as a social and ecological process, embedded in relationships and power dynamics between humans, and between humans and nature (Christophers, 2018) We believe emerging thinking around how to finance *reparative* climate infrastructures is a foundational approach (Webber et al., 2022). It considers shifting capital from destructive economic sectors to ones that redress some of the inequalities, trauma, and losses generated by uneven urban development and supporting socio-natural relations of care and mutual flourishing. For example, collective community resistance in Jakarta, Indonesia has reimagined and, in some cases, reshaped the top-down financialized coastal and flood protection infrastructures and their financial sources, directing some funds to upgrade kampungs (informal settlements) and build protective infrastructures (Webber et al., 2022). Along these lines, we echo calls for further research into the financial relations and tools that can support smaller scale infrastructure initiatives, especially those operating through informal

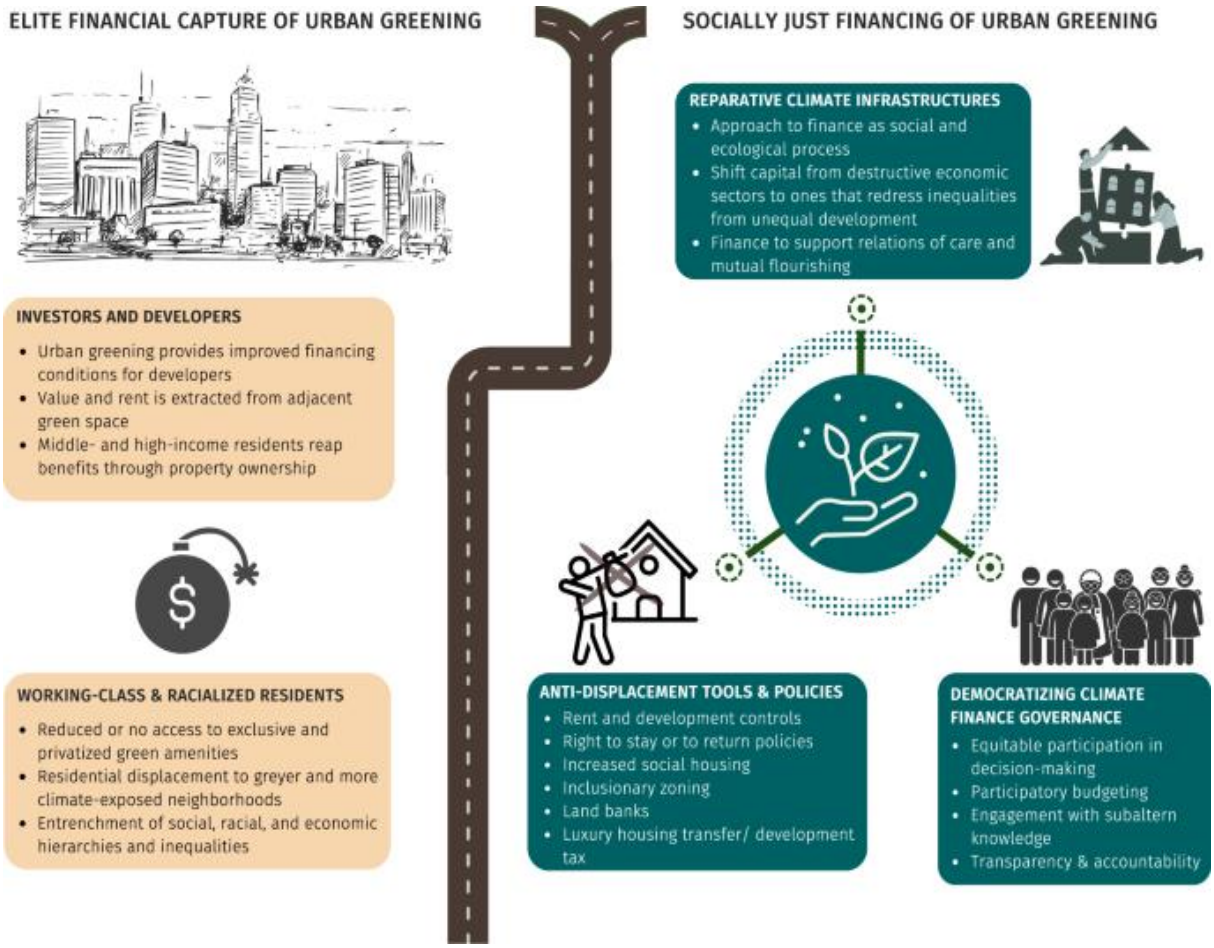
economies and community-based forms of coordination, to better understand the financial processes behind more inclusive urban climate action (Robin, 2022).

Another means to shift capital driving urban green growth to benefit working-class and racialized communities is through a bottom-up approach to democratize climate finance governance (Schalatek, 2012). Incorporating grassroots engagement, subaltern forms of knowledge (Olazabal et al., 2021), transparency, and accountability as core principals is urgent both globally and locally. Tools like participatory budgeting have challenged the predominant green growth paradigm in Lisbon, Portugal (Falanga et al., 2021). Lessons can also be learned from the use of explicit equity criteria in participatory budgeting institutional design in Cuenca, Ecuador, which has enabled more funds to be directed to residents most vulnerable to floods, landslides, drought and frost, all increasing in frequency due to climate change (Cabannes, 2021).

A range of tools and policies can also be implemented by cities to regulate land use, development, and investment around green amenities (Oscilowicz et al., 2021; Klein et. al., 2020) Vacancy taxes and transfer taxes on luxury properties (Vancouver), rent controls (Berlin), development tax or linkage fee for affordable housing construction (Boston), and facilitating cooperative housing (Copenhagen, Barcelona) or community land trusts (CLTs) (Washington DC) are examples of measures that can contribute to increasing housing affordability and preventing green gentrification by controlling speculation and thus avoiding the displacement of long-term marginalized residents. More widespread adoption of these well-established tools requires bold local governments who put equity and justice concerns for marginalized groups, rather than elite profit-making interests, at the centre of city planning and building processes.

In closing, the challenge of building sustainable, healthy and green cities is not simply one of increasing financing of urban greening or closing the financing gap. Rather, financing urban greening should always be viewed in the context of how it inequitably impacts land markets and socially vulnerable groups. We call for a shift in the way urban greening is financed from the predominant path that leads to elite financial capture to one that prioritizes equity by recognising and seeking to meet the needs of marginalized communities. This can be achieved via a reparative approach, bold anti-displacement policy tools, and the democratization of climate finance governance (Fig. 2.1). While not as financially appealing as prevalent short-term profit making and economic growth incentives, the principal motivation for this new path is long-term economic, social and ecological sustainability that disrupts climate apartheid and reduces entrenched urban inequalities and vulnerabilities.

Figure 2.1: Urban greening and its financing at a crossroads.



The panel on the left illustrates the path to elite financial capture, with positive effects for investors and developers and negative effects for working-class and racialized residents. In contrast, the panel on the right shows how the proposed reparative approach, anti-displacement policy tools, and democratization of climate finance governance can pave the way to socially just financing of urban greening.

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Chapter 3. The Multi-Scalar Inequities of Climate Adaptation Finance: A Critical Review[4]

Abstract

Purpose of Review

Following a multi-scalar analytical approach, this critical literature review explores the factors that determine adaptation finance accessibility and allocation with particular attention to how the needs of climate-vulnerable communities are considered.

Recent Findings

Our review reveals that climate vulnerability is not a primary determinant in the accessibility and allocation of climate adaptation finance at inter-state, sub-national and local scales. Instead, factors such as institutional capacities and financial and political interests exert significant influence. This leads to maladaptation and multi-scalar inequities where climate finance favours relatively resilient groups across scales with less support for more vulnerable populations.

Summary

We argue that finance does not trickle down, but "ripples" within a climate finance arena – where we define the latter as a messy space of competition, negotiation and collaboration. To unlock equitable adaptation finance patterns, future research should focus on the multi-scalar configurations of adaptation finance beyond the international level and consider local and regional territorial and scalar politics.

Keywords: Climate adaptation finance, Climate justice, Climate vulnerability, Maladaptation, Climate change governance, Scalar politics

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3.1. Introduction

In the wake of the Paris Agreement, climate adaptation finance has emerged as a salient topic within climate governance debates. One crucial aspect that underpins these discussions is the principle of prioritising climate-vulnerable communities (Garschagen & Doshi, 2022). Fulfilling this principle would mean that financial resources effectively target assistance where it is most urgently needed, mitigating immediate climate risks while fostering equitable climate protection. However, adaptation finance has consistently fallen short of expectations in comparison to mitigation finance, and the promised 100-billion-dollar pledge set during the 2009 Copenhagen climate negotiations to support (climate-vulnerable) developing countries remains unfulfilled (Roberts et al., 2021; Barrett, 2022). Consequently, the dominant discourse from governments, development institutions, and multilateral agencies stresses the need to scale up adaptation finance (Long, 2021).

Often idealized and promoted as a silver bullet solution to the climate crisis (Long, 2021), 'finance' has become a goal in and of itself, on par with adaptation and mitigation, as illustrated by the recently agreed-upon Glasgow Climate Pact:

> *"*[The Conference of the Parties] Stresses the urgency of enhancing ambition and action in relation to *mitigation, adaptation and finance* in this critical decade to address the gaps in the implementation of the goals of the Paris Agreement*"* (United Nations Framework Convention on Climate Change, 2021, p.2).

In line with this, we can observe that adaptation investments are repeatedly marketed as de facto win-win solutions for both private and public actors. This is evidenced, for instance, by the Global Commission on Adaptation flagship report, asserting that investments in adaptation lead to "triple dividends": 1) avoiding future losses, 2) boosting economic growth and 3) creating social and environmental benefits (Global Commission on Adaptation, 2019, p.4-5).

Yet adaptation finance does not materialize in a political and social vacuum. The aspirational character of adaptation finance at global levels, and the emphasis on scaling up finance, has a danger of undermining its political nature. Indeed, efforts to mainstream climate adaptation have reproduced conventional development practices and technocratic responses, further depoliticising climate adaptation (Scoville-Simonds et al., 2020). However, there is a tension - and often conflict - between the everyday realities of adaptation finance and the previously mentioned principle of prioritising the most vulnerable. The financial and political dynamics behind this equitable allocation lack cross-scalar consideration, with most attention being paid to the inter-state level (Barrett, 2022; Ciplet et al., 2022). Limited analysis exists at the subnational and local levels, as well as the interconnections between scales.

This critical review aims to shed some light on the underexplored scalar politics of adaptation finance allocation and its equity dimensions (Ciplet et al., 2022; Hilbrandt & Grafe, 2023). For this, we use a multi-scalar analytical approach where we categorize scholarly work on the accessibility and allocation of adaptation finance into three main typologies of spatial inequity: inter-state, sub-national and local. In our deployment of this triple typology of scalar inequity, we align with Hilbrandt & Grafe's reading of space as relational and emerging through practice (Hilbrandt & Grafe, 2023), and with Swyngedouw and Heynen's similar proposal of scale as a process, transformed through social conflict and political struggle (Swyngedouw & Heynen, 2003). As we outline in the discussion, we recognize that the typologies do not capture all scalar and interconnected patterns of adaptation finance, and instead propose them as heuristic devices to provide clarity and illuminate present gaps in adaptation finance literature. Moreover, this classification allows us to enrich adaptation finance scholarship with insights from other bodies of literature operating at different scales. Finally, we focus on equity as a counterpoint to the vast body of literature dealing with justice in relation to adaptation finance allocation, whether distributive, procedural, recognition, reparative, or neoliberal justice (Khan et al., 2020). Thus, although not the focus of this critical review, we recognize that adaptation finance may result in unjust outcomes, not just spatially, but also along intersecting racial, gender and class lines.

3.2. Concepts and Methods

We use a critical review method (Snyder, 2019) and take a pragmatic philosophical stance, where we draw from a wide range of disciplines exploring adaptation finance including development studies, international relations, political economy, critical geography, political ecology, and urban planning. Literature was identified between January 2022 and June 2023 using Google Scholar, Scopus, and ResearchGate through search terms that included "climate adaptation finance", "climate vulnerability", "allocation", "climate adaptation justice" or "climate adaptation equity". In a subsequent phase, critical articles from the bibliographies of the identified publications obtained through the search terms were analysed. For this review - and in the absence of a universally accepted definition - we understand adaptation finance as *financial resources accessed and allocated for the implementation of climate adaptation actions* (Watson et al., 2022; Shishlov & Censkowsky, 2022). Other critical concepts and their definitions are compiled in Table 3.1.

Table 3.1: Main concepts and definitions used in this review

Concept	Definition
Climate (adaptation) finance	While there's typically a differentiation made between funding and finance—where funding implies non-repayment and finance suggests repayment—this paper, for the purpose of legibility, employs a broad definition of climate (adaptation) finance as financial resources accessed and allocated for the implementation of climate (adaptation) actions (Watson et al., 2022; Shishlov & Censkowsky, 2022). This includes both public and private finance, and instruments, including grants, equity, debt, household savings and insurance (Intergovernmental Panel on Climate Change, 2022).
Climate vulnerability	The likelihood of being negatively impacted by climate change, encompassing factors such as sensitivity to harm, susceptibility to damage, and the inability to effectively cope with or adapt to changing environmental conditions (Intergovernmental Panel on Climate Change, 2022).
Maladaptation	Actions that heighten the likelihood of negative impacts from climate change, such as new, deepened or shifted vulnerability to climate-related risks, unequal outcomes or reduced well-being, both now and in the future (Intergovernmental Panel on Climate Change, 2022).
Climate apartheid	A worldwide regime of discrimination, segregation and brutality, rooted in divisions of race, socioeconomic status and gender, exploiting the pretext of climate change and responses to it to justify and perpetuate its oppressive structures (Long et al., 2020).
Scalar politics	Scalar politics involves the perpetual restructuring of spatial scales, serving as a crucial component of social strategies aimed at asserting or safeguarding authority over scarce resources and/or seeking empowerment (Swyngedouw & Heynen, 2003).
Multi-scalar inequities of climate finance*	A form of spatial inequity where the most vulnerable groups across scales—be they vulnerable states, sub-national administrations, or local communities—are not the primary beneficiaries of climate adaptation finance accessibility and allocation.
Climate finance arena*	Inspired by Hilhorst & Jansen's (2010) concept of a humanitarian arena, we propose the climate finance arena as a way to portray the climate finance landscape as a messy political space where decision-making involves diverse social actors at different levels collaborating, negotiating, and competing for access to and allocation of financial resources. Unlike the static imagery of a climate finance "landscape" or "architecture," this concept underscores the pivotal dynamics of territorial and scalar politics, including the agency of recipients of finance and their ability to attract and compete for finance.
Rippling climate finance*	Rather than "trickling" down according to vulnerability, we hypothesize that climate finance as a political-ecological process "ripples" into opportunities for some while creating barriers for others across scales and sectors. The concept "rippling" suggests not everyone benefits from climate finance in an equitable way and highlights the institutional and political dimensions of accessing and allocating climate finance, acknowledging both vertical and horizontal dynamics.

The asterisks (*) indicate newly proposed concepts

We structure the paper around the three established typologies of spatial inequity. First, we discuss inequitable inter-state patterns of adaptation finance and elaborate on the relationship between adaptation finance allocation and vulnerability between countries. We then move to explore inequitable sub-national patterns of adaptation finance accessibility and allocation, where sub-sections focus on urban-rural disparities and inter-urban disparities as two predominant patterns of spatial inequality. Third and finally, we discuss inequitable local patterns of adaptation finance accessibility and allocation, drawing primarily from the climate urbanism literature and geographical

critiques on the financialization of (urban) climate governance. In the discussion, we bring the different elements of the paper together and discuss and introduce the concepts of multi-scalar inequities, the climate finance arena and rippling climate finance. We assert these as concepts to bring the dispersed literature together in an attempt to make sense of the factors that underlie the varied spatial configurations of adaptation finance accessibility and allocation and its equity dimensions. Finally, we close with concluding thoughts and reflections on future research.

3.3. Inter-State Accessibility and Allocation of Adaptation Finance: What Role for Climate Vulnerability?

One of the most prominent themes in scholarly debates on adaptation centres on inter-state exchanges, responsibilities and obligations (Scoville-Simonds et al., 2020; Ciplet et al., 2022). In line with this, a significant body of literature that has emerged in the past 15 years deals with the allocation of climate adaptation finance between countries (Garschagen, & Doshi, 2022; Barrett, 2022; Ciplet et al.,2013; Stadelmann et al., 2014; Robinson & Dornan, 2017; Saunders, 2019; Doshi & Garschagen, 2020; Weiler & Klöck, 2021; Islam, 2022). Literature of this nature frequently highlights the ethical responsibilities of developed countries towards financing climate adaptation efforts in developing countries, contributing to and resonating with conversations held at UN climate change conferences - such as the yearly Conference of the Parties (COP) - and similar international political forums (Ciplet et al., 2022; Khan et al., 2020; Füssel et al., 2012; Grasso, 2010). The role of climate vulnerability in said allocation is often a central topic of concern.

Although “much depends on the timeframe of data sampling, the specific funder, whether they are bilateral or multilateral and how the data is analysed” (Barret, 2022, p.205), recent research shows a country's vulnerability is not a primary determining factor in the allocation of climate adaptation finance (Garschagen & Doshi, 2022; Barret, 2022; Robinson & Dornan, 2017; Doshi & Garschagen, 2020). A recent report (Lee et al., 2023) found that the most prominent and largest climate funds globally – the Climate Investment Funds (CIF) and Green Climate Fund (GCF) - have not provided any adaptation finance to many of the most climate vulnerable countries. Garschagen & Doshi (2022) reach similar conclusions, indicating that the most vulnerable countries shortlisted by the GCF, particularly low-income developing countries in Africa, do not gain from these funds. Notwithstanding, Islam (2022) argues that although there is a relationship between climate adaptation finance allocation and vulnerability, this relationship is "parabolic", meaning that moderately vulnerable countries receive relatively more climate adaptation finance than the most vulnerable countries.

If not vulnerability, what factors determine the accessibility and allocation of adaptation finance at the international level? Three main interconnected dimensions prevail according to the literature.

First, some authors argue that climate finance flows to countries based on the perceived ability to manage and carry out projects, institutional capacity, and climate change and political commitments rather than adaptation needs or vulnerability (Doshi & Garschagen, 2020). In connection with the aforementioned, the allocation of adaptation finance has sparked an ongoing debate over the balance between efficiency and equity (Barrett, 2022). Evidence points to the prioritization of efficiency and cost-effectiveness being given higher priority than ensuring equity (Stadelmann et al., 2014). These patterns are consistent with the logic behind traditional bilateral development cooperation/aid (Weiler & Klöck, 2021). What is more, the institutionally fragmented "architecture" of multilateral climate funds has led to misunderstanding and extraordinary bureaucratic demands on the already overburdened governance systems in developing countries (Roberts et al., 2021; Weiler & Klöck, 2021; Kalaidjian & Robinson, 2022; Weikmans & Roberts, 2017). This occurs on top of the fact that the most vulnerable countries have weak institutional capacities in terms of accessing and managing climate finance (Garschagen & Doshi, 2022).

The second factor is unequal power in decision-making processes, most notably the role of donor interest (Barrett, 2022; Scoville-Simonds et al., 2020). Ciplet et al. (2022) argue from a world-systems theory perspective that structural economic advantages are maintained and reinforced by wealthy states as well as through the power of global capitalist elites, resulting in a global hierarchy of uneven relations between wealthy vs. deprived nations. With most climate finance flowing through conventional bilateral and multilateral mechanisms outside the UNFCCC, donor countries have a strong grip on how climate finance is spent. In contrast, countries which are part of the core (e.g. the West) have overall more agenda-setting power and power to influence the allocation of finance through intermediary institutions (MDBs, UN Agencies etc.) (Long, 2021; Ciplet et al., 2022). Even for climate finance flows outside official UNFCCC mechanisms, developing countries have limited decision-making power (Ciplet et al., 2022). Webber et al. (2020) show that the same holds for global city networks that are predominantly headquartered in global North cities, with a considerable number of their beneficiary cities located in the Global South. Within this backdrop of global power inequality, Weiler & Klöck (2021), as well as Barrett (2022), contend that donor interests, encompassing geopolitical, military, and economic factors, significantly influence allocation decisions in climate finance negotiations. To the dismay of developing countries, these power imbalances also manifest in minimal additional climate finance allocated beyond existing official development aid (Khan et al., 2020; Islam, 2022; Weikmans, 2023). This is problematic since the primary objective of climate finance is to assist recipients in coping with the additional challenges imposed by climate change on top of already existing development challenges (Ledger & Klöck, 2023).

A third and final explanatory dynamic emerging from the adaptation finance allocation literature at the inter-state level has to do with the socio-political implications of proliferating debt-based instruments over grants. Despite repeated calls from developing countries for grant-based funding (Khan et al., 2020), the vast majority of general climate finance (both mitigation and adaptation action-oriented) are loan-based (Climate Policy Initiative, 2021). More specifically, 62% of public climate adaptation finance in 2016-2020 was allocated as loans (Weikmans, 2023). Roberts et al. (2021) highlight the equal treatment of grants and loans in the reporting of climate finance flows. In other words, no differentiation between these two types of financial assistance is made when reporting on the progress of scaling up finance (e.g. to reach the 100-billion goal), despite their significant differences in terms of equity (Roberts et al., 2021; Khan et al., 2020). Grants primarily serve as a way for developed countries to address their historic responsibility given their disproportionate contribution to causing climate change (also coined "climate debt") and provide developing countries with opportunities to manage the impacts of climate change without deepening indebtedness (Khan et al., 2020). On the other hand, loans require developing countries to repay the borrowed amount along with interest, even in the case of concessional loans with interest rates below market rates (Roberts et al., 2021). Weikmans (2023) asserts that loans are entrenched within a consequentialist viewpoint predominantly advocated by developed nations and multilateral development institutions. Proponents of this stance prioritize the profitability of climate adaptation projects as a means to ensure loan repayment (Webber et al., 2020). Indeed, the rationale behind adaptation finance seems motivated by economic growth and profitability considerations (Long, 2021; Webber et al., 2020; Friedman, 2023). The abundance of debt-based climate finance instruments reflects a broader neoliberal logic that deepens the debtfare state and shifts power to market actors (Söderberg, 2014, Bracking & Leffel, 2021). International climate agreements, such as the Copenhagen Accord and the Paris Agreement, do not specify or distinguish between grants and loans when discussing climate finance (Khan et al., 2020), meaning that predominant political economic market logic is de facto perpetuated. Scholars have emphasized that debt-based instruments may thus reinforce dependencies, indebtedness and systemic inequities between countries (Roberts et al., 2021; Khan et al., 2020; Ledger & Klöck, 2023; Bracking & Leffel, 2021).

All in all, as summarized in the top section of Table 3.2, the literature refers to various determinants, alongside vulnerability, that underlie adaptation finance allocation at the inter-state scale, such as weak institutional capacities/low absorptive capacity (Garschagen & Doshi, 2022; Barrett, 2022; Doshi & Garschagen, 2020), cost-effectiveness and donor interests (Barrett, 2022; Weiler & Klöck, 2021), overrepresentation of western countries in intermediary institutions (Long, 2021; Ciplet et al, 2022), and the prevalence of debt-based instruments over grants (Roberts et al., 2021; Khan et al., 2020; Ledger & Klöck, 2023; Bracking & Leffel, 2021). This enables the economic, financial and

political interests of core nations to take precedence over vulnerability considerations, leading to inequitable inter-state patterns of adaptation finance allocation.

3.4. Allocation and Accessibility of Adaptation Finance at the Sub-National Scale: What Role for Climate Vulnerability?

Although the climate justice narrative has historically been framed primarily from an inter-state perspective (Ciplet et al., 2022; Fisher, 2015), equity considerations do not cease at state borders. Climate vulnerability is ultimately experienced as a local issue, and local and regional inequalities exist within countries, just as they do between countries. Despite scholars identifying spatial injustice and within-country differences as a major concern relatively early on in adaptation scholarship (Shi et al., 2016), few studies focus on how adaptation finance is accessed and allocated unevenly within countries. Consequently, this remains an overlooked topic in current scholarship on adaptation finance.

Existing evidence, primarily derived from the Global South, suggests that the role of vulnerability in the sub-national allocation of adaptation finance is inconclusive. For instance, in Bangladesh, disaster risk finance is positively correlated with the most vulnerable and risk-prone districts (Karim & Noy, 2020). However, Barrett's study (2014) in Malawi reveals that within-country allocation of adaptation finance is driven by factors such as cost-effectiveness, donor utility, and absorptive capacity, rather than vulnerability. The latter indicates that adaptation finance allocation within countries is influenced by development aid logic similar to those observed at the international level (Doshi & Garschagen, 2020; Weiler & Klöck, 2021; Barrett, 2015).

The marginalization of sub-national actors in adaptation finance governance, as well as disconnections and systemic barriers within multinational climate funds – referred to as the missing middle (Omari-Motsumi et al., 2019) – offer a potential explanation for the observed trends. What is more, power imbalances between different levels of government, similar to those underlying inter-state disparities, have been found to result in differential access to adaptation finance among local governments Colenbrander et al., 2017).

Empirical evidence from Kenya demonstrates that the introduction of structural reforms resulting in heightened levels of devolved and decentralized frameworks for climate adaptation finance has yielded notable enhancements in the allocation of adaptation finance to the most vulnerable districts (Barrett, 2014). The improvements described were the result of meticulous planning and the efforts exerted by coordination committees, which actively fostered heightened transparency, enhanced

participation and diminished politicization (Barrett, 2015). This finding confirms that sub-national adaptation finance is influenced by governance structures and political dynamics.

The existing body of literature on adaptation finance accessibility and allocation at the sub-national level can gain valuable insights from disciplines such as urban planning, climate urbanism and territorial politics. In addition, recognising the complexity and heterogeneity of the state is crucial to understanding the subnational inequities arising from climate finance. Taking the above as a point of departure, we build on Shi (2020) and structure the discussion on sub-national adaptation finance and its accessibility and allocation around two major and interrelated inequitable patterns: urban-rural inequitable climate protection and inter-urban inequitable climate protection.

3.4.1. Urban-rural disparities

As society wrestles with the climate crisis, scholars have framed the dominant development and policy paradigm as one of climate urbanism (Castán Broto & Robin, 2021), defined as: "a policy orientation that (1) promotes cities as the most viable and appropriate sites of climate action and (2) prioritizes efforts to protect the physical and digital infrastructures of urban economies from the hazards associated with climate change" (Long & Rice, 2019, p. 1). Considering the recognition of cities as primary locations for climate adaptation and mitigation initiatives (van der Heijden, 2019) and significant recipients of climate finance (Long, 2021), it is plausible that cities are gaining a head-start in terms of adapting to climate change compared to their rural counterparts.

Indeed, Shi (2020) shows the current policy paradigm of climate urbanism creates a competitive arena in which large cities appropriate resources from rural communities, turning rural communities into "sacrifice zones" (p.56). In so doing, climate change reinforces the historical extractivist relationship between the urban and the rural, deepening vulnerabilities in rural areas (Shi et al., 2021). Recent studies indicate that this extractive relationship might extend beyond the realm of natural resources and also apply to climate adaptation finance. Although not focusing uniquely on climate adaptation, Seong et al. (2022) find that grants from the Hazard Mitigation Grant Program in the USA are disregarding rural communities, with grants primarily flowing to urban areas. This occurs because, in comparison to their metropolitan counterparts, rural towns experience more severe budgetary limitations, are unable to meet the cost-sharing requirement and lack the bureaucratic capabilities to apply for these federal grants (Seong et al., 2022).

In Europe, similar processes of urban-rural inequality can be observed, as is the case with EU Next Generation Funds. With a significant portion (over 37%) of these funds specifically earmarked for addressing climate change, the NextGeneration Funds hold substantial importance as a source of climate finance for local governments within the European Union. With grants and loans subject to intra-country distribution, territorial coordination and balance are lacking (Losada & Martinez, 2022;

Ferry, 2022). For example, in Spain, despite the national recovery plan addressing both urban and rural concerns, there is a noticeable absence of crucial synergies and insufficient collaborative efforts and actions between urban and rural administrations. Moreover, limited steps have been taken to address uneven capacities and promote interterritorial collaboration (Seong et al., 2022).

Even in cases where municipal capacity imbalances are being targeted, such as in Italy, where the national government plans to hire "3,800 experts (of which 2,800 in the southern regions), where larger gaps exist between the tasks to be fulfilled and the human resources and skills available" (Fedeli, 2022, p.14), it remains questionable whether the efforts are sufficient at addressing the vast territorial unbalances that exist, not just between rural and urban administrations, but also more generally between historic north-south development inequalities and inter-urban disparities.

3.4.2. Inter-urban disparities

The accessibility and allocation of climate adaptation finance also often generates inequalities *between* cities. For example, in the context of the Next Generation Funds, Ferry (2022) states that in England: "Cities enter into deal-making with varied experience and resources, producing an unbalanced set of agreements across the country with competitive bidding that places funding decisions with central government" (p. 51). With many cities, primarily secondary cities where climate finance is not yet the norm (Hilbrandt & Grafe, 2023), lacking resources and access to financial markets, adaptation will in many cases be privately led. Teicher (2018) refers to *competitive resilience* to highlight how private actors such as real estate firms invest in adaptation actions to attain a competitive advantage. They raise a cautionary note that patterns of intra-urban inequity – for example, where market-driven real estate projects transfer vulnerability from the privileged onto disadvantaged groups – are particularly likely to manifest in resource-constrained secondary cities, where reliance on private sector resources for climate change adaptation is higher. In these cities, the act of welcoming and attracting private wealth may confer upon private actors an increased influence in city governance and climate adaptation planning (Teicher, 2018). This observation resonates with the concerns raised by other scholars who have highlighted the potential encroachment of financial actors on urban governance (Bracking & Leffel, 2021).

Ultimately, these warning signs are based on the premise that local governments do not operate at equal starting points. Shi et al. (2016) argue that "the lack of adaptation by cities with fewer resources represents a fundamental form of spatial injustice, as future resilience to climate impacts will exacerbate existing developmental gaps between large, wealthy cities and 'the rest'" (p.133). While financial resources are widely recognized as a significant barrier to adaptation, certain local governments encounter more pronounced constraints (Shi et al., 2016). Part and parcel of this inequitable dynamic is how finance interacts with race and other intersectional realities historically

in space (Kish & Leroy, 2015); for example, Ponder (2021) has shown how territorial blackness and financial risk are linked in how majority-Black cities in the USA paid more for their water infrastructures than majority-white cities.

Unequal starting positions between cities in adaptation are further compounded by uneven access to financial markets and differences in creditworthiness across local administrations. Research conducted by Rashidi et al. (2019) reveals that credit ratings can be downgraded by up to three levels in the wake of climate disasters, with the severity of the event playing a significant role. Consequently, cities that require climate adaptation finance after recent climate disasters may paradoxically face challenges in accessing the necessary finance due to their lower creditworthiness. Bracking & Leffel (2021) argue that differential access to climate finance at the sub-national level exists because "neoliberal market-based logics reward the most creditworthy cities with direct municipal access to debt finance, while excluding those cities unlikely to produce secure derivative income streams to guarantee repayment" (p. 11). Hilbrandt & Grafe (2023) demonstrate how standardising adaptive infrastructures makes them investable and bankable. They underline how this can have a catalytic effect as the first project funded establishes a track record and demonstrates financial expertise and a readiness to financialize infrastructure. This catalytic effect results, according to Hilbrandt & Grafe (2023) in a "geography of relational absences and presences" (p. 334) in urban climate finance, with a restricted number of projects in a limited number of cities absorbing the majority of funds.

While the urban-rural and inter-urban disparities stand out as prominent examples of sub-national inequities, various other forms of sub-national inequity exist. For example, Shi & Varuzzo (2020) show how financial incentives favouring development in flood-prone regions may alter future municipal revenue streams in the context of climate change. They conclude that coastal municipalities face varying degrees of fiscal risk from sea level rise and argue that this uneven landscape of fiscal vulnerability may increase inequities between local administrations to cope with the impacts of climate change (Shi & Varuzzo, 2020).

All in all, as summarized in the middle section of Table 3.2, evidence from the literature shows that vulnerability is not the main determining factor in the accessibility and allocation of adaptation finance at the sub-national level. Although vulnerability plays some role in certain contexts, it is evident that the accessibility and allocation of adaptation finance relies on a range of factors including institutional capacities, political dynamics and interests, governance structures, budget scarcity, and access to financial markets. These findings highlight the political and socio-ecological nature of adaptation finance, emphasising the importance of considering territorial and scalar politics and competition.

3.5. Local Accessibility and Allocation of Climate Adaptation Finance: To What Extent do Local Climate Adaptation Investments Prioritize Climate-Vulnerable Residents?

The 2022 IPCC Working Group II report emphasizes that "the greatest gains in well-being can be achieved by prioritising finance to reduce climate risk for low-income and marginalized residents [...]" (Intergovernmental Panel on Climate Change, 2022, p. 32). However, empirical data on adaptation finance flows is largely lacking (Robin, 2022) making it difficult to assess how financial flows and processes relate to local equity. To outline what happens when finance reaches the local level, we consider the political economic processes shaping the deployment of local climate adaptation finance, emerging financial instruments and the equity impacts of green infrastructure investments.

To adapt to the consequences of climate change "municipalities are experimenting with a range of financial instruments, including tax increment financing (TIF), green bonds, in-lieu fees, mitigation banking and offsets, as well as credit trading [...]" (Cousins & Hill, 2021, p.3). These forms of financial experimentation are an expression of a much broader societal and economic shift from entrepreneurial urbanism, in which the provision of public services is largely privatized and outsourced to private companies (Harvey, 1989; Ward, 2003), to financialized urbanism, in which financial markets and institutions become increasingly important in the governance of a city – a process also known as financialization (Peck & Whiteside, 2016).

Emerging evidence from urban political ecology and the wider critical geography field suggests that the silver bullet discourse around finance needs to be problematized. Climate finance instruments such as green bonds, for example, have been shown to lead to inequitable urban socio-spatial impacts (Bigger & Millington, 2020; Christophers, 2018; García-Lamarca & Ullström, 2022). Similar to the dynamics of inter-state allocation of adaptation finance, this phenomenon can be attributed to the fact that green bond investments promote neoliberal economic growth logic, prioritising ideals such as profitability and a secure return on investment (García-Lamarca et al., 2022a). Under such principles, vulnerability assumes a subordinate position.

However, relatively positive evaluations on climate finance at the urban level also exist, for instance by those emphasising "healthy credit" (Castree & Christophers, 2018) or those pointing to the potential of finance to achieve justice goals depending on the political-economic context in which it is deployed (Fainstein, 2016). How climate finance is deployed and enacted matters, in this regard, Webber et al. (2022) make a valuable contribution by proposing a reparative logic to truly foster socially just outcomes. Additional noteworthy suggestions are made by Rubin et al. (2023, p.2) who

put forward four evidence-based guidelines to prioritize equity in climate adaptation finance, which involve upholding community autonomy, pursuing transformative approaches, avoiding maladaptation, and promoting integration across sectors when funding adaptation projects.

Despite contrasting proposals and positions, scholars agree on the need for caution. In the context of financialized climate governance, urban power may be shifting from the city government to financial actors and institutions (Bracking & Leffel, 2021). Under their influence, policymakers may be tempted to ignore vulnerability indicators by prioritising less risky investments that lead to more immediate and visible results, such as high-value assets concentrated in urban centres at the expense of more climate-vulnerable areas (Long & Rice, 2019; Keenan et al., 2019; van der Heijden, 2019). Indeed, not only do rating agencies reward and punish some cities over others, as we have seen previously, but they also influence the way in which adaptation and resilience are implemented based on their neoliberal perception of what "counts" as resilience (Cox, 2022).

The financialization of urban climate governance is evident in the prevailing development and policy framework of climate urbanism, which has been described as "business-as-usual capitalism with climate characteristics" (Shi, 2020, p.59), representing a "technocratic, neoliberal approach to development" (Long et al., 2020, p.44). One manifestation of the latter is the conventional top-down nature of planning for climate adaptation that excludes the use of local scientific data and local knowledge (Coger et al., 2022). In the absence of local vulnerability assessments (Olazabal et al., 2019), poor adaptation planning and related adaptation investments are likely to lead to maladaptation or unintended negative consequences of adaptation actions (Schipper, 2020).

By prioritising financial and political interests, and disregarding local climate vulnerability data, climate adaptation investments not only overlook vulnerability but also have the potential to worsen it. Research shows that urban climate adaptation projects are often unresponsive to vulnerability needs, leading to inequitable outcomes and uneven climate protection (Shi, 2020; Cousins & Hill, 2021; Bigger & Millington, 2020; Anguelovski et al., 2016; Klein et al., 2018; Mohtat & Khirfan, 2021; Shokry et al., 2020). Studies have shown that urban adaptive infrastructures contribute to processes of gentrification and socio-spatial exclusion (Anguelovski et al., 2016; Shokry et al., 2020; Anguelovski et al., 2019; Keenan et al., 2018; Anguelovski et al., 2022). For instance, (green) adaptative infrastructures may be concentrated in economically valuable areas or raise property prices in poor neighbourhoods, leading to the displacement of poor and marginalized residents (Anguelovski et al., 2016; Shokry et al., 2020; Anguelovski et al., 2019; Keenan et al., 2018; Garcia-Lamarca et al., 2021; Swanson, 2021). Garcia-Lamarca et al. (2022b) show how private players seeking to decrease their financial risk may co-opt public greening interventions, often part and parcel of climate adaptation responses. They argue that the allure of green areas decreases financial

risk for investors by ensuring a predictable return on investment. As a result, investors choose premises adjacent to these "natural" areas, subsequently hijacking their social, economic and health benefits, in a process that they coin "urban green grabbing".

Scholars point out that climate urbanism research needs to elaborate on the shortcomings of technocratic and pro-growth urban climate interventions (McKendry, 2020). Though in its early stages, this need is beginning to be addressed. According to Bulkeley (2022), a third wave in climate urbanism research is focusing on "scrutinising questions of power and of how, and by and for whom, climate urbanism is being enacted" (p. 280). Elementary to this body of scholarship is the realization that urban climate projects are not neutral or win-win interventions but rather competitive processes in which vested financial and political interests operate (Castán Broto & Robin, 2021; Cox, 2022; Shokry et al., 2020; Rice et al., 2020).

Such dynamics have long been identified in critical urban theory (Harvey, 1989), for example through what Graham and Marvin (2001) call splintering urbanism, which has parallels with emerging work on climate apartheid. Splintering urbanism draws attention to urban areas experiencing growing spatial divisions and fragmentation along socio-economic, racial and environmental lines. These spaces are marked by significant economic disparities and stigmatization, which further exacerbate social and environmental injustices. In the context of climate change, the expansion of enclaves and exclusionary spaces resonates with what scholars are calling climate apartheid (Long et al., 2020; Rice et al., 2021; Robin et al., 2020). While relevant to the climate urbanism literature and debate in illustrating manifestations of climate inequities (Robin et al., 2020), this concept more broadly refers to a global system of segregation between the climate-privileged and the climate-vulnerable (Long et al., 2020). Building from Desmond Tutu's use of apartheid in a 2008 Human Development Report, stating that "adaptation is increasingly becoming a euphemism for global-scale social injustice" (United Nations Development Programme, 2007, p.166), the concept draws attention to the ways in which climate protection intersects with race and other positions and backgrounds.

Some of the emerging urban climate finance literature directs its attention toward such concerns. For example, Claussell (2022) demonstrates how, through a "blue-lining" process – inspired by the historic racist practice of red-lining – banks split urban areas into climate sacrifice zones and climate-safe havens and decide whether or not to give loans based on new lines of risk, such as susceptibility to flooding. These sacrifice zones disproportionately affect communities of colour who subsequently have less access to finance to adapt their neighbourhoods to rising sea levels, echoing work by Ponder (2021) linking territorial blackness and financial risk. Similarly, calls have been made for adaptation finance to better take into account gender inequities by becoming gender-sensitive (Schalatek, 2020; Wong, 2016; Zagema et al., 2023). There is a need to deepen emerging research on how financial

processes intersect with race, gender and other intersectional positions, to more carefully comprehend how such positions connect into multi-scalar patterns of climate adaptation finance and examine the extent to which the institutional makeup of financial processes may sustain said climate apartheid.

All in all, as summarized in the bottom section of Table 3.2, the literature so far demonstrates that local climate adaptation investments often overlook vulnerability, contribute to and deepen gentrification and socio-spatial exclusion, and may be co-opted by private players seeking financial returns. The financialization of local climate governance, combined with top-down, technocratic, and pro-growth planning approaches, frequently results in maladaptation. Amidst this context, power dynamics and vested interests take precedence over the role of local vulnerability assessments (which are often missing). Thus, the drivers of local accessibility and allocation of climate adaptation finance extend beyond vulnerability, encompassing political-economic factors and the influence of financial actors prioritising profitability.

Table 3.2: Multi-scalar inequitable patterns of climate adaptation finance in the climate finance arena, illustrating rippling climate finance

Scale	Driving forces behind inequitable patterns of climate adaptation finance
Inter-state Inequitable climate protection between countries	Disparities in (perceived) institutional capacity, investment readiness and absorptive capacity (Garschagen & Doshi, 2022; Barrett, 2020; Doshi & Garschagen, 2020; Islam, 2022).
	Lack of clear rules on what counts as climate finance (Roberts et al., 2021).
	A disproportionately high reliance on market and debt-based instruments that perpetuates systemic dependency and inequality (Roberts et al., 2021; Khan et al., 2020; Ledger & Klöck, 2023; Bracking & Leffel, 2021).
	Cost-effectiveness and donor interests (Barrett, 2022; Weiler & Klöck, 2021).
	Overrepresentation of core countries (the West) in climate finance intermediary organisations and unequal relations of power in adaptation decision-making (Scoville-Simonds et al., 2020; Ciplet et al., 2022; Webber et al., 2020).
	Multiplicity of multilateral climate funds and their distinct procedures, standards and rules (Kalaidjian & Robinson, 2022).
Sub-national Inequitable climate protection between cities & Inequitable climate protection between cities and rural communities	Cost-effectiveness and donor interests (Barrett, 2022; Weiler & Klöck, 2021).
	Disparities in track records that demonstrates financial expertise and a commitment to financialize infrastructure (Hilbrandt & Grafe, 2023).
	Unequal access to financial markets and disparities in creditworthiness (Bracking & Leffel, 2021; Rashidi et al., 2019).
	Insufficient bureaucratic/administrative capacities or absorptive capacities (Barrett, 2015; Omari-Motsumi et al., 2019; Shi, 2020; Seong et al., 2022).
	Sub-national actors sidelined due to disconnections and systemic barriers in multinational climate funds (the missing middle) (Omari-Motsumi et al., 2019).
	Appropriation of resources by cities from rural communities (Shi, 2020; Shi et al., 2021).
	Political representation and lobbying efforts of (big) cities vs. small cities or rural communities (Shi, 2020; Payson, 2021).
	Lack of territorial coordination at the national level (Losada &Martinez, 2022; Ferry, 2022).
	Varied levels of experience among local governments to apply for competitive funds (Ferry, 2022).
	Uneven landscape of municipal fiscal vulnerability (Shi & Varuzzo, 2020).
Local Inequitable climate protection within local administrations or communities	Financial and private actors encroaching upon local governance of climate change (Bracking & Leffel, 2021; Teicher, 2018).
	Top-down approaches that do not draw on local knowledge or local scientific data (Colenbrander et al., 2017; Coger et al., 2022).
	Bankability of projects and the power of investors: return on investments are prioritized over public and social values (van de Heijden, 2019).
	Gentrification and displacement of disadvantaged communities due to urban revalorization and rising property prices following green adaptive infrastructure (Anguelovski et al., 2016; Anguelovski et al., 2019; Anguelovski et al., 2022; Garcia-Lamarca et al., 2021).
	Appropriation of financial and social benefits of green adaptive infrastructure by elite groups (Garcia-Lamarca et al., 2022b).

3.6. Discussion

As summarized in Table 3.2, the literature reviewed tacitly demonstrates that the most vulnerable groups at each scale — be they vulnerable states, sub-national administrations or local communities — are not the ones who benefit most from climate adaptation finance, giving rise to multi-scalar inequities of climate adaptation finance. Within each scale, the relatively resilient, capable and powerful actors who are better-positioned to defend their political and financial interests, seem to attract and benefit most from climate adaptation finance. Instead of narrowing the gaps in climate protection, our review shows climate adaptation finance – quite paradoxically – may exacerbate and deepen existing disparities, not just between countries, but across scales and geographies, raising questions of justice and maladaptation.

We hypothesize that the multi-scalar inequities of climate adaptation finance crystallize into safe havens and sacrifice zones across scales and geographies, and are driven by a complex interplay of competing political interests, environmental concerns, and societal dynamics. Despite climate finance's inherent political nature, there are ongoing efforts to depoliticize climate adaptation investments, either directly or indirectly. The key literature on international adaptation finance primarily focuses on institutionalized climate funds at the international level, often neglecting the accessibility and allocation processes at the subnational and local levels, as though finance will miraculously "trickle down" to effectively benefit those in greatest need once it reaches a country. In this light, we propose the *climate finance arena* as a valuable concept in relation to climate finance overall. This conceptualization builds on Hilhorst & Jansen's (2010) concept of a humanitarian arena and helps open up regional and local ontologies of climate finance (Fisher, 2023). While the literature speaks of a climate finance "architecture" (Garschagen & Doshi, 2022; Watson et al., 2022) or climate finance "landscape" (Barrett, 2022; Weikmans, 2023; Climate Policy Initiative, 2021), we believe a more dynamic conceptualization like *climate finance arena* is needed to do justice to the messy actualities and scalar and territorial politics of climate finance.

In the climate finance arena, forms of domination can be subtle, such as in the case of knowledge-sharing city platforms, but also rather crude in the form of lobbying. For example, Mocca (2018) shows how city coalitions and networks may reinforce "asymmetrical relationships among network members, enabling the ´soft domination' of more advanced cities over less successful ones" (p. 140). While not specifically centred on adaptation finance, Payson (2021) illustrates how cities advocate for funding across various policy domains within a federal framework. This lobbying results in increased state finance flowing to these cities, particularly those with more significant financial resources, thus exacerbating inequities. In many ways, the notion of competitive resilience, although intended to refer to private actors at the intra-urban level, also holds for competition between local governments. The concept of the climate finance arena recognizes this competition at local and sub-

national levels and puts greater emphasis on their agency. This emphasis is necessary because sub-national and local political interests and agendas are often ignored in climate adaptation planning, whereas local and sub-national actors such as cities increasingly lead climate adaptation processes (Kythreotis et al., 2020). By recognising the agency of various actors, such as intermediaries and local recipients, and acknowledging the pivotal role of negotiating funding conditions, including the negotiation of vulnerability, we believe that an arena approach has the potential to advance climate finance scholarship.

At the same time, adopting a heuristic approach, we acknowledge that this critical review falls short of fully capturing the intricacies and interconnectedness of scales and spatial dynamics. Inspired by the concept of scale framing, we acknowledge scale is "[…] not simply a fixed level in a hierarchy of territories that cascade downwards from the international through the national to the urban" (Kythreotis et al., 2023, p.5), but moves in all directions, opening up avenues for alternative scalar configurations. While we bring to light the inequitable patterns "within" each of the three scalar typologies discussed, less is known about how scaled processes (MacKinnon, 2010, p.21) interact with others to create the nuanced multi-scalar configurations that ultimately determine who benefits from climate adaptation finance. Future research could investigate how disparities in the accessibility and allocation of climate finance not only persist and are (re)produced within each spatial scale, but also across and between different spatial scales. This topological thinking "includes considering the ways in which these spaces are entangled in and shape extant territorial divisions and inequalities […]" (Hilbrandt & Grafe, 2023, p.2).

Within the climate finance arena, and following this thinking, we hypothesize that finance does not trickle or cascade down according to vulnerability, but *ripples* across scales and sectors as a political-ecological process facilitating opportunities for some while debilitating others. Naturally, climate finance involves more than just distributing resources—it also involves attracting them. Similar to how ripples in water spread out, finance as a political-ecological process moves both vertically up and down and horizontally in and out. It is attracted (inward) and distributed (outward) through the actions of political actors who negotiate access and opportunities navigating scales. For instance, local administrations lobby to attract and access finance at higher levels (vertical) while competing and collaborating with other local administrations, e.g. in city coalitions (horizontal). Simultaneously, decisions made at higher levels can impact sub-national and local levels, such as EU funding programmes affecting local communities (vertical). Within these rippling movements of negotiating the accessibility and allocation of finance, our review demonstrates finance seems to benefit the relatively resilient and powerful actors across scales and sectors who are better able to defend their interests. For this reason, we propose the concept of 'rippling' as a means to draw attention to political and institutional inequities, discrepancies in the allocation of and accessibility

to finance, as well as the associated terms and conditions. This concept also underscores the need and responsibility to create a more single-level playing field within the climate finance arena. Understanding how public and private climate finance ripples across different scales and sectors, creating opportunities and barriers, while actors navigate, negotiate and compete in both vertical and horizontal ways, requires deeper investigation.

3.7. Conclusion

This critical literature review, bringing together a wide range of disciplines including development studies, international relations, political economy, political ecology, critical geography and urban planning, explored to what extent climate vulnerability is a determinant in the accessibility and allocation of climate finance at multiple scales. In so doing, we brought into conversation scholarly debates around international climate finance allocation and urban climate finance, while also shedding light on the relatively overlooked issue of sub-national accessibility and allocation of climate adaptation finance.

We find evidence that climate vulnerability is not the main determinant for accessibility and allocation of climate adaptation finance at inter-state, sub-national and local scales, and that climate adaptation finance can exacerbate existing vulnerabilities and create new ones. In this context, climate adaptation finance is subject to various financial and political interests, shaped by varying institutional capacities, and characterized by a highly competitive process. Table 3.2 summarizes the driving forces behind the inequitable patterns of climate adaptation finance identified in the literature based on each of the three scalar typologies. Based on this evidence, we argue that climate adaptation finance cannot be represented as a static landscape or architecture; rather, it operates within a dynamic *arena* as a political-ecological process, creating *ripples* that manifest as opportunities for some, and barriers for others.

At the international level, climate finance debates largely neglect the agency of sub-national and local actors to attract and compete for finance accessibility and allocation, falsely assuming that sub-national and local priorities naturally align with international and national political priorities. As the next steps for scholarship, we urge scholars engaged in climate adaptation finance research at the international level, particularly those addressing justice concerns, to broaden their scope and recognize the significance of regional and local actors and political processes. In essence, adopting a multi-scalar analytical approach emerges as a critical next step in effectively addressing inequitable climate adaptation. This approach underscores the climate finance landscape as a messy arena where various stakeholders, including both providers and recipients of climate finance, along with the most vulnerable, exert agency. Operating from varying levels of vulnerability and capacity to attract, access, and manage climate finance, they engage in negotiation, collaboration, and competition to

secure climate protection. In light of this context, we advocate for national-level policymakers to strengthen state interventionism and facilitate national-level coordination that prioritizes vulnerability to promote fair adaptation opportunities among sub-national administrations. This entails, among other factors, taking into account the disparities in climate and fiscal vulnerabilities, the divergence in financial and technical capacities, and the unequal access to financial markets for climate adaptation initiatives.

Our approach, rejecting an ideal-type "landscape" or "architecture", enables a deeper exploration of the scalar politics involved in climate finance. By illustrating how climate finance isn't distributed or accessed based on vulnerability, but instead, is entangled in complex power asymmetries that ripple into multi-scalar inequities, we draw focus away from (international) discussions centred on quantity (X billion in climate finance), towards the quality and conditions of climate finance as a political-ecological process. Through this endeavour, we aspire to enrich climate finance debates.

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Chapter 4. Winners and Losers in European Urban Climate Change Adaptation Funding and Finance[6]

Abstract

Despite increased attention to climate finance in urban adaptation, empirical data about funding barriers, practices, and equity implications is lacking. In a first-of-its-kind survey, we analyse results from 148 urban administrations across 17 EU countries. Our results reveal widespread financial constraints (>85% of administrations), insufficient staff capacity (73%) and low levels of political support (43%). Additionally, we find limited participation of vulnerable groups and inadequate consideration of climate risks and vulnerability when allocating resources. These challenges disproportionately affect small municipalities, which report more difficulty in accessing EU funding programmes and private finance. Towns lag behind cities, and Southern Europe lags behind Northern Europe, in funding adaptation measures. Paradoxically, higher climate risk levels do not correlate with easier access to funding or increased funding availability. With reliance on public funding over loans, we nuance the role of financialization in urban climate governance and suggest avenues for future research, policy and practice.

Keywords: climate adaptation, funding, financing, equity, justice, vulnerability, local governments, urban climate adaptation, loans, adaptation planning, evidence synthesis.

[6] This chapter is under review in: **Venner, K**., Olazabal, M., García-Lamarca, M., Treville, A., Arbau, L. C., & Bertoldi, P. (under review). Winners and losers in European urban climate change adaptation funding and finance. *Nature Communications.*

4.1 Introduction

The urgency of the climate crisis has awakened a renewed attention to municipal finance as a means to facilitate effective climate action on the ground (Colenbrander & Barau, 2019). Research shows that local governments are experimenting with a wide variety of financial instruments to adapt to the consequences of climate change (Cousins & Hill, 2021). As a consequence, urban climate governance is increasingly enmeshed in financial logics, e.g. becoming more financialised (Bracking & Leffel, 2021; Long et al., 2020). Often conflated or used interchangeably, funding and finance refer to distinct processes that have their own challenges and dynamics (Keenan et al., 2019. While funding entails non-repayable monetary support, finance involves borrowed funds, typically in the form of debt with interest rates (Carbon Disclosure Project North America, 2023; Bertoldi et al., 2021). As public funds are limited, private finance is currently encouraged as a possible solution for the climate crisis by multilateral development banks and national governments (Long, 2021). While research on climate finance tends to focus on innovative instruments and attracting private finance, climate urbanism, urban political ecology and critical geography scholars raise important questions as to how funding and financing climate action impacts vulnerable groups (Bigger & Millington, 2019; Hofmann et al., 2024; Knuth et al., 2023; García-Lamarca & Ullström, 2022; Ponder, 2021; Johnson, 2021; Diezmartínez & Short Gianotti, 2024; Wójcik et al., 2024).

Although positive strides are being made, research is still inconclusive about how financial processes affect vulnerable groups across scales, including how it may create inter-urban inequity. The many financial instruments available for cities have created confusion (Keenan et al., 2019), and many unknowns remain about the actors involved in flows of urban climate finance (Robin, 2022). Empirical data is needed to obtain an evidence-based understanding of how local governments navigate the funding and financing of urban climate adaptation. Such an understanding can help assess the extent to which financialization is unfolding and identify trends in inter-urban adaptation progress.

Empirical studies so far are mostly confined to specific climate finance instruments and projects (Robin, 2022), with notable examples including research on green bonds in Gothenburg ((García-Lamarca & Ullström, 2022), Mexico City (Hilbrandt & Grafe, 2023), Cape Town and New York (Bigger & Millington, 2019). Large-scale studies on urban climate adaptation finance have primarily centred on the United States (Cousins & Hill, 2021; Moser et al., 2019), with notable exceptions such as the ongoing European Pathways 2 Resilience project (England et al., 2023). While some studies in Europe have offered insights into the use of financial instruments for climate mitigation (Bertoldi et al., 2021; Economidou et al., 2024; Bourgeois et al., 2022; Ulpiani et al., 2023), there remains a notable scarcity of empirical data and understanding regarding financing EU local climate adaptation,

particularly beyond large-sized municipalities (Fila et al., 2024; Fünfgeld et al., 2023; Ricciardi et al., 2023).

In the European context, three significant gaps exist: a lack of empirical data on the use of finance and funding arrangements for urban climate adaptation, limited research on small and medium-sized municipalities, and insufficient exploration of the links between barriers to both funding and financing adaptation, and their equity impacts. Given the European Union's ambition to achieve climate neutrality and resilience by 2050, particularly through initiatives like the Sustainable European Investment Plan (SEIP) under the European Green Deal (Abdullah, 2021; Castán Broto, 2022; European Commission, 2021; European Commission, 2024; European Climate Law, 2021), local governments are anticipated to play a pivotal role. It is thus crucial to comparatively analyse how local governments access funding and finance programmes and allocate adaptation funds, understanding these processes within broader political and economic dynamics.

To address these questions, we surveyed 587 urban municipalities in the EU, achieving a 25% response rate from 148 different-sized urban administrations across 17 EU countries (see Figure 4.1). We unpack the survey results based on 1) the constraints and challenges in implementing adaptation measures, 2) the use of financial instruments for urban climate adaptation measures, and 3) the factors influencing the allocation of climate adaptation funds. We considered multiple variables in our analysis including degree of urbanization, gross domestic product (GDP) per capita, climate risk scores, population size, and location within Europe (see Methods in Appendix A for further details).

4.2. Results

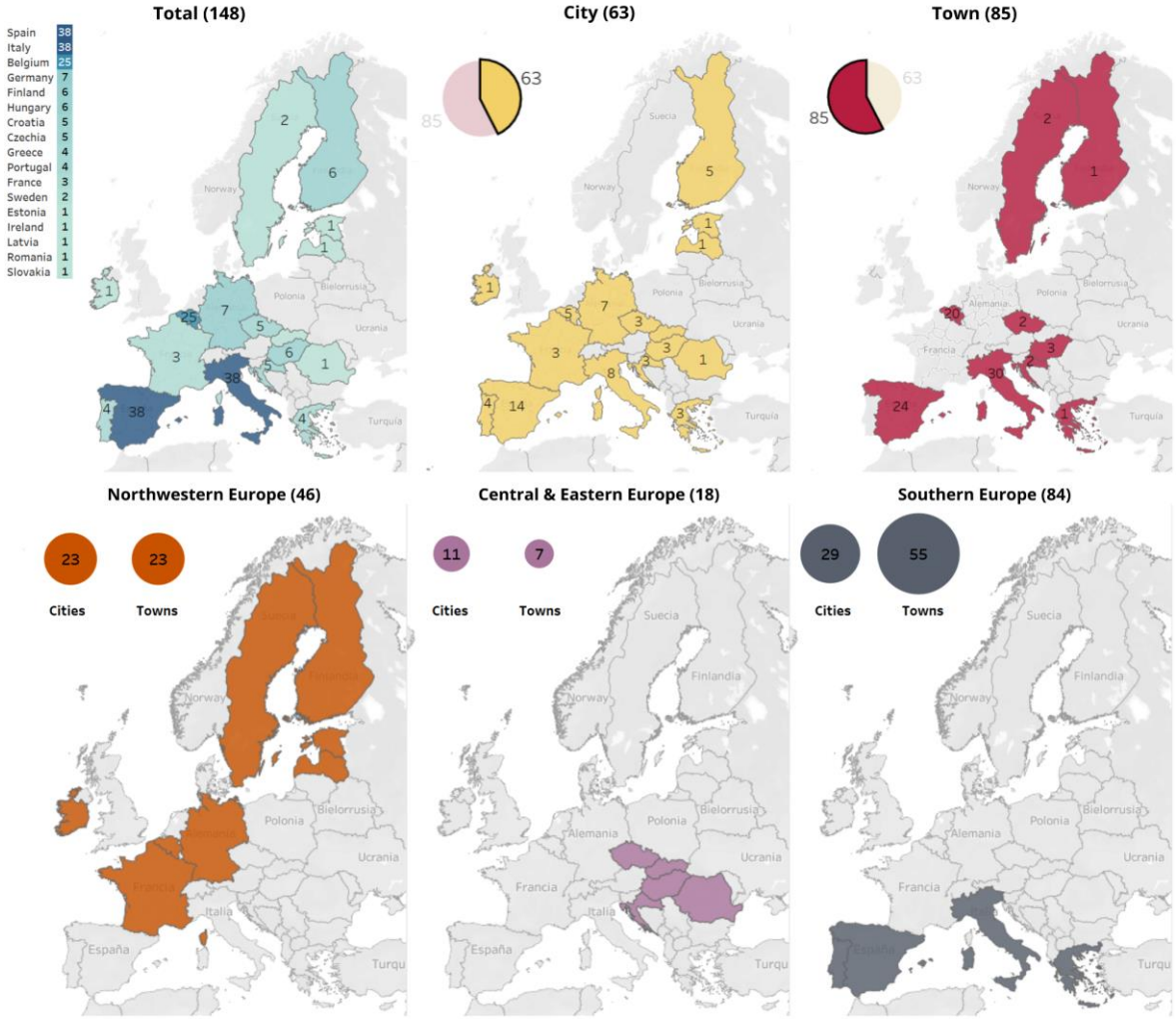

Figure 4.1: Mapping survey respondents by Eurostat's degree of urbanization (a classification using population density, size and contiguity to denominate towns or cities) and European region. Total number of cities and/or towns (N values) indicated between brackets. See Methods in Appendix A for further details.

4.2.1. Constraints and Challenges in Funding Adaptation Measures

The large majority of local administrations (85%) report insufficient funds for the implementation of adaptation measures. Both towns and cities report substantial financial constraints (see Figure 4.2a), but our results point out a relevant North-South divide: while in Northwestern Europe only 10% of local governments report extremely insufficient funds, this rises to 21% in Southern Europe and 28% in Central and Eastern Europe. A statistically significant relationship exists between adaptation fund availability and both GDP per capita and climate risk (NUTS 3 level). Local governments reporting extremely insufficient funds show the highest average climate risk (1.63) and the lowest GDP per capita (€23,062), compared to those reporting insufficient (1.54; €34,104) and sufficient funds (1.52; €34,824). Although local governments reporting extremely insufficient funds have a lower average

population (120,847) than those with insufficient (153,915) and sufficient funds (165,605), no statistically significant relationship exists (See SI, Table A.1-2).

Only 43% of local governments indicate adequate political support for adaptation measures, with towns notably lagging behind cities (Figure 4.2b). Cities in Southern Europe notably affirm the highest political support (69%), contrasting with Central and Eastern European cities (36%) and Northwestern European cities (33%). Nevertheless, 34% of Southern European towns report adequate political support, highlighting the city vs. town divide (See SI, Table A.17). Limited staff capacity is more frequently identified as an obstacle by towns (82%) than by cities (60%). Central and Eastern Europe stands out as an anomaly, with only 50% of local governments indicating staff capacity constraints, in contrast to 78% in Northwestern and 75% in Southern Europe. In these latter regions, particularly Southern European towns (87%) and Northwestern European cities (83%) report staff capacity constraints (See SI, Table A.18).

a) Availability of Funds for Climate Adaptation Measures

b) Statements on Adaptation Barriers

Statement	City / Town	Agree	Neutral	Disagree	Don't Know Response Rate
Our local authority has enough staff capacity to look for funding opportunities and write competitive grant applications (n=147)	City	13%	27%	60%	
	Town	10%	8%	82%	
	Total	**11%**	**16%**	**73%**	
Budget constraints are hindering the implementation of the adaptation measures of our climate plan (n=145)	City	81%	13%	6%	
	Town	82%	14%	4%	
	Total	**81%**	**14%**	**5%**	
There is sufficient political support to implement the adaptation measures of our climate plan (n=132)	City	50%	28%	22%	
	Town	38%	36%	26%	
	Total	**43%**	**33%**	**24%**	
The COVID-19 pandemic added further financial strain to our local authority, making it more difficult to implement the adaptation measures of our climate plan (n=135)	City	56%	32%	12%	
	Town	54%	29%	17%	
	Total	**55%**	**30%**	**15%**	
Our country's National Recovery and Resilience Plan (NRRP) provides opportunities for our local authority to secure funding for climate adaptation measures (n=109)	City	64%	24%	11%	
	Town	63%	27%	11%	
	Total	**63%**	**26%**	**11%**	

Figure 4.2: Constraints and challenges in implementing adaptation measures. Panel 2a illustrates the availability of funds for climate adaptation measures across total, town, city, and European regions (n value varies). Panel 2b displays statements on adaptation barriers along with corresponding agree/neutral/disagree responses. Excluded 'Don't know' responses are illustrated by the bar graphs on the right; the darker the shade of orange, the higher the number of "don't know" responses. The total 'Don't know' response rate is represented by grey bars in 2b.

Our study reveals minimal disparities between cities and towns regarding the COVID-19 pandemic's impact on adaptation efforts. While a slight majority (55%) acknowledges its financial strain, most (63%) also identify adaptation funding opportunities in their country's Recovery and Resilience Plan, with Northwestern (68%) and Southern European (66%) administrations more frequently reporting opportunities. Notably, the "don't know" response rate varies significantly across regions, with Southern European local governments showing an 8% rate, compared to 52% in Northwestern and 44% in Central and Eastern Europe, likely reflecting greater use of the Recovery and Resilience Facility (RRF) for urban adaptation measures in Southern Europe (See SI, Table A.19-20)

In terms of barriers to equitable adaptation, only 26% of urban administrations report that they involve vulnerable groups (or their representatives) in drafting their climate adaptation plans, with only 19% of towns indicating such involvement compared to 43% of cities. Significant regional variations exist, with 23% of Southern European respondents, 31% of Central and Eastern European respondents, and 40% of Northwestern European respondents reporting participation of vulnerable groups in plan creation (See SI, Table A.21-22).

In terms of the accessibility of funding and financing sources, our results reveal a cascading difficulty in meeting conditions and requirements from regional to national to international sources of funding (Figure 4.3). Private investors, EU institutions and programmes and financial intermediaries (banks) are perceived to have the most stringent conditions and requirements, emphasising the need for capacity building in these areas. The high "don't know" response rate for non-public funding sources might indicate limited experience with debt and market-based instruments. Towns face significant challenges meeting funding requirements, particularly with EU institutions and programmes, where 78% report difficulty compared to 46% of cities. Population size is associated with easier access to EU funding programmes, while climate risk is associated with more difficult access to national government funding and financial intermediaries. Local governments reporting ease in meeting EU programme requirements have a larger average population (317,945) compared to those reporting difficulty (102,383). In contrast, those reporting ease in meeting the funding/finance requirements of national governments and financial intermediaries have lower average climate risk scores (1.49 and 1.50, respectively) compared to those reporting difficulties (1.60 and 1.61, respectively). No significant relationship was observed between GDP per capita and access to funding sources (See SI, Table A.4-12).

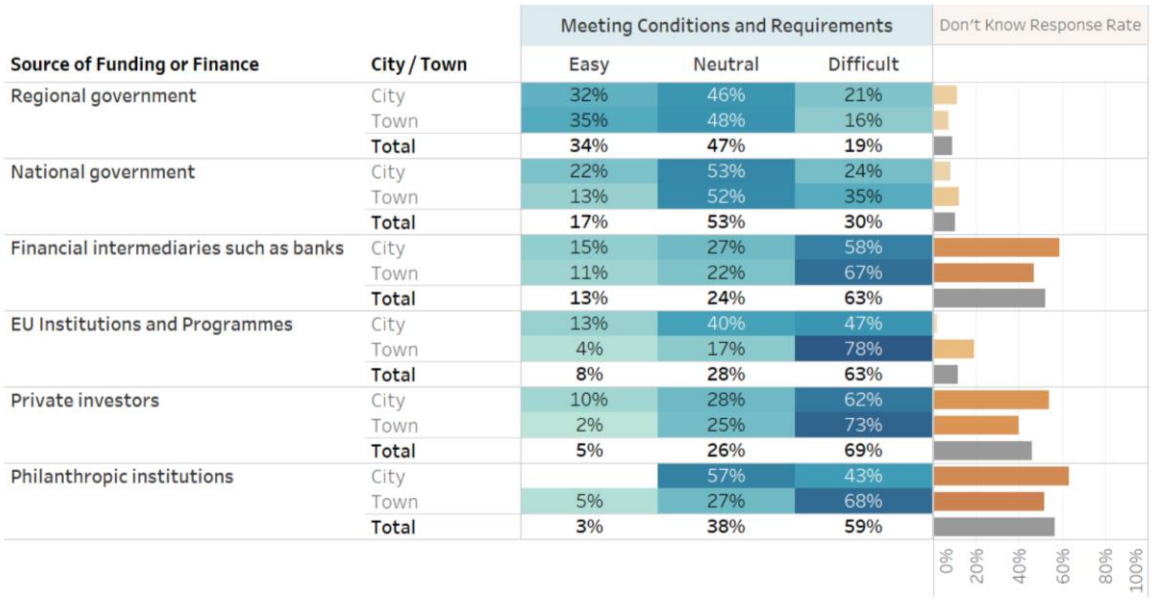

Figure 4.3: Funding or finance accessibility by source as indicated by Towns and Cities, ordered by ease in fulfilling conditions and requirements (N=148). Excluded 'Don't know' responses are illustrated by the bar graphs on the right; the darker the shade of orange, the higher the number of "don't know" responses.

4.2.2. The Use of Financial Instruments for Urban Climate Adaptation Measures

The most commonly reported instruments are local government funds (79%), regional grants/subsidies (63%), national grants/subsidies (55%), and EU grants/subsidies (50%) (Figure 4.4a). In comparison, the use of finance for climate adaptation, particularly debt-based and market-based options like private sector loans and municipal bonds, is relatively low (Figure 4.4a). Over 75% of local administrations report no plans to use debt-based instruments like loans and bonds (towns: around 85%; cities: around 65%), indicating limited financialization on the ground. Among the cities expressing interest in using financial instruments, public loans are preferred over private-sector loans. The least popular instruments are risk mitigation tools, such as insurance, which also exhibit the highest number of 'Don't know' responses, indicating a lack of awareness about these options. The most popular market-based instrument for climate adaptation is public-private partnerships, used by 17% and planned for use by 35% of administrations. In general, the data suggests a diverse profile of local governments expressing interests in debt and market-based instruments, encompassing variations across EU regions, GDP per capita, and population size. Among the 109 local governments that report using local funds, only 16% report using land value capture instruments (54% do not use them; 30% don't know).

a)

Type of Instrument	City / Town	Use of Instrument: Used	Use of Instrument: Planning to use	Use of Instrument: Not planning to use
Local government's own funds	City	85%	12%	3%
	Town	74%	23%	3%
	Total	**79%**	**18%**	**3%**
Regional grants and/or subsidies	City	61%	27%	13%
	Town	65%	31%	4%
	Total	**63%**	**29%**	**7%**
National grants and/or subsidies	City	61%	34%	5%
	Town	49%	45%	6%
	Total	**55%**	**40%**	**5%**
EU/International grants and/or subsidies	City	60%	36%	3%
	Town	39%	52%	8%
	Total	**50%**	**45%**	**6%**
Public private partnership	City	18%	46%	36%
	Town	17%	26%	57%
	Total	**17%**	**35%**	**48%**
Private sector loan	City	18%	13%	69%
	Town	5%	8%	87%
	Total	**10%**	**10%**	**80%**
Public loan	City	16%	24%	59%
	Town	4%	9%	88%
	Total	**9%**	**15%**	**76%**
Risk mitigation instruments	City	11%	22%	67%
	Town	5%	11%	84%
	Total	**7%**	**14%**	**79%**
Municipal (green) bonds	City	10%	27%	63%
	Town		15%	85%
	Total	**4%**	**19%**	**77%**

Don't Know Response Rate

0% 20% 40% 60% 80% 100%

b)

Type of EU Fund or Programme	City / Town	Use of EU Fund or Programme: Used	Use of EU Fund or Programme: Planning to use	Use of EU Fund or Programme: Not planning to use
European Regional Development Fund (including INTERREG)	City	68%	32%	
	Town	53%	36%	11%
	Total	**60%**	**34%**	**5%**
Horizon 2020 / Horizon Europe	City	61%	33%	6%
	Town	28%	48%	24%
	Total	**50%**	**38%**	**12%**
The LIFE Programme	City	59%	28%	13%
	Town	20%	53%	27%
	Total	**43%**	**38%**	**18%**
EU's Recovery and Resilience Facility / NextGenerationEU	City	35%	59%	6%
	Town	33%	59%	9%
	Total	**34%**	**59%**	**8%**
European Social Fund	City	38%	28%	34%
	Town	31%	47%	22%
	Total	**34%**	**38%**	**28%**
Cohesion Fund	City	41%	22%	37%
	Town	22%	39%	39%
	Total	**32%**	**30%**	**38%**
Urbact III & IV	City	41%	41%	19%
	Town	13%	44%	44%
	Total	**31%**	**42%**	**27%**
European Urban Initiative or Urban Innovative Actions	City	16%	61%	23%
	Town		65%	35%
	Total	**10%**	**63%**	**27%**
The Just Transition Fund	City	5%	42%	53%
	Town	5%	20%	75%
	Total	**5%**	**31%**	**64%**

Don't Know Response Rate

0% 20% 40% 60% 80% 100%

Figure 4.4: (a) Overview of financial instrument usage categorised by City / Town, arranged according to the *Used* column from highest to lowest usage (N=148). (b) Overview of the use of EU funding programmes and funds categorised by City / Town, arranged according to the *Used* column from highest to lowest usage. For this second panel, the sample size is 112, as this question was restricted to those who had indicated they had used or planned to use EU funds (4a), following a skip logic. Specifically, 29 local governments were excluded because they responded with "don't know," and 7 were excluded for not indicating any experience or plans to use EU funds. For both panels, the percentages in the *Use of Instrument* column represent usage excluding "don't know" responses. In contrast, the bar graphs on the right depict the proportion of 'Don't know' responses relative to the respective sample size; the darker the shade of orange/red, the higher the number of 'Don't know' responses.

Cities report primarily using Horizon 2020/Europe, the LIFE program, and the European Regional Development Fund (ERDF) for urban adaptation, while towns mainly rely on the ERDF and NextGeneration EU (Figure 4.4b). Overall, cities demonstrate greater experience with EU funds compared to towns, which report a higher 'don't know' response rate (28%) than cities (8%) regarding

the use of EU/International grants (Figure 4.4a) Notably, among local governments using or planning to use these grants, there is a high "don't know" response rate about specific EU funding programmes (Figure 4.4b). This suggests limited awareness of these funds among local government officers responsible for adaptation and a potential knowledge gap between governmental agencies and the necessity for capacity building and information exchange in this area.

Irrespective of the European region, more cities (92%) than towns (73%) have allocated funds to the implementation of adaptation actions (Figure 4.5). A significant relationship exists between population size and funding adaptation efforts; local governments with high populations more frequently report funding all surveyed adaptation actions/processes (See SI, Table A.13-14). Paradoxically, local governments with high climate risk scores less frequently report funding for climate change risk/vulnerability assessments and monitoring and evaluation of implemented actions (See SI, Table A.15-16). GDP per capita is associated with reported funding for participatory processes, climate change risk/vulnerability assessments, and monitoring and evaluation, with those funding these actions having a GDP per capita about 25% higher, or roughly €7400 more, than those that do not. Relatedly, cities in Northwestern Europe are particularly notable for their advanced stage in the adaptation planning cycle. For example, they are already using funds for the implementation of adaptation actions (100% of Northwestern European cities), climate change risk/vulnerability assessments (90%), participatory processes (86%) and monitoring and evaluation of implemented actions (81%). In contrast, relatively few cities in Southern Europe fund climate change risk/vulnerability assessments (69%), and similarly, relatively few cities in Central and Eastern Europe (45%) report funding for participatory processes and monitoring and evaluation activities.

Type of Action or Process	City / Town	Regions of Europe	Funded	Not Funded
Implementation of adaptation actions	City	Northwestern	100%	
		Central and Eastern	82%	18%
		Southern	90%	10%
		Total	**92%**	**8%**
	Town	Northwestern	74%	26%
		Central and Eastern	71%	29%
		Southern	73%	27%
		Total	**73%**	**27%**
	Grand Total		**81%**	**19%**
Adaptation planning and coordination of climate adaptation plan	City	Northwestern	90%	10%
		Central and Eastern	73%	27%
		Southern	76%	24%
		Total	**80%**	**20%**
	Town	Northwestern	74%	26%
		Central and Eastern	71%	29%
		Southern	54%	46%
		Total	**62%**	**38%**
	Grand Total		**70%**	**30%**
Climate change risk or vulnerability assessment	City	Northwestern	90%	10%
		Central and Eastern	82%	18%
		Southern	69%	31%
		Total	**79%**	**21%**
	Town	Northwestern	61%	39%
		Central and Eastern	29%	71%
		Southern	52%	48%
		Total	**53%**	**47%**
	Grand Total		**64%**	**36%**
Participatory processes in adaptation planning or implementation	City	Northwestern	86%	14%
		Central and Eastern	45%	55%
		Southern	62%	38%
		Total	**67%**	**33%**
	Town	Northwestern	48%	52%
		Central and Eastern	57%	43%
		Southern	46%	54%
		Total	**47%**	**53%**
	Grand Total		**56%**	**44%**
Monitoring and evaluation of implemented actions	City	Northwestern	81%	19%
		Central and Eastern	45%	55%
		Southern	62%	38%
		Total	**66%**	**34%**
	Town	Northwestern	39%	61%
		Central and Eastern	43%	57%
		Southern	46%	54%
		Total	**44%**	**56%**
	Grand Total		**53%**	**47%**

Figure 4.5: Types of funded actions or processes by town, city, and European region (N=139). 'Total' represents the sum of all regions. 'Grand Total' denotes the combined total of towns and cities. Note: the Total percentage is skewed towards Southern Europe and the Grand Total percentage is skewed towards the town Total due to a higher number of Southern European respondents and a larger representation of towns in the sample, respectively.

4.2.3. Factors Influencing the Allocation of Climate Adaptation Funds

While, in theory, equitable allocation of climate adaptation funds should be guided by climate vulnerability assessments as a primary criterion (Venner et al., 2024), our findings illustrate other interests at play. Figure 4.6 reveals that political interests (71%) and the visibility of adaptation actions (68%) hold roughly equal importance to local climate vulnerability (67%). This phenomenon is stronger in cities compared to towns and suggests a greater diversity of interest groups and political pressures.

Factor	City / Town	Region of Europe	Plays a Role in Allocation of Funds	
			Yes	No
Political interests	City	Northwestern	90%	10%
		Central & Eastern	70%	30%
		Southern	66%	34%
		Total	**75%**	**25%**
	Town	Northwestern	95%	5%
		Central & Eastern	57%	43%
		Southern	60%	40%
		Total	**69%**	**31%**
	Grand Total		**71%**	**29%**
Visibility of action or project	City	Northwestern	86%	14%
		Central & Eastern	70%	30%
		Southern	62%	38%
		Total	**72%**	**28%**
	Town	Northwestern	76%	24%
		Central & Eastern	71%	29%
		Southern	60%	40%
		Total	**65%**	**35%**
	Grand Total		**68%**	**32%**
Local climate vulnerability	City	Northwestern	67%	33%
		Central & Eastern	80%	20%
		Southern	79%	21%
		Total	**75%**	**25%**
	Town	Northwestern	67%	33%
		Central & Eastern	43%	57%
		Southern	62%	38%
		Total	**61%**	**39%**
	Grand Total		**67%**	**33%**
Fiscal sustainability of local government	City	Northwestern	67%	33%
		Central & Eastern	80%	20%
		Southern	76%	24%
		Total	**73%**	**27%**
	Town	Northwestern	43%	57%
		Central & Eastern	86%	14%
		Southern	56%	44%
		Total	**55%**	**45%**
	Grand Total		**63%**	**37%**
Return on investment of action or project	City	Northwestern	48%	52%
		Central & Eastern	30%	70%
		Southern	62%	38%
		Total	**52%**	**48%**
	Town	Northwestern	57%	43%
		Central & Eastern	71%	29%
		Southern	63%	37%
		Total	**63%**	**38%**
	Grand Total		**58%**	**42%**
Private sector interests	City	Northwestern	38%	62%
		Central & Eastern	10%	90%
		Southern	10%	90%
		Total	**20%**	**80%**
	Town	Northwestern	19%	81%
		Central & Eastern	43%	57%
		Southern	17%	83%
		Total	**20%**	**80%**
	Grand Total		**20%**	**80%**
Historic budget allocation (path-dependency)	City	Northwestern	29%	71%
		Central & Eastern	10%	90%
		Southern	10%	90%
		Total	**17%**	**83%**
	Town	Northwestern	19%	81%
		Central & Eastern	14%	86%
		Southern	15%	85%
		Total	**16%**	**84%**
	Grand Total		**16%**	**84%**

Figure 4.6: The factors influencing the allocation of adaptation funds by city, town and European region (N=140). 'Total' represents the sum of all regions. 'Grand Total' denotes the combined total of cities and towns. Note: The Total percentage is skewed towards Southern Europe and the Grand Total percentage is skewed towards the town Total due to a higher number of Southern European respondents and larger representation of towns in the sample, respectively.

Noticeable distinctions emerge between cities and towns: cities prioritise fiscal sustainability (73%) more than towns (55%), while towns place relatively more importance on (perceived) return on investment (62% vs. 52%). Moreover, a higher percentage of cities (75%) factor in local climate vulnerability compared to towns (61%).

When specifically looking at formal climate risk and vulnerability assessments (as part of the adaptation planning and policy cycle), only 33% of local governments—43% of cities compared to 24% of towns—recognize their important role in the allocation of climate adaptation funds. Most concerning, a majority of administrations expressed a neutral or, in fewer cases, disagreeing stance regarding how significant RVA were for the allocation of funds in practice (See SI, Table A.23). It is surprising, for example, that while Northern European cities indicate they frequently fund climate RVA (90%, Figure 4.5), only 43% acknowledge its importance in the allocation of adaptation funds (See SI, Table A.23). This suggests that assessments may not always effectively guide adaptation efforts, potentially due to the high reported role of political interests in adaptation funding.

In terms of where funding is allocated, studies suggest that (green) adaptive infrastructures may favour economically strategic areas like centres (Long & Rice, 2019) or affluent areas (Kim et al., 2021), at the expense of more vulnerable areas. Studies have furthermore shown urban (green) adaptive infrastructures in lower-income areas can contribute to gentrification and socio-spatial exclusion through rising property values and housing prices (Anguelovski et al., 2022). Considering perceived return on investments, our results indicate that neither affluent nor central neighbourhoods are considered easier locations for financing climate adaptation projects, with only about a quarter of local administrations perceiving central areas (23%) and less than a fifth perceiving affluent neighbourhoods (18%) as easier financing locations, further showing minimal disparities between cities and towns (See SI, Table A.24-25). Only a limited number of local governments (22%) consider how adaptation investments influence land markets and real estate values and only a few local governments (14%) actively aim to boost land and property values through climate adaptation investments (See SI, Table A.26-26).

Lastly, while participatory budgeting processes are considered a tool for advancing more just and equitable climate adaptation outcomes (Cabannes, 2021), the majority of local governments do not include them in their climate adaptation plans. Cities (23%) do however appear to have slightly more experience deploying them than towns (16%) (See SI, Table A.27).

4.3. Discussion

Based on this synthesis of evidence on urban adaptation funding and financing practices in the EU, we highlight four key discussion points that advance our understanding of this field.

First, our EU-wide data further substantiates existing findings showing that a vast majority of local governments lack funds to implement their own climate adaptation plan (Aguiar et al., 2018, Boehnke et al., 2023; Mendizabal et al., 2021). Problematically, local governments with lower GDP per capita tend to report reduced funding for participatory processes, climate risk assessments, and monitoring. This may suggest that municipalities operating within smaller economies may face greater difficulties in implementing comprehensive and effective adaptation planning, possibly due to a lack of resources for thorough planning, evaluation, and community engagement initiatives. This questions the credibility of plans to reduce vulnerabilities and increase resilience (Olazabal et al., 2019). In the field of urban adaptation research, most studies assessing progress in adaptation planning focus on adaptation plans themselves (Reckien et al., 2023). While these studies can give us insights into the quality of adaptation processes, our findings emphasise the discrepancy between planned actions and their practical implementation on the ground, highlighting the importance of assessing progress through impacts and outcomes rather than policies and plans (Goonesekera & Olazabal, 2022; Vandecasteele et al, 2024).

Secondly, with EU municipal-driven adaptation largely depending on public funds, our findings question the role of financial instruments in urban climate adaptation. Much empirical research on finance originates in the United States [16], yet the role of financial actors and processes in urban climate adaptation may operate differently in Europe and elsewhere. Widespread "don't know" responses across market and debt-based instruments suggest limited financial expertise among local government officers overseeing adaptation, reinforcing recent survey findings from the European Climate Adaptation Mission (European Commission, 2023). Contrary to the prevailing tendency in the literature to overstate the influence of (private) finance (August et al., 2022), our data indicates limited use of financial instruments in EU municipal climate adaptation planning, aligning with prior studies on mitigation, which similarly emphasised the limited involvement of EU cities with financial products (Economidou et al., 2024; Ulpiani et al., 2023). Especially smaller urban areas (“towns” through our data) rarely engage with financial instruments, possibly because of legal and administrative barriers (strict debt ceilings across Europe), constrained tax bases, homogeneous economic structures, reduced creditworthiness, and elevated borrowing costs (Bourgeois et al., 2022; Fila et al., 2024; Fünfgeld et al., 2023). Our findings support the call for a situated (context-specific) understanding of climate urbanism (Robin & Castán Broto, 2021), urging European climate adaptation scholarship to look at financial relations alongside capitalist market dynamics (Robin,

2022), better recognize state interventionism and challenge the idea that climate urbanism merely equals *business-as-usual capitalism* (Shi, 2020). Nevertheless, even with limited utilisation of financial instruments in municipal-driven adaptation efforts in Europe, the prevalence of financial logics in urban climate adaptation projects is evident through the reported significance of demonstrating returns on investments and ensuring fiscal sustainability in resource allocation. This aligns with recent research that reveals the entanglement of financial logics in both debt and public funding dynamics (Diezmartínez & Short Gianotti, 2024). Interdepartmental municipal capacity building on finance is needed to create more awareness on how debt and market-based instruments can be used both to spur adaptation and impact local climate vulnerability. Careful evaluation of financial products is necessary to ensure that adaptation projects evaluate financial interests alongside equity and vulnerability considerations, and that governments (at different levels) deploy public funding and/or other forms of state support where local vulnerabilities are not reduced or even exacerbated.

Thirdly, climate vulnerability, while acknowledged, is not sufficiently prioritised in the accessibility and allocation of EU, national and local adaptation funds. At the urban level, we find that political interests and pressure to show return on investments play a substantial role in funding adaptation measures. Although frequently presented by EU institutions as a non-political issue (Remling, 2018), climate adaptation planning is a highly politicised phenomenon (Long et al., 2020; Shokry et al., 2020; Castán Broto & Robin, 2021; Rice et al., 2020; Boehnke et al., 2023; Eriksen et al., 2015). Under such conditions, climate vulnerability often takes a subordinate role. Likely due to their position in the adaptation cycle (having more experience with implementation), this dynamic is especially perceived in Northwestern Europe, where political interests and private sector interests in fund allocation are reported to play a more dominant role than in other EU regions. In all EU regions, particularly Southern and Central & Eastern Europe, equitable adaptation is also impeded by the infrequent involvement of vulnerable groups in planning and limited funding for participatory processes. Concernedly, local governments with higher climate risk scores tend to report less access to national funding sources and financial intermediaries (banks), fewer available funds, and less frequent funding for climate change risk/vulnerability assessments as well as for monitoring and evaluation of implemented actions. One possible explanation is that these local governments, disproportionately located in Southern Europe, may struggle with inadequate institutional capacity to manage competitive funding tenders, face strict debt ceilings, and risk-averse behaviour from banks. This paradox suggests that those most in need of climate adaptation interventions may be the least financially prepared to address climate impacts and less advanced in their adaptation implementation cycle. This funding-climate risk mismatch prompts inquiries into inter-urban equity and emphasises the need for more research to establish comparable risk and vulnerability indicators

and allocate regional and national funding accordingly. Such an effort requires attention to social issues where adaptation is understood as a more holistic and transversal practice (Chmutina et al., 2023). A concrete example demonstrating this need is the limited number of local governments which consider how adaptation investments influence local land markets and real estate values, as well as the limited number of local governments that use land value capture instruments (which could redirect private wealth toward funding public services), despite studies showing urban (green) adaptive infrastructures in lower-income areas can contribute to gentrification and socio-spatial exclusion (Anguelovski et al., 2022). Amidst compounding crises (climate, cost-of-living), it is precisely such social dimensions that urgently require more weight in the quest for comparable climate vulnerability indicators.

Fourthly, funding and financing adaptation is especially challenging for towns, aligning with prior research on adaptation barriers for small and medium-sized municipalities (Fila et al., 2024; Fünfgeld et al., 2023; Rivas et al., 2022). Compared to cities, towns more frequently report a lack of political support, deficiency in staff capacity to identify funding opportunities, higher difficulty in meeting the conditions and requirements of various sources of funding, including EU institutions and programmes, lower levels of engagement with vulnerable groups, and less consideration of climate risk and vulnerability assessments. They subsequently fund fewer climate adaptation actions and processes, and lag behind cities in their climate adaptation planning cycle. Based on this strong evidence of significant inequalities, more attention should be paid to multi-level governance in adaptation planning. We call for concrete steps to improve coordination across different levels of government in funding and financing adaptation, as well as targeted strategies that prioritise capacity building in small and medium-sized municipalities, particularly those facing heightened climate risks, while paying attention to the adaptation barriers discussed.

By focusing on those urban administrations already active in the adaptation field, we have been able to distil important patterns, trends, and disparities in processes of implementation and investment between towns and cities, European regions, GDP per capita, population size and climate risk. While our work sheds light on the unequal geographies of urban climate adaptation within and across EU countries, we underscore the need for further research to understand the underlying reasons for these disparities to foster more effective and equitable adaptation efforts across the EU. Our findings underline the need for concrete steps to improve coordination across different levels of government in funding and financing adaptation, as well as targeted strategies that prioritise capacity building in small and medium-sized municipalities, particularly those facing heightened climate risks while paying attention to the adaptation barriers discussed.

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Chapter 5. Optimising EU Funding Programmes for Equitable Urban Climate Adaptation: A View from Below[7]

Abstract

In the fast-evolving arena of climate finance, the equitable access and allocation of funds for adaptation continues to pose a significant and urgent challenge. In theory, to prepare for the impacts of climate change in an equitable way, regional, national, and European Union (EU) funding tenders on climate adaptation should prioritise the most climate-vulnerable local administrations. However, evidence on the ground suggests that other factors are at play. We build on 11 interviews with policymakers and consultancy agencies in Portugal working in the field of climate adaptation to understand what factors influence the absorption of EU funds for climate adaptation projects and how the criteria of EU funding programmes affect equitable access spatially in Portugal. Our findings indicate that EU funding programmes fail to prioritise the most vulnerable, fostering a culture of local competition, projectification, expertisation and climate finance "snowballing". We argue that this dynamic has three potential policy implications: urban areas may either be pushed off the climate adaptation map, compelled to engage in relatively small-scale low-impact experimental projects, or propelled into debt relations with (public) financial institutions. Our study concludes with some proposals and policy recommendations for EU policymakers and urban climate adaptation officers across scales to both equitably and effectively finance climate adaptation projects.

Keywords: EU Funding Programmes, Urban Climate Adaptation, Spatial Equity, Fund Absorption,

[7] This paper is under review as: **Venner, K.**, García-Lamarca, M., & Olazabal, M. (under review). Optimising EU Funding Programmes for Equitable Urban Climate Adaptation: A View from Below. *City Climate Policy and Economy*

5.1. Introduction

While various financial instruments, like green bonds, have emerged as paths for local administrations to fund urban climate adaptation measures, in the European context, European Union (EU) funds continue to wield significant influence. However, numerous studies outside the field of climate finance reveal disparities in the absorption of EU funds among countries (Achim & Borlea, 2015; Bachtler et al., 2024; Hagemann, 2019; Incaltarau et al., 2020; Tosun, 2014), as well as within countries (Aiello et al., 2019; Baun & Marek, 2017; Crescenzi & Giua, 2020; Cunico et al., 2022; Mendez & Bachtler, 2024; Zaman & Georgescu, 2009). "Absorption" refers to the ability of Member States to effectively utilise (EU) funds allocated to them (European Court of Auditors, 2018). Although in theory, climate vulnerability indicators should be used to prioritise access and allocation of funding for adaptation, the literature on EU fund absorption suggests that other factors are at play, such as administrative capacity, political stability, and level of digitalization (Bachtler et al., 2024; Crescenzi & Giua, 2020; Hagemann, 2019; Tiganasu & Lupu, 2023; Tosun, 2014; Zaman & Georgescu, 2009). In the context of varying local realities, this raises questions regarding fair opportunities among local administrations to, therefore, actually adapt to the consequences of climate change.

There has been relatively limited research dedicated to understanding the dynamics of inequitable adaptation across local administrations. However, interest in addressing sub-national inequities in climate change adaptation is on the rise (Barrett, 2014, 2015, 2022; Incerti & Barnett, 2024; Seong et al., 2022; Shi, 2020; Shi et al., 2021). We aim to contribute to this emerging body of literature by putting into conversation existing research on the absorption of EU funds with empirical findings on sub-national adaptation funding dynamics in Portugal. To this end, we ask: *How do EU funding dynamics impact inter-urban inequity in climate adaptation efforts in Portugal?* Drawing on semi-structured interviews with adaptation and finance actors in Portugal, we explore the interplay between EU programme criteria and their impact on spatial inequalities between local administrations in Portugal, with valuable insights for other EU countries.

5.2. Framing the Context: European Climate Policy and Funding Programmes for Adaptation

The EU is committed to becoming the first climate-neutral continent in the world and climate resilient by 2050, as outlined in the European Green Deal (EGD), the European Climate Law, and the EU Strategy on Adaptation to Climate Change (Castán Broto, 2021; European Commission, 2021a). This commitment is accompanied by an unprecedented availability of EU funding for local administrations, with the 2021-2027 programming period almost doubling EU financing efforts (Bachtler et al., 2024). Through initiatives such as the Sustainable European Investment Plan (SEIP),

the EGD aims to leverage one trillion euros of private and public investments in sustainability, including climate mitigation and adaptation actions (Abdullah, 2021; European Commission, n.d.-c). The surge in available funding for adaptation-related actions is further propelled by post-COVID recovery efforts. Notably, the Recovery and Resilience Facility aims to mobilise over 720 billion euros, with 37% allocated to climate-related endeavours. More details on these and other relevant funds are outlined in Table 5.1.

The EGD has drawn criticism for its prioritisation of competitiveness and reliance on financial market instruments (Khoury, 2023; Knapp et al., 2024), reflecting eco-modernist and neoliberal perspectives, effectively using public funds to support and de-risk private investments (Bouzarovski, 2022). Efforts are being rolled out by the European Commission, particularly through the European Investment Bank, to facilitate the financial sector's role in financing local climate adaptation. Examples include advisory services like JASPERS, the City Climate Finance Gap Funds and the Smart Cities Marketplace, (see Figure 5.1) indicating a direction and intention to mobilise private capital and market actors towards financing urban resilience.

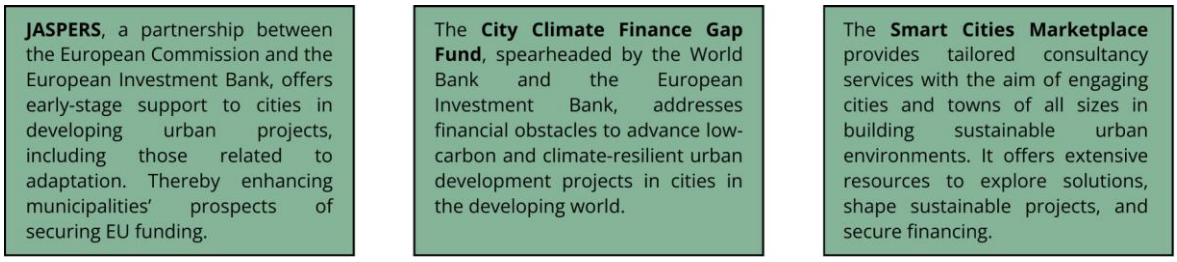

Figure 5.1: Advisory Services Facilitating the Financing of Urban Adaptation: JASPERS, the City Climate Finance Gap Fund and the Smart Cities Marketplace

Despite criticism of the market-based nature of EU climate policy, substantial funding programmes within the EU, which do not necessitate repayment, are required to allocate a minimum percentage to climate action, including adaptation. Some of these EU funding programmes are meant to catalyse innovation and experimentation, like the Horizon Europe (European Commission, 2021b) and LIFE programmes (Yougova, 2021). Of special note is the **Adaptation Climate Change Mission**, funded by the Horizon Europe programme with €370 million. The mission aims to support large-scale projects targeting relevant climate-induced hazards, such as flooding (Rayner, 2023). However, concerns persist about the effectiveness of the Mission, including unclear definitions for resilience and just adaptation, deficiencies in national coordination, the separation of adaptation and mitigation in different Missions, and reservations about exacerbating regional and urban disparities between participating and non-participating areas (Rayner, 2023).

Other funding programmes within the EU, especially the Cohesion Policy funding programmes, are designed to address spatial inequalities within the EU by directing resources to economically

disadvantaged regions (see Table 5.1). For instance, the Cohesion Fund (CF) is only accessible to Member States with GDP per capita below 90% of the EU average. All Cohesion Policy funding programmes require own contributions, but different co-financing thresholds exist based on economic indicators, with the poorest regions (GDP per capita below 75% of the EU average) receiving up to 85% EU financing, transition regions (GDP per capita between 75% and 100% of the EU average) receiving up to 70%, and affluent regions (GDP per capita above 100% of the EU average) receiving up to 50% (European Commission, n.d. -b). The way EU funds are allocated is specified in Partnership Agreements, established between the Commission and individual Member States.

On paper, the EGD aims to "leave no one behind" and achieve a "just resilience" to address the unequal impacts of climate change (European Climate Law, 2021; European Commission, n.d. -c). Yet, despite EU funding programmes' inherent design to alleviate spatial disparities across Member States and regions, their effectiveness in reducing cross-scalar spatial inequality in adaptation remains questionable. This has to do with the absorption determinants of EU funds discussed earlier and an emphasis on economic rather than vulnerability indicators. In this paper, we consider these issues in detail through the Portuguese case study.

Table 5.1: Overview of climate targets in EU funding programmes particularly relevant for urban municipalities of different sizes in the context of adaptation (2021-27 programming period).

EU funding programme	Description	Budget 2021-2027	Minimum climate target	Committed or proposed
European Regional Development Fund (ERDF)	The European Regional Development Fund (ERDF) is dedicated to reducing disparities between regions, and fostering investments in themes such as environmental sustainability, innovation, connectivity, and social welfare. The European Regional Development fund also includes the programmes URBACT IV (previously III) and the European Urban Initiative (previously Urban Innovative Actions), which are particularly relevant to cities.	226.1 billion	30 %	33%
European Social Fund Plus (ESF+)	The European Social Fund+ (ESF+) is geared towards aiding Member States in addressing the challenges posed by the coronavirus pandemic, promoting robust employment rates, ensuring equitable social protection, and cultivating a skilled and resilient workforce ready for the shift to a green and digital economy.	99.3 billion	No Target	6%
The Cohesion Fund (CF)	The Cohesion Fund (CF) assists Member States whose gross national income per capita is less than 90% of the EU-27 average. The fund aims to enhance the economic, social, and territorial cohesion of the European Union.	48 billion	37%	56 %
The Just Transition Fund (JTF)	The Just Transition Fund (JTF) seeks to provide support to territories facing serious socio-economic challenges arising from the transition towards climate neutrality.	19.3 billion	*100%*	*96%*
Recovery and Resilience Facility (RRF)	The Recovery and Resilience Facility (RRF), also known as NextGenerationEU, is a funding programme aimed at fostering cohesion by lessening the economic and social repercussions of the COVID-19 crisis. Its goal is to enhance the sustainability and resilience of EU economies and societies, ensuring they are better equipped to manage the green and digital transitions. The RRF came into effect in February 2021 and is a temporary fund allocated through grants and loans.	723.8 billion (337.9 billion in grants & 385.9 billion in loans)	37%	40%
Horizon 2020/Europe	Horizon 2020 was the EU's research and innovation funding programme from 2014-2020. The programme has been succeeded by Horizon Europe. While primarily focused on research and innovation, Horizon Europe includes areas related to climate change and environmental sustainability. For instance, Horizon Europe includes the Adaptation to Climate Change Mission, in which local administrations can participate in collaborative projects to address climate adaptation.	95.5 billion	35%	34%
The LIFE programme (EU)	The LIFE programme is the EU's funding instrument for the environment and climate action. Like Horizon Europe, the programme aims to test solutions and link with research and innovation.	5.4 billion	*61%*	*61%*

The table underscores the essential role of EU funding initiatives in climate finance, with diverse programmes imposing different minimum climate targets. To monitor this, projects receiving EU funding are evaluated using a "climate coefficient," reflecting their impact on climate change goals (Levarlet et al., 2022). Significant contributions receive a 100% score, substantial contributions 40%, and activities with limited impact receive a 0% score (Levarlet et al., 2022). The authorities overseeing these funds at the national or regional levels, referred to as "managing authorities", select the appropriate category when allocating EU funding to a project (Fichter, et al., 2024). The classification system of three distinct percentage values has been effective in providing a low administrative burden and improved intervention field breakdown. However, shortcomings include ambiguous spending contributions, lack of explicit result targets, accounting issues, and incomplete coverage of negative climate and biodiversity impacts (Levarlet et al., 2022). The European Court of Auditors recently reported that the EU's green spending was overestimated by at least €34.5 billion, with many projects labelled as green despite having only weak connections (*European Court of Auditors*, 2024). The data in the table is rounded up to one decimal place and derived from the EU funding programme datasheets (Euro*pean Commission*, n.d. - a) and the performance data statements of the European Commission (European Commission, n.d. -d). The first four make up Cohesion Policy.

5.3. Data and Methods

To understand how the dynamics created by EU funding programmes impact spatial disparities in climate adaptation efforts in Portugal, we use a case study approach (Yin, 2009) based on semi-structured interviews and document analysis.

Fieldwork was conducted in the Lisbon Metropolitan Area (AML, as in *Area Metropolitana de Lisboa*) from October 2023 to February 2024, where 11 interviews, involving a total of 15 individuals, were conducted. Table 5.2 presents the interviewees, comprising eight local government officers from five municipal financial and climate departments in the AML, one funding expert from the Metropolitan level climate team (AML), one expert from the Advisory programme of the European Investment Bank (JASPERS), one Horizon Europe expert, and four individuals representing major consultancy agencies specialising in climate adaptation in Portugal: CEDRU, SPI, and PATER. Additionally, we analysed over a dozen EU and municipal documents collected during fieldwork and considered relevant by interviewees for the contextualisation of the Portuguese case and the EU funding conditions. Interviews were transcribed using HappyScribe and revised to ensure proper translation and analysed using MAXQDA, using a coding scheme informed by insights from the interviews and key concepts from the literature.

Table 5.2: Overview of interviews

Interview Code	Organisation
#1	Área Metropolitana de Lisboa
#2	Câmara Municipal de Lisboa
#3	Câmara Municipal de Cascais
#4	Câmara Municipal de Loures
#5	Câmara Municipal de Vila Franca de Xira
#6	Câmara Municipal de Almada
#7	JASPERS / European Investment Bank
#8	National Contact Point & Delegate of Horizon Europe / Agência Nacional de Inovação (ANI)
#9	Centre for Studies and Urban and Regional Development, Ltd. (CEDRU)
#10	Sociedade Portuguesa de Inovação (SPI)
#11	MEGALOCI – Plataforma Empresarial e Território, Unipessoal, Lda. (PATER)

5.4. Results

5.4.1. Climate Adaptation Planning and Finance in Portugal and the Lisbon Metropolitan Area

Over half of Portugal's municipalities (a total of 308) have populations under 20,000. Ninety-seven fall in the medium range (20,000 to 100,000 inhabitants), and 24 are classified as large (over 100,000 inhabitants) (Basílio & Borralho, 2021). All these municipalities operate within a unified legal and institutional framework, undergoing reforms like the Local Administration Reform of 2012 and Laws 73/2013 & 75/2013, which notably increased financial control. Municipalities in Portugal mainly rely on central government transfers and their revenues, with larger municipalities having a higher proportion of own revenues, while smaller ones depend more on transfers (Basílio & Borralho, 2021) In the absence of a municipal bond market, municipalities obtain additional funds through borrowing from banks and other financial institutions, with Law 73/2013 imposing stricter regulations on municipal finances, including limits on indebtedness (Basílio & Borralho, 2021)

Portugal, and the Lisbon Metropolitan Area in particular, serve as an ideal case study for questions of equity and urban climate adaptation in relation to European funding. Portugal distinguishes itself within the EU by showcasing a robust commitment to urban climate adaptation efforts. Notably, it boasts the highest municipal participation rate among EU Member States in the EU Adaptation Mission (European Union, 2023). Municipal adaptation planning started early in Portugal thanks to the ClimAdapt.Local Project that facilitated the creation of nearly 30 local climate adaptation strategies, including five in the AML region, from 2014-2016 (European Climate Adaptation Platform Climate-ADAPT, n.d.). This catalysed adaptation efforts nationwide, and by 2021, 86 municipalities had developed climate adaptation plans with the support of European grants (Figure 5.2).

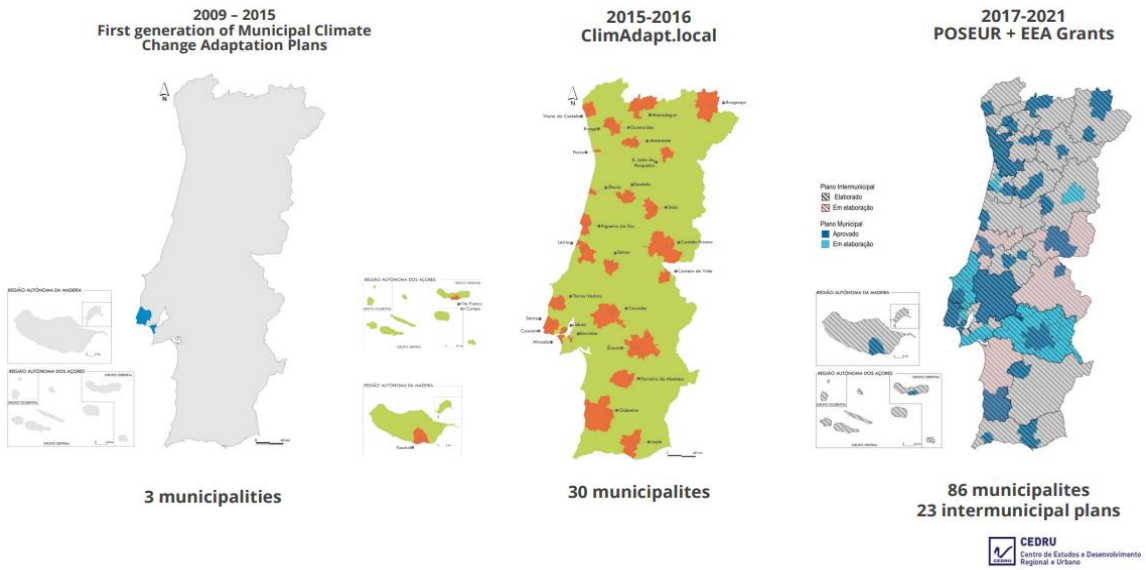

Figure 5.2: Evolution of Climate Adaptation Plans in Portugal (CEDRU, 2021). The ClimAdapt.Local project, part of the

AdaPT Programme, aimed to develop municipal adaptation strategies and raise awareness on climate change adaptation at the local level in Portugal, supported by the European Economic Area (EEA) Financial Mechanism (European Climate Adaptation Platform Climate-ADAPT., n.d.). In exchange for gaining access to the internal market of the EU through the EEA agreement, Norway, Iceland, and Liechtenstein established the EEA grants. These grants are exclusively available, like the Cohesion Fund, to EU Member States with a GDP per capita below 90% of the EU average, to reduce social and economic disparities in Europe (Dalen et al., 2023)

In Portugal, the AML stands out due to its high number of municipalities involved in adaptation efforts; 11 out of 18 AML municipalities are signatories of the EU Mission on Adaptation. Particularly Lisbon and Cascais municipalities (both within the AML) have gained recognition for their proactive approach to climate change adaptation, with Lisbon being named European Green Capital in 2020. The environmental department of Cascais, on the other hand, is actively participating in eight Horizon Europe projects, demonstrating its commitment to environmental objectives, including adaptation (European Climate, Infrastructure and Environment Executive Agency, 2023; Cascais Ambiente, n.d.). Furthermore, Lisbon and Loures Municipalities have received substantial EIB framework loans of 250 million and 100 million euros, respectively, for investment in adaptation-related interventions, particularly focusing on flood prevention measures.

Current climate adaptation planning in Portugal should be framed within the backdrop of the Climate Framework Law (Law No. 98/2021), which mandated municipalities to develop climate adaptation plans by February 1, 2024. In contrast to the process leading up to the adoption of nearly 30 municipal plans as part of the CLIMA Adapt project, which combined capacity building, financing opportunities and coordination, the process since the adoption of the climate law framework has been chaotic [#9]. The absence of guidance, standards, national coordination, and adequate support by the Portuguese Environment Agency (APA) led to significant variations in the quality and typology of climate (adaptation) plans adopted [#6, #9, #11], as communicated by this interviewee:

“It's a great problem because [across Portugal] we have all kinds of plans [...] We have the kind of plans [...] that have data, that work with workshops, that listen to all the stakeholders [...] And on the other side, you have plans that some municipalities have done with two or three pages [...] and they have done that kind of plan only to respond to the law [...]” [#11]

In addition to fulfilling legal obligations, some interviewees recognized that municipalities were primarily motivated to engage in climate adaptation and formulate plans because of the funding opportunities they would unlock [#1, #4 and #10]. What is more, due to reliance on EU funding, implementation of adaptation actions is frequently driven by funding tenders, leading to adaptation interventions not originally conceptualised in the adaptation plan [#10]. This highlights the substantial impact of EU funding calls on urban adaptation efforts.

Although the nationally-funded Portuguese environment fund *Fundo Ambiental* holds significant importance, interviewees noted that this fund “has a problem with their calls because they do annual

calls and it's very difficult to develop a climate adaptation project in just one year" [#9]. Interviewees subsequently estimate that roughly 90% of adaptation actions implemented in Portugal are financed by European funds [#1 and #10]. Even in "wealthy" municipalities like Cascais, EU funds make up roughly 80% of the adaptation projects [#3]. This dependency is perceived as a problem by some adaptation planners, as one expressed to us in an interview:

*"*In Portugal [...] we don't have money to put these kinds of [adaptation] projects on the field. We need the funding opportunities from the EU, from EU grants, from the European Investment Bank in the form of loans. If we don't have these kinds of opportunities, we don't have investment. We don't have investment! [...] this is the problem of the municipalities and the problem of Portugal right now: we are very dependent on EU funding*"* [#1]

Local administrations in Portugal can access EU funds through competitive European-level calls, such as Horizon Europe and the LIFE Program, or through competitive national calls, through the PT2020 and PT2030. The latter two are the partnership agreements of the Portuguese state with the European Commission on the allocation of European Structural and Investment Funds (ESIF) to support Portugal's economic, social, and territorial development goals for the 2014-2020 and 2021-2027 programming periods respectively (*PO SEUR*, n.d.-a; Portugal 2030, n.d.). For the 2021 – 2027 timeframe, Portugal is among the fifteen European countries eligible for the Cohesion funds. Both PT2020 and PT2030 encompass regional operational programmes and thematic operational programmes. Among the thematic operational programmes crucial for adaptation are POSEUR (PT2020) and Sustentavel (*PO SEUR*, n.d.-b; Portugal 2030, (n.d.).

In comparison to European-level calls like Horizon Europe, the regional operational programmes of PT2020 and PT2030 generally face less competition due to their restricted territorial scope and are subsequently preferred by smaller municipalities [#10]. PT2020 and PT2030 calls have specific regulations that provide certain advantages to low-density municipalities. These municipalities may benefit in three ways: 1) specialised tenders 2) bonus criteria for application evaluations, and 3) raising the level of support provided (Comissão Interministerial de Coordenação do Portugal 2030 – Plenária, 2023). However, official documents acknowledge the lack of clear criteria for defining a low-density municipality (Comissão Interministerial de Coordenação Portugal 2020, 2015; Lusa, 2020) which may arguably lead to suboptimal consideration of vulnerabilities and climate risks across the Portuguese territory (see Figure 5.3). Thus, while funds like Cohesion Policy (and EEA grants) may reduce broader inter-state inequities, they may fail to effectively address sub-national inequities in climate vulnerability.

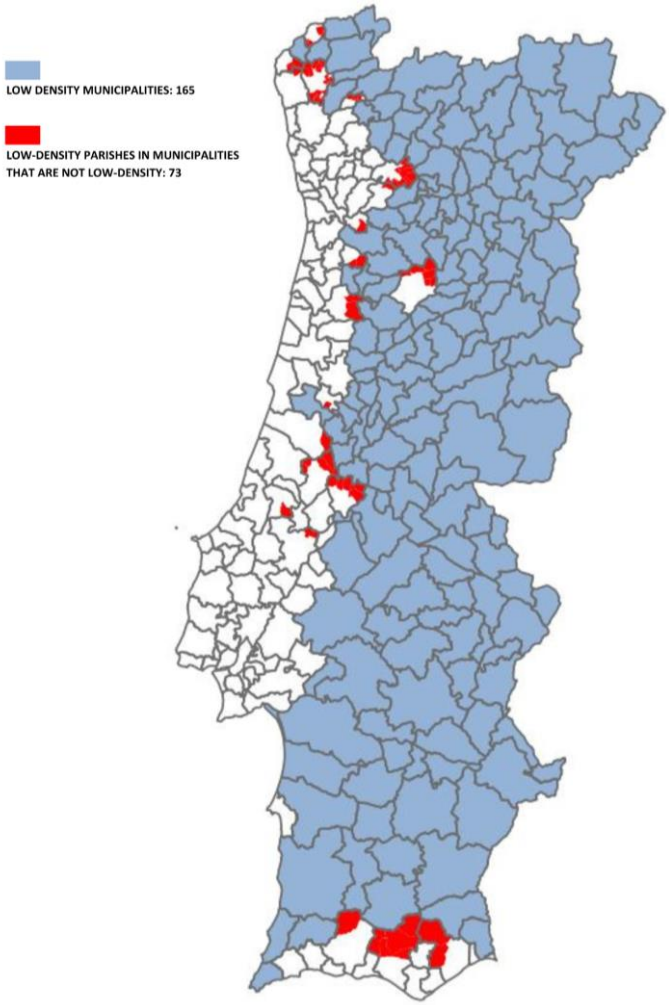

Figure 5.3: The Officially Designated 165 Low-Density Municipalities During the PT2020 Period**.** The classification covers the vast majority of Portugal's territory and remained largely the same for the PT2030 period. Adapted from Comissão Interministerial de Coordenação Portugal 2020 (2015).

5.4.2. The Determinants of EU Fund Absorption for Municipal Adaptation in Portugal

From the interviews conducted, we derive four determinants that influence EU absorption of funds: 1) administrative capacity 2) track record and reputation, 3) networks and contacts and 4) the commitment of municipal leaders and technicians.

Administrative capacity

Administrative capacity, as a key factor in EU fund absorption, encompasses a variety of elements like skilled staff, efficient organisation, ICT resources, management systems, leadership, and openness to external knowledge (Bachtler et al., 2024). Applying for funds can be an administrative burden, as the municipality of Vila Franca de Xira highlighted in the context of the Portuguese Recovery and Resilience Plan (PRR): "[...] It's very difficult because we have a lot of bureaucracy…paper paper paper paper. We have all the time to justify everything [ugh], that we

spend the money OK. [...] It's very hard because it's too much paper. In my opinion, it's too heavy. It's suffocating" [#5].

This administrative burden means smart choices have to be made on which funds to apply for. The municipality of Almada underscored its deliberate decision to pursue a LIFE tender call as it provided the option of subcontracting someone to manage the project as part of the call. This had significant preference over other calls as they were a small team and couldn't afford to "lose" a team member to work on a new project [#6]. The municipality of Cascais, hailed as the "hero", "machine" or "Ronaldo" of climate adaptation in Portugal [#1, #4, #11], highlighted their success in attracting funding partly due to substantial administrative capacity and knowledge on how to write applications [#3]. Albeit with considerable time investment, they were able to secure EEA grants, Horizon grants, and LIFE projects [#3]. However, both Cascais and Almada identified administrative capacity as a limiting factor in absorbing additional funds for climate adaptation initiatives: "The problem is that we do not have a structure to go beyond where we are right now [...] I need to hire more people, but this needs to be structured. I need to get finance for this, and unfortunately, it's not that easy at all [#3]"

Limited knowledge within administrations, especially concerning innovative projects like Nature Based Solutions [#3], or ever-evolving EU priorities like the European Green Deal [#8], can hinder fund absorption. Indeed, amid staff capacity shortages and knowledge gaps, compounded by rising complexities of policy issues and the demand for specialised expertise in EU funding applications, there's a noticeable trend toward heightened "expertisation" (Büttner, 2019). In this context, local governments often "outsource" adaptation planning, monitoring, evaluation and results communication. Indeed, all municipalities we interviewed made use of consultancy agencies, although the limited number of consultancy agencies working on adaptation in the country and differences in municipal budgets impact municipalities' outsourcing capabilities and thus influence the quality of the adaptation planning process [#11]. Consultancy in adaptation governance has been shown to influence climate adaptation planning (Keele, 2019) but has been given little attention in urban climate finance, which highlights an important issue for further research.

Track-record and reputation

Local administrations' track record and reputation in managing funded projects, especially with EU funds like Horizon 2020, are another aspect playing a role in accessing and securing funding opportunities. For example, in relation to Horizon 2020, Vila Franca de Xira argued that: "[...] The consortiums that have more winning chances are the consortiums with more experience. So, it's a difficult group to get into [...] [#5]. Similarly, the municipality of Loures underscored the importance of reputation, noting that rather than being the initiators or promoters of projects, experienced

municipalities are invited to participate in consortiums based on their demonstrated success in earlier endeavours: “They are invited to be part of a testing territory because people know that they work well. And they have a name on this type of project. So okay, let's go, let's meet Cascais because then when you apply with that name on the funding, it's always better” [#4]

The Portuguese Horizon Delegate and National Contact Point confirmed the importance of track record and reputation by stating that municipalities that are a signatory of the EU adaptation mission “may enjoy greater visibility and recognition for their commitment to climate adaptation, which could attract further support and collaboration opportunities” [#8].

When it comes to EU funds directly managed by the EU, such as Horizon Europe, as well as cross-border programmes like POCTEP or SUDUE, a consultancy agency highlighted that previous participation plays a pivotal role: “the ones that already have that experience, they are invited for new networks. They already have…they know how to score in the evaluations, and the ones that are out of that circle for them it is more difficult" [#10].

Network and contacts

The influence of networks and contacts in accessing funds was reiterated by many informants [#3, #4, #8, #11]. Particularly for smaller municipalities, gaining acceptance into a winning consortium represents a significant hurdle in accessing Horizon Europe funding [#5]. For instance, the municipality of Vila Franca de Xira stressed that their entry into what they deemed "a very good" consortium - consisting of Paris, Barcelona and Bucharest - was largely due to a local partner, who facilitated their inclusion in the consortium by inviting them to join: “we had a local partner that called us, an enterprise which already has projects in Paris…so we came to this good consortium because we have a local partner that asked us to join with them” [#5]. According to Loures municipality, municipalities with many existing projects, such as Cascais, enjoy greater success in securing funds due to their ability to foster relationships and cultivate partnerships, arguing that when “you go to the places, you are with the other countries, you get to know people and then when the opportunity comes, they remember you” [#4]. Additionally, proximity to centres of power like Lisbon, Porto, and Braga offers advantages in terms of accessing information and establishing institutional contacts, thereby facilitating awareness of calls: “in all of these processes you have to have institutional contacts, you have to know what is happening and what is going to happen” [#11]. These observations underline the critical role of networks and contacts in navigating the complex landscape of EU funding opportunities for climate adaptation initiatives.

Mayoral and technical-staff commitment

Last but not least, the absorption of funds for climate adaptation is intertwined with the presence of genuine political support and sustained engagement from municipal leaders and government officials [#10, #11]. Exemplifying this, the consultancy SPI, which works exclusively with small and medium-sized municipalities, noted the lack of understanding among city mayors regarding fund allocation processes: "We deal directly with the city mayors and most of them, they don't know how the rules are defined, how the sectors are selected and how the budgets are negotiated [...] they don't know when the calls open, how much, which sector will be covered" [#10].

Consequently, despite political rhetoric emphasising the importance of climate adaptation, tangible actions frequently fail to materialise [#10]. This sentiment is further underscored by the consultants' PATER, stressing the indispensable need for ongoing mayoral engagement beyond mere rhetoric.

Indeed, Boehnke et al. (2023) highlight that in some cases the incorporation of adaptation is not only a matter of subject- or goal-oriented planning but also of individual professional power and influence. In the same line, Fila et al. (2023) highlight that individuals, especially those with formal responsibilities or professional affinity to climate change adaptation, play crucial roles in acting as pioneers or champions, serving as knowledge facilitators to raise awareness among colleagues and external stakeholders. As emphasised by the Municipality of Loures, politicians often have some general awareness of climate change. Still, technicians play a crucial role in educating politicians about the importance of climate adaptation efforts [#4].

5.4.3. Navigating Projectification, Expertisation, and Competitive Dynamics in Climate Finance: The "Snowballing" Phenomenon

Although the determinants described above play a role in all funding tenders and calls, they may be particularly decisive in Horizon and LIFE programmes as interviewees acknowledged these were particularly competitive [#10]. For instance, in the initial call of the Climate Adaptation Mission (Horizon Europe), less than a quarter of applications are expected to succeed.[8] The competitive context in which climate adaptation planning operates can encompass certain positive feedback loops that can create increasing disparities. Several interviewees mentioned that EU funds managed directly by the EU, such as the Horizon and LIFE programmes, frequently favour the same municipalities [#4, #10]. The Horizon Delegate acknowledged that larger municipalities, endowed with administrative and financial capabilities, tend to be more active in pursuing Horizon Europe

[8] With a deadline set for September 20, 2023, and a budget of 82.81 million euros, 53 project proposals were received (European Commission, 2023). However, this call aims to support only nine projects (European Commission, 2024, p.16).

opportunities [#8]. In practice, smaller municipalities are frequently excluded from Horizon Europe calls: “if we go to smaller municipalities, they are not able to access that. We tried with them and that's quite difficult, the teams are not... they have no routines on that” [#10]. Similarly, in the context of the LIFE Program, the municipality of Almada noted: “The work to win the process, the contests are very competitive, so [...] it was a very tough task with three people allocated during several weeks and we were stopped in other interventions [...] I cannot imagine a smaller municipality than Almada to be successful in this project [call] alone [#6]

While the Horizon programme (2021-2023) acknowledges particular attention will be given to less developed and vulnerable local authorities (European Commission, 2021b), this attention doesn't seem to be reflected in the project funding evaluation criteria. The Portuguese National Horizon Europe delegate underscored that the evaluation criteria applied to evaluate project proposals within the Adaptation mission are consistent across the entirety of the HORIZON work program, lacking differentiation based on thematic areas [#8]. Although nuances may exist depending on the specific call, the primary evaluation typically revolves around three fundamental aspects: Excellence, Impact, and Quality and Efficiency [#8]. Therefore, although climate vulnerability may be indirectly taken into consideration as part of the overall consistency of an application [impact], proposals are not comparatively evaluated and prioritised based on climate vulnerability and the need for adaptation action planning and implementation.

Based on our findings, we theorise that the observed reliance on competitive, bid-driven, project-based funding—also referred to as tournament financing (Peck, 2012)—can lead to a scenario where entities with greater financial and technical resources, reputation, networks and political support secure more funding opportunities, perpetuating their advantage. In the past, researchers have identified a similar dynamic, e.g. in the context of funding for ecosystem restoration between regions in Sweden (Borgström et al. 2016), or urban climate finance initiatives between secondary cities and “donor darlings” in Mexico (Hilbrandt & Grafe, 2023, p.342). Our track record determinant ties back to Hilbrandt and Grafe's work (2023), who emphasize that the performance of the first funded project may demonstrate financial expertise and a readiness to financialize infrastructure. In the EU context, however, the focus is less on a readiness to financialize infrastructure, but more on proving reliability (e.g., within the consortium) and competence in timely implementing EU funded projects like Horizon Europe and LIFE. Building on the "cascade" observed by Hilbrandt and Grafe (2023, p.342), and drawing from our empirical data, we coin this phenomenon “climate finance snowballing”:

“This is a snowball because people that get more money are usually the ones that have more money, and they have more technicians working on that [the calls]. And then the small ones always get lost

[lose the opportunity] because they don't have the technicians to do it [...] then they don't get the money, and it goes on like this" [#4]

In the context of a lack of a regional structure with extensive competencies, competition between municipalities reigns even among municipalities part of the same metropolitan strategy [#6, #11]. The municipality of Almada highlighted how they won a LIFE project and competed with other municipalities in the AML area for the same call: "We knew that other municipalities [in the AML] were applying too. We won. I don't know the results of others, but I think they were not funded [...] you always have competition between the 18 departments [of the AML] and it's absolutely unbelievable that can happen [...] some calls could be deliverable to a metropolitan scale" [#6]. Others contended that this competition also exists among different levels of administration (municipalities, communities, and regions) within the same territory: "It's quite strange [...] when there opens a financing opportunity, it can happen that the three levels are applying for the same funding" [#10]. Various interviewees subsequently highlighted the importance of multi-level coordination and inter-municipal collaboration [#10], and the need for more competencies at the metropolitan level [#1, #6].

Despite the climate finance snowball effect, EU-funded projects remain insufficient to truly address all the challenges at hand. Scholars and practitioners have long called for transformative adaptation (Shi & Moser, 2021), yet EU funding often comes with specific objectives and rigid timeframes (typically 3-4 years, or in the case of the Fondo Ambiental 1 year). Due to its urgent objective of revitalising the EU economy post-pandemic, NextGeneration EU funding encounters particular challenges related to its limited timeframes. Some researchers predict that even if current projects are rebranded to align with NextGeneration EU, less than half of the allocated funds will be used. (Jones, 2021). This setup can furthermore create standardisation, short-term thinking and what others have called *project proliferation* or *projectification*, where temporary management structures grow to handle specific tasks (Borgström et al., 2016; Büttner, 2019; Ehnert et al., 2018; Sjöblom, 2009; Sjöblom & Godenhjelm, 2009; Torrens & Wirth, 2021). If not incorporated into a comprehensive plan and systemic institutional frameworks, the short-term and competitive nature of EU funding programmes may result in fragmented rather than transformative approaches to urban climate adaptation. This is further compounded by the limited scale of EU funding calls, as expressed by the AML representative:

"[...] I had a meeting last week with the EU Adaptation Mission - we are the signatory of the EU mission - but the grants they have, the calls they have opened, it's for the experimental projects; for thinking, living labs, with many universities on the consortiums, and they don't have scale to put these projects on the field [...] So we don't need 1 million euros, because when you talk about, for

example, Ribeira de Alges [a small river prone to flooding], it cost about €50 million [...] I think the biggest call I have this year is €5 million [..]. So, I think it's too little. It's not enough for the biggest problems" [#1]

The EIB comes in as a viable solution in this situation as it is largely regarded as an "opportunity" to implement structural solutions with more large-scale adaptation projects [#1, #2, #4, #7]. While the EIB's allocation towards adaptation has historically been modest, ranging from 1-2% in the 2010s to 3.7% in 2020, its commitment to raising this figure to 7.5% by 2025 underscores its growing importance (Mertens & Thiemann, 2023). There is also interest from cities: as we found in Chapter Four, public loans from institutions such as the European Investment Bank outperform commercial loans in the use and planned use for adaptation.

For example, due to the limited scope of local, national and EU funds, both the municipalities of Loures and Lisbon turned to EIB framework loans [#2, #4]. Several challenges were addressed by interviewees regarding accessing EIB loans. First and foremost, interviewees indicated that EIB loans are not accessible to the majority of municipalities in Portugal, because many, especially small municipalities, have reached their debt ceiling following the 2013 reforms (Basílio & Borralho, 2021). Secondly, loans for adaptation require immense political support, because, unlike EU funds, the repayment requirement and the financial risk involved are substantial. Lisbon's 500 million drainage plan project, half financed by the EIB, faced difficulty in getting approval, primarily because tunnels, being unseen, were politically less compelling. However, following a flood event in December 2014, political consensus was reached in 2015 [#2]. Thirdly, the EIB requires projects of scale, which adaptation projects alone may not reach. To overcome this challenge, the JASPERS/EIB expert advises cities to "bundle up" projects and themes to reach EIB's financial thresholds and create a cohesive pipeline aligned with their strategy [#7].

Such an approach requires municipalities to improve interdepartmental collaboration (housing, environment, health), which continues to pose a challenge as many departments operate in silos [#10]. This issue is not easily resolved, as the municipal officer in Loures described: "when I say to you that climate change is transversal, it's really beautiful for me, but not for the others. Because every time that I schedule the meetings, here it comes: the environmental girl asking things. It's a thing that you need to work on and it's not easy. And sometimes people get tired of it because it's usually a thing that brings more work than the usual work that they have already daily" [#4]. For small and medium-sized cities, interdepartmental collaboration alone may not suffice; partnering with other municipalities could be a viable alternative. This way resources and projects can be pooled together so that smaller municipalities can collectively reach the scale required to attract bank interest

[#7]. More research is needed to understand the most equitable and effective ways in which local administrations can benefit from these processes and approaches.

5.5. Discussion and Conclusion

Our findings show that funding programmes at both national and EU levels create a competitive adaptation space, characterised by projectification and expertisation. Within this space, deeper qualitative research in Portugal shows how funding programmes, primarily those meant to spur innovation and experimentation, create unequal opportunities of access, frequently benefitting the same larger municipalities, a phenomenon that we have called “climate finance snowballing”.

Our study provides good evidence of three less desirable scenarios in terms of inequitable adaptation funding and finance. First, municipalities may be pushed off the climate adaptation map, receiving no or limited access to EU funding. This may be especially true for smaller and medium-sized urban areas that lack the administrative capacity to participate in demanding and competitive funding calls. Secondly, municipalities may possess the capacity to actively participate in small-scale experimental projects funded by the EU, leveraging their administrative, political, networking, and reputational advantages to access and compete in EU calls. However, the tension between the push for transformative adaptation and the short-term focus imposed by EU funding, characterised by rigid timeframes and projectification, may lead to fragmented rather than systemic approaches to urban climate adaptation if not integrated into broader institutional frameworks. Thirdly, in pursuit of structural and large-scale solutions, cities demonstrating financial robustness (i.e., those that have not reached their debt ceiling) and possessing the necessary scale to meet financial thresholds (e.g., by bundling projects into a coherent pipeline) may engage in debt relationships with public financial institutions such as the European Investment Bank (EIB). These three scenarios, perpetuated by an inadequate institutional focus on equity in funding accessibility and allocation practices, create unequal geographies of urban climate adaptation.

Based on the plausibility of the above hypothetical scenarios and to move towards more equitable adaptation opportunities, in Table 5.3 we gather key problems and put forward some proposals to build more equitable financial processes that reduce spatial disparities.

Table 5.3: Overview of drivers of sub-national inequity in EU fund absorption, proposals, and responsible actors

Driver of sub-national inequity	Proposals	Actor responsible
Absence of comprehensive national guidance to ensure fair and effective reduction of vulnerabilities across all regions	Legislation should be complemented by capacity-building initiatives and increased awareness of funding opportunities. In so doing, attention should be paid to addressing the unequal starting points among municipalities rather than fostering competition.	While national policymakers hold primary responsibility, cities can advocate at the national level for change.
Variation in staff capacity	Although it's clear that structural solutions to strengthen municipal staff are needed, broadening the scope of EU funding tenders to incorporate a dedicated budget for hiring personnel to oversee EU-funded projects throughout their duration would be a positive move in the right direction. As emphasised by our interviewees, adopting such an approach would increase the attractiveness of these calls for small to medium-sized municipalities, as they would not "lose" crucial staff to the management and coordination of a new project.	While EU policymakers hold primary responsibility, cities can advocate at the EU level for change.
Knowledge and network gaps persist	Our research underscores the importance of networking. Establishing connections with the right individuals, to form partnerships and exchange knowledge, appears to be crucial for accessing EU funds for adaptation	Urban, national, and EU actors can support capacity building and networking initiatives.
Mayors often provide discursive support, but what is truly needed is day-to-day commitment.	Close and structural collaboration between technicians and mayors on the topic of climate change.	Mayors and urban policymakers
The accumulation of EU projects among particular local authorities that possess greater administrative capacity, wealth, and connectivity (coined "*climate finance snowballing*").	We propose a cap on the number of Horizon and LIFE projects that each local administration can benefit from in each programming period, taking into account certain metrics like population size and vulnerability. At the same time, providing tailored administrative assistance to small and medium-sized municipalities as they apply for these calls could help level the playing field. Additionally, a territorial allocation key can be established to ensure equitable distribution of funds, as discussed below.	While EU policymakers hold primary responsibility, managing authorities and cities can advocate at the EU level for change.
The 2022 European Cohesion Report acknowledges the role climate change plays in creating territorial disparities (European Union, 2024), yet the EU's Cohesion Policy funding programmes predominantly rely on economic metrics to reduce such disparities, overlooking the imperative of incorporating climate vulnerability indicators	To address this, we propose the implementation of more favourable financial terms based on vulnerability indicators across EU funding tenders concerning climate adaptation. This can include i) higher co-financing rates ii) targeted tenders and iii) increased administrative support for the most vulnerable administrations, paying specific attention to small and medium-sized municipalities. This ensures that regions facing the greatest risks receive adequate support for effective adaptation measures. Within the Portuguese context, this entails revising the overly broad definition of "low-density municipalities" for PT2030 calls that fail to account for climate vulnerability.	While EU policymakers hold primary responsibility, managing authorities and cities can advocate at the EU level for change.
The EU Adaptation Mission is embedded in the Horizon Europe programme. Horizon Europe funding tenders are evaluated using a single and consistent approach, which does not align with the unique needs of the missions.	Rather than adhering to uniform evaluation criteria throughout the entire Horizon programme, we advocate for the necessity of customising criteria for EU Missions according to the particular challenge they address. By employing mission-relevant indicators, we can ensure that funding allocation resonates closely with societal needs. For example, instead of broadly considering climate vulnerability within a general impact category, the Adaptation Mission could prioritise criteria related to climate risk and vulnerability in a targeted and comparative manner. Similarly, the EU Mission on Cancer could focus on specific public health indicators. This approach acknowledges the distinctive nature of each challenge and seeks to allocate resources where it is needed most.	While EU policymakers hold primary responsibility, cities can advocate at the EU level for change.
The funding calls from Horizon and LIFE programmes foster competition among local municipalities while encouraging collaboration with distant counterparts facing vastly different climate risks. This juxtaposition fails to represent natural boundaries and regional cohesion.	We suggest reconfiguring consortium requirements for climate adaptation funding tenders, including those related to the Adaptation Mission under Horizon Europe. Instead of mandating international partnerships whilst fostering local competition, criteria could positively evaluate local collaboration and consortiums centred around shared climate risks (reflecting natural boundaries, e.g. along river catchment). This approach aims to overcome local governmental and departmental competition, barriers and silos, leading to more transformative and equitable adaptation efforts.	While EU policymakers hold primary responsibility, cities can advocate at the EU level for change.

The EIB has focused on integrating climate adaptation into its operations, yet its emphasis on larger-scale projects may pose challenges for smaller municipalities striving to meet the financial thresholds for such loans.	Consolidating multiple projects within a municipality (e.g. those related to adaptation, housing, health) into a cohesive "pipeline", which requires interdepartmental collaboration, allows it to attract bank interest by achieving the necessary scale, improving project appeal, efficiency, and cost-effectiveness. Within such broad urban interventions, special care must be paid to ensure that equity concerns are integrated and prioritised throughout the entirety of the projects. Conversely, smaller municipalities can collaborate and collectively meet scale requirements by pooling resources and projects together, fostering shared knowledge, expertise, and risk management.	Policymakers at both regional and local levels

We find evidence that prevailing EU funding dynamics that prioritise performance and efficiency indicators do not sufficiently encourage systemic and equitable change. While our paper has delved into several determinants of EU fund absorption and their potential to drive inequalities in adaptation opportunities among administrations, the pursuit of more equitable and effective public European finance is a complex challenge and questions remain.

To begin addressing outstanding questions, future research is needed on the extent to which variations in partnership agreements, including the roles and contributions of managing authorities, affect equitable fund absorption. Moreover, while we provide a broad initial overview of EU funding programmes, each EU funding programme may introduce unique dynamics related to competition, project management, typology, and accessibility, among other factors. For deeper insights, future research could comparatively examine individual funding programmes. Similarly, the literature points to a variety of determinants influencing the absorption of funds, and the four determinants we discuss in our paper are by no means exhaustive, albeit prominent in the case of Portugal. More qualitative research is needed on how other determinants may influence inequitable fund absorption, and how these dynamics vary across different policy and geographic contexts.

Furthermore, the project-oriented nature and increasing "expertisation" of EU funding contribute to spatial disparities. This includes a deeper examination of the role of consultancy agencies in climate adaptation planning, the kinds of knowledge involved, as well as understanding which actors and regions reap benefits from these processes, and conversely, which do not. Lastly, while we introduce the concept of "climate finance snowballing," the indirect effects of funding dynamics have yet to be thoroughly analysed. Future research could explore how EU funding dynamics may indirectly catalyse climate adaptation initiatives across diverse sectors and regions.

In closing, our work illuminates the intricate arena of EU funding and its relationship with inter-urban inequity in climate adaptation. We hope that our findings and recommendations will serve as a catalyst for meaningful discourse and action, ultimately guiding us toward a more spatially equitable and transformative approach to funding and financing local climate adaptation.

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Chapter 6. Discussion and Conclusion: Pursuing Cohesive Adaptation

This dissertation sought to explore the following research question: *How do socio-political and financial processes affect urban climate adaptation funding and finance and what are the implications for spatial inequities?* At the outset of this dissertation, I preliminarily identified several critical gaps in knowledge, practice and policy within the field of financing climate adaptation that relates to this main research question: i) the often-overlooked impact of elite capture on vulnerable groups in the financing of urban green adaptation; ii) the lack of sub-national and cross-scalar considerations in the accessibility and allocation of climate adaptation finance, as well as the scalar politics influencing these processes; iii) the lack of empirical data on the use of financial instruments and funding mechanisms in EU urban climate adaptation; and iv) the underexplored effects of EU funding programmes on spatial inequalities among local administrations. In this context, drawing on insights from critical geography and the third wave of climate urbanism research (Bulkeley, 2021), I addressed this research question and the identified knowledge gaps through a commentary article (Chapter Two), a comprehensive literature review (Chapter Three), an analysis of empirical survey data on EU-level funding practices (Chapter Four), and a detailed case study on the interplay between EU funding and inter-municipal inequity in the metropolitan area of Lisboa (Chapter Five).

This chapter now underlines the main findings of the dissertation as articulated in the previous four chapters. The subsequent section reflects on the collective theoretical contribution of the findings of these studies, providing a more nuanced perspective of financialization in climate urbanism, as well as developing a novel conceptualization of the climate finance landscape as a dynamic, competitive arena. I then discuss potential theoretical next steps and propose the competitive-cohesive adaptation financing model, introducing *cohesive adaptation* as an integral financing strategy for transformative adaptation and a course of action to address emerging inequities. Finally, I conclude with some closing reflections, limitations and avenues for future research.

6.1 Summary of Main Findings

In addressing how socio-political and financial processes affect the accessibility and allocation of urban climate adaptation funding and finance in the EU, and the implications for spatial inequities, my research highlights several critical points. The findings indicate that, amid the transition from entrepreneurial to financial urbanism and earlier decentralization processes, it is institutional capacities, political interests, and financial priorities—rather than climate vulnerability—that primarily shape the accessibility and allocation of adaptation finance across inter-state, sub-national, and urban levels. Table 6.1 provides a full overview of the main findings in my dissertation.

At the urban level, elite capture within green adaptation initiatives exacerbates intra-urban disparities by inflating property prices through speculation, leading to displacement and gentrification (Chapter Two). Yet, local governments frequently don't consider the potential impacts of adaptation investments on land markets and barely use land value capture instruments which could redirect private wealth toward funding public services (Chapter Four). At the sub-national level, funding and financing mechanisms reveal various spatial inequities, such as disparities between large cities and small-to-medium-sized cities (Chapter Four), as well as urban-rural divides (Chapter Three). Socio-political factors, including institutional capacities, track records, networks, technical expertise, political commitment, governance structures, fiscal health, legal constraints on financial autonomy, and uneven access to financial markets, all influence which local administrations can successfully secure climate adaptation funding and finance (Chapters Three, Four & Five). Importantly, we find these socio-political aspects pose significant challenges for towns[9], which commonly report, among other things, less political support, lower staff capacity for identifying funding opportunities and greater difficulty meeting funding and financing requirements. Towns in the EU subsequently implement fewer climate adaptation measures and fall behind cities in their adaptation planning (Chapter Four). Staff capacity is a particularly critical issue, with 82% of towns reporting insufficiencies compared to 60% of cities (Chapter Four), a concern perhaps best summarised by one interviewee in Chapter V, who remarked that securing structural funding to hire skilled staff is "not easy at all". These disparities are further exacerbated by the *expertisation* and *projectification* of competitive funding tenders, with short project development and implementation timeframes for EU funds such as the Recovery and Resilience Funds known as NextGeneration (Chapter Five). In this context, our findings underscore the importance of multi-level governance (Chapters Four & Five), a need perhaps most vividly demonstrated by our results from Portugal, where interviewees highlighted the "*strange*" and "*crazy*" situation of competition for the same funding opportunities among municipalities of the same metropolitan area, as well as competition between different levels of administration within the same region (Chapter Five).

Inequities in adaptation finance are also apparent at the international level, with notable spatial disparities in adaptation progress (funded adaptation actions and processes) between cities in Northwestern Europe and Southern and Central & Eastern Europe (Chapter Four). Additionally, significant inequities exist between the Global South (Majority World) and the Global North (Minority World). Within the Majority World, the most vulnerable countries are systematically

[9] In this thesis, I use Eurostat's degree of urbanisation method - a classification using population density, size and contiguity - to differentiate between cities and towns/suburbs. Within this framework, urban areas are those that are either cities (level 1) or towns and suburbs (level 2). I use the term "towns" instead of "towns and suburbs" to enhance clarity and to acknowledge that these are independent local administrations, rather than suburbs within the same administrative area.

deprived of adaptation funding and financing due to socio-political factors such as weak institutional capacities, low absorptive capacity (e.g., in conflict-ridden countries), cost-effectiveness considerations, donor interests, the overrepresentation of Western countries in intermediary institutions, and a preference for debt-based instruments over grants (Chapter Three).

Table 6.1: Summary of main findings

RQ: How do socio-political and financial processes affect urban climate adaptation funding and finance and what are the implications for spatial inequities?

Ch.	Main findings
2	Investments in urban greening, while promoting health and environmental benefits, often prioritize economic growth, leading to elite financial capture, such as urban green grabbing, and the exacerbation of social inequalities. More specifically, the introduction of urban green spaces can lead to gentrification, where rising property values attract wealthier residents and investors, pushing out lower-income and historically marginalized populations. This trend has been observed in numerous cities, where new urban green developments contribute to city-wide gentrification. To combat these inequities, the financing of urban greening needs a shift towards more reparative and democratic approaches, focusing on the needs of working-class and racialized communities. This includes implementing anti-displacement tools like vacancy taxes, rent controls, and community land trusts.
3	Inter-state Inequities in climate finance distribution are driven by disparities in institutional capacity, investment readiness, and absorptive capacity, with a lack of clear rules on what qualifies as climate finance. Overreliance on market and debt-based instruments exacerbates inequality, and power imbalances favour Western countries in climate finance decision-making. Sub-national inequities are characterized by cities, especially larger ones, often having more access to climate finance due to better creditworthiness, financial expertise, and political influence. In contrast, rural areas and smaller cities are marginalized, lacking the bureaucratic capacity, financial markets access, and political clout necessary to compete for climate funds. Local inequities are characterized by the dominance of financial actors and top-down approaches that disregard local knowledge. Projects prioritize financial returns over public or social benefits, leading to gentrification, displacement of vulnerable communities, and appropriation of green infrastructure benefits by elite groups.
4	Most EU local governments lack adequate funding to implement climate adaptation plans, particularly those with lower GDP per capita, which report reduced funding for participatory processes, climate risk assessments, and monitoring. This raises concerns about the credibility of plans to reduce vulnerabilities and increase resilience, highlighting a disconnect between planned actions and actual implementation. EU municipalities, especially towns, rarely use financial instruments for climate adaptation due to legal, administrative, and financial barriers. Climate vulnerability is often deprioritized in funding decisions, with political and financial interests playing important roles in the allocation of funds. EU urban administrations most at risk from climate impacts frequently report less access to national and local funds, highlighting a mismatch between climate risk and financial preparedness. Towns face significant barriers, including lack of political support, staff capacity, and difficulty accessing funding and finance. They subsequently lag behind cities in climate adaptation efforts. Cities in Northwestern Europe are particularly notable for their advanced stage in the adaptation planning cycle. To address inequities in adaptation progress, there is an urgent need to improve coordination among various levels of government—fostering collaboration over competition—and to enhance staff and technical capacity at the local level, particularly in towns, to increase access to funding and finance.
5	EU funding programmes stand out as crucial sources of climate finance for European municipalities. However, the absorption of EU and national funds is a competitive and unequal process, characterized by "projectification" and "expertisation". Inter-urban competition is particularly evident in funds meant to catalyse innovation and experimentation, such as Horizon Europe and the LIFE programme. Existing economic and population density metrics influencing the allocation and access to EU funds fall short of ensuring fair adaptation opportunities in Portugal. Local administrative capacity, along with political support and engagement, a proven track record, and established networks and contacts, significantly affect the absorption of EU funds. This creates a snowball effect, leading to an accumulation of EU funded projects in administrations that excel in these areas. Addressing climate finance "snowballing" and subsequent inequalities in adaptation requires greater emphasis on vulnerability indicators alongside traditional economic metrics. This may include: 1) more favourable financial terms based on vulnerability such as higher co-financing rates 2) targeted tenders for the most vulnerable communities and 3) increased administrative support for vulnerable small and medium-sized municipalities. Other steps may include fostering inter-municipal collaboration through local consortiums around shared climate risks, rather than relying on international consortiums that encourage local competition.

Our findings led through multiple theoretical insights, which I will elaborate on in the following section.

6.2. Theoretical Contribution

Contrary to expectations based on the climate urbanism literature, and the theorized shift of urban power toward financial actors and institutions (Bracking & Leffel, 2021), our analysis of climate adaptation finance in EU cities and towns uncovers a nuanced narrative of financialization. As a counterpoint to the prevalent focus in climate urbanism and critical geography literature on market-based instruments such as green bonds, our study emphasizes the crucial roles of regional, national, and EU funding mechanisms in EU municipal climate adaptation planning. The importance of these funding mechanisms, combined with the limited experience of local administrations in the European Union with financial products, is further supported by recent studies on local climate mitigation and adaptation (European Commission, 2023; Vandecasteele et al., 2024; Economidou et al., 2024; Ulpiani et al., 2023). This perspective nuances the prevailing idea within the climate urbanism literature that climate governance is increasingly financialised. Indeed, as August et al. (2022) describe, scholars often "fetishize" the influence of private finance. Instead, building on the insights of critical geography scholars who highlight the uneven spread of financialization (Pike et al., 2019), I argue that research on climate urbanism should consider regional and geographical variations in financialization, acknowledging the diverse financial relationships that emerge in different local contexts with distinct socio-political landscapes, and recognising the significant role of the state, alongside the role of the market, in this process.

Following the argued dominance of neoliberal ideology in climate urbanism (Long et al., 2020)—emphasising market-driven solutions and reduced state support—the EU context presents a more nuanced scenario where neoliberal principles and significant state involvement coexist in a complex interplay. Challenging the state-market dichotomy, I hypothesize that New Public Management (NPM)-style reforms in European countries from the 1980s onwards (Funck & Karlsson, 2020; Hammerschmid et al., 2019; Pollitt et al., 2007; Schedler & Proeller, 2001) have prioritized effectiveness while integrating the financial logic of neoliberalism in public administration. Examples of this are the evaluation criteria of the Horizon Europe funding programme, e.g. emphasising excellence and efficiency, among others (Chapter Five). In practice, alongside the EU's history of the social welfare state (Laurent, 2021), this indicates that, although the state remains significantly involved in providing climate adaptation funding and financing—contrasting with the lack of federal funding in more financialized countries like the USA (Shi & Moser, 2021)—its actions are heavily shaped by efficiency-driven criteria, financial metrics, and the competitiveness characteristic of neoliberal thought. This is evidenced by the pressure to demonstrate returns on

investment and the importance of fiscal health in adaptation finance decisions (Chapter Four), as well as the competitive nature of EU and national funding tenders (Chapter Five). Consequently, despite substantial public funding, the EU and its member states actively contribute to the competitive spatial dynamics among local governments, where financial logics continue to dominate (Brenner, 2012). This situation is further compounded by the absence of a genuinely financially supported EU territorial cohesion strategy on par with the EU Green Deal (Medeiros & Caramelo, 2023)

We conceptualise the movement of finance across different spaces as "rippling" and the context in which this movement occurs as a climate finance "arena" (Chapter Three). This framework underscores the socio-political dimensions of finance, revealing how some communities benefit while others are excluded, in a process perhaps best described by one interviewee as "*contests*" (Chapter Five). In the absence of a cohesive EU territorial adaptation strategy, competitive adaptation prevails. By this, we refer to the competition for access to and allocation of adaptation funding and finance, leading to the multi-scalar inequities discussed in Chapter Three. As explored in Chapter Five, local governments and other actors have agency and actively strive to attract this funding and finance. This emphasis on accessibility, alongside allocation, challenges traditional top-down, hierarchical approaches and questions the "landscape" (Barrett, 2022; Buchner et al., 2021; Weikmans, 2023) and "architecture" (Garschagen & Doshi, 2022; Watson et al., 2023) conceptualizations of climate finance.

6.3. Theoretical Next Steps: Advancing Spatial Equity through Cohesive Adaptation

So far, I have shown that 1) climate adaptation funding and financing function within a competitive neoliberal framework, and 2) how this competitive dynamic creates inequities across multiple scales. In what remains of this chapter, I will reflect on what these findings mean for the field of climate adaptation (finance) and propose a more spatially sensitive approach to funding and financing adaptation, which can be understood through the ***competitive-cohesive adaptation model***. This model is informed by my own findings and builds on critiques from the climate urbanism and critical geography literature. Part and parcel of this funding and financing model is a more pluralistic understanding of the adaptation finance gap. I will introduce the competitive-cohesive model of funding and financing by i) problematising the EU finance gap through a spatial equity lens ii) listing the principles of *competitive* and *cohesive adaptation* as an ideal-type model placed along a continuum, iii) delivering concrete policy recommendations across governance scales that stem from insights of the model.

Discussions on adaptation finance, as reflected in the 2023 Adaptation Gap report, often present the finance gap in a relatively one-dimensional manner, focusing primarily on quantitative financial

disparities between adaptation costs and available finance, especially between developing and developed countries (Malik & Ford, 2024; United Nations Environment Programme, 2023). While this perspective has merit, finance gaps exist in other geographical contexts, such as within the European Union, and embodies multiple dimensions. Based on the findings discussed in the chapters, this dissertation advocates for a comprehensive and pluralistic understanding of the finance gap as a complex set of interconnected challenges that must be addressed in relation to spatial inequities.

Table 6.2 illustrates this by examining the adaptation finance gap—with a special focus on the EU based on our findings—through the lens of spatial equity. It reveals disparities in climate vulnerability, income, expenditure and debt obligations, access to financial products, access to funding programmes, and risk transfer and compensation mechanisms (e.g., insurance coverage).

Reflecting on the socio-spatial dialectic of Soja (1980), the analysis of the dimensions of finance gaps reveals how adaptation funding and financing are space-contingent because the unique spatial characteristics of target areas, including their geography, climate vulnerability, legal and socio-political contexts, demography, and the institutional capacity of local governments, affect access to markets and funding programmes. Additionally, funding and financing mechanisms are space-forming, as the makeup of these institutional arrangements actively shapes and transforms the physical (and social) realm, driving patterns of development and influencing spatial inequality (who adapts, and how adaptation happens).

Table 6.2: Dimensions of the finance gap from the perspective of spatial equity

		Problematising the (EU) Adaptation Finance Gap
Intersecting Inequalities	**Variations in climate vulnerability**	A significant challenge to multi-level adaptation governance is the variability in climate vulnerability across different localities, regions, and countries (Dewulf et al., 2015). Certain areas require significantly more investment due to their heightened vulnerability yet lack the resources needed to adapt effectively. Consequently, although not all adaptation requires monetary investments, the finance gap inherently intersects with variations in climate vulnerability; they are two sides of the same coin. Instead of "ingesting" entrepreneurial or financial logics (Peck, 2014), there is a need for funding and financial mechanisms to "ingest" the spatial heterogeneity in climate vulnerability. As demonstrated in this thesis, funding and financing processes often overlook this variation, rarely considering climate vulnerability indicators comparatively. For example, In Chapter III, we observed that vulnerability indicators at interstate, subnational, and local levels are not sufficiently taken into account in allocation and accessibility processes, which may lead to elite capture (Chapter Two). in Chapter Four we saw how climate vulnerability assessments play a limited role in the allocation of funding at the local level. Similarly, in Chapter Five we saw that at the inter-state and sub-national levels, EU funding allocation tends to prioritize economic indicators, as seen with Cohesion funding, or emphasizes efficiency and excellence, as in the case of Horizon Europe, rather than climate vulnerability.
	Variations in Income, Expenditure, and Debt Obligations	In Chapter One, we observed that local governments' capacity to generate revenue and meet expenditure needs varies significantly due to differing local socio-economic realities, and that efforts to address these disparities between EU local governments through fiscal equalization are inconsistent (Blair, 1992; Dougherty & Forman, 2021; Moisio & Bover, 2023). In Chapter Four, we found the importance of fiscal health influencing the allocation of funds for adaptation, with differences observed among local governments. As Shi and Varuzzo show, touched upon in Chapter Three, fiscal capacity also intersects with climate change (e.g. sea level rise). In Europe, too, extreme weather events have been shown to exacerbate fiscal challenges, as evidenced by the significant impacts following major floods in Germany in 2021 and Slovenia in 2023. These events can result in reduced tax revenues, heightened government spending, lower credit ratings, and increased borrowing costs (European Environment Agency, 2024).
	Unequal Access to (competitive) Funding Programmes and Subsidies	As we have seen in Chapter Five, the absorption of EU funding programmes is unequal both between and within countries, which is further supported by literature outside the field of climate finance (Cunico et al., 2022; Hagemann, 2019; Mendez & Bachtler, 2024). Apart from the political and legal contexts that shape (local) governance (Vandecasteele et al., 2024), factors contributing to this disparity include inter alia variations in administrative capacity, networks, track record, commitment of mayoral and technical staff. In the context of competitive adaptation, elite capture, as discussed in Chapter Two, is likely to occur across multiple scales, including between municipalities. For instance, wealthier municipalities like Cascais in Portugal, with greater capacity and expertise, are more likely to benefit from the current political economy and EU funding programmes, exacerbating spatial inequities in adaptation progress if territorial differences are not adequately addressed.
	Disparities in Access to Financial Products	In Chapter One, we saw the degree of financial autonomy in the EU varies significantly among member states (Ladner & Keuffer, 2023). Apart from these legal aspects, access to financial products differs widely among local governments in the EU due to variations in fiscal health, institutional capacities and other socio-political aspects (Vandecasteele et al., 2024). In Chapter Four we discussed how this primarily affects towns due to their uniform economic structure and constrained tax base. At the local level, access to financial products and services often restricted in racialized neighbourhoods in a process referred to as *bluelining*, as discussed in Chapters One, Two and Three.
	Risk Transfer and Compensation Mechanisms (e.g. insurance)	In addition to the above gaps, a significant gap exists in insurance coverage. Climate-related economic losses are insured at rates as low as 5% or less in certain regions of Europe, compared to an average of only 35% (European Commission, 2021). In Chapter Four, we observed that only 11% of cities and an even smaller percentage of towns we surveyed use risk mitigation instruments, with a high number of "don't know" responses highlighting a general lack of awareness about these options. The notion that adaptation is a public service, and a state responsibility varies across countries and has implications for insurance. For instance, in the Netherlands, the government fully assumes responsibility for flood management in climate adaptation, while in the UK, this responsibility is shared among the government, citizens, and private insurance industry (Dewulf et al., 2015). These disparities in the distinct roles of public and private actors regarding insurance, further exacerbate this dimension of the EU finance gap.

The dimensions above highlight key aspects of the finance gap revealed in my research, though they are neither exhaustive nor exclusive. Although Table 6.2 primarily focuses on sub-national inequities, I theorize that the dimensions of the finance gap are multi-scalar, with relevance at local, sub-

national, and international levels in distinct ways. While I acknowledge that spatial disparities are inherently interconnected to issues such as race, gender, and other axes of inequality, my dissertation has thus far concentrated primarily on equity, with limited exploration of justice-related issues as explained and justified in the introduction. In theorizing the multi-scalar nature of the finance gap across its five dimensions— i) climate vulnerability, ii) income, expenditure and debt obligations, iii) access to financial products, iv) access to funding programmes, and v) risk transfer and compensation mechanisms—I return to ideas explored in the introduction on justice and equity to broaden the lens on what cohesive adaptation might look like in practice.

As illustrated in the left column of the table, I theorize that intersecting inequalities permeate all dimensions of the finance gap. For instance, research shows that certain privileged groups, such as white property owners, may have better access to financial markets and state subsidies for adaptation, which may exclude renters and informal landholders (Wagner, 2024). Marginalized groups are also more susceptible to challenges such as insufficient insurance coverage due to higher premiums and limited access to financial services and products, including less favourable mortgage financing, compounded by discriminatory practices like historic redlining and emerging *bluelining* (Claussell, 2022; Keenan & Bradt, 2020; Montgomery & Palmeira, 2023). Such gaps can also persist at the sub-national level; for example, research indicates that majority-Black cities in the USA have been shown to face reduced and less favourable access to financial markets (Ponder, 2021).

What these various gaps tell us is the need and urgency for more spatially equitable, or "cohesive" strategies in funding and financing, while giving particular attention to marginalized groups. Importantly, I do not aim to feed the 'gap talk' narrative, which simplifies the climate crisis to merely a lack of funding and finance (Bryant & Webber, 2024). I present this conceptualization of the finance gap with the explicit understanding that finance alone cannot solve all problems; other factors, such as political will, institutional reforms, citizen mobilization, and paradigm shifts also play essential roles. Instead, with my problematization of the *singular* finance gap, I aim to shift the focus away from finance alone and toward deeper discussions on the political economy of climate finance, including the multi-scalar inequities it perpetuates. This includes recognising issues such as elite capture and other financial processes common in market-based approaches and competitive funding tenders, thereby broadening the dialogue to address the structural and systemic challenges within climate finance. By problematising the finance gap across five dimensions at multiple scales, I hope to contribute meaningfully to this broader conversation.

At the outset of this dissertation, I identified both a theoretical and policy need to address spatial inequities. Our exploration of the 'spatial turn' in urban studies and human geography highlights the importance of spatial sensitivity in adaptation investments—an element often neglected in current

transformative models, which remain vague about spatial scales (Few et al., 2017; Lonsdale et al., 2015), and are therefore blind to multi-scalar spatial inequities. The policy gap stems from a lack of territorial logic in key EU policies and funding programmes related to adaptation. My findings on the funding and financing of urban climate adaptation empirically demonstrate the consequences of this gap: unequal adaptation progress both within and between cities and countries.

The competitive-cohesive model aims to bridge this theoretical and policy gap by explicitly focusing on reducing spatial inequities and tackling the finance gap across five dimensions at multiple scales. Table 6.3 presents competitive and cohesive adaptation as ideal types that represent contrasting funding and financing models. Similar to Schipper's (2020) maladaptation-effective adaptation framework - and the subsequent NAM framework (Reckien et al., 2023), I theorize competition and cohesion along a spectrum, serving as a theoretical benchmark for promoting spatially equitable adaptation financing practices. Although achieving complete cohesion may be unlikely, the model may contribute to setting standards in adaptation funding and financing.

Table 6.3: The competitive vs. cohesive adaptation funding and financing model[10]

	Competitive Adaptation	Cohesive Adaptation
Paradigm	The philosophical principles of competitive adaptation are shaped by key paradigms such as New Public Management (NPM), climate urbanism, and a mix of entrepreneurial and financialized urbanism.	The philosophy behind cohesive adaptation is grounded in paradigms such as New Public Service (NPS), democratic governance, and (global) spatial Keynesianism.
State Responsibility	Adaptation is a shared responsibility of the state, but it is increasingly framed as a multi-stakeholder issue where private actors are expected to take the lead, effectively shifting the burden from public to private entities. In the lack of structural government support, the pursuit of competitive grants and finance has evolved from a strategic choice to a fiscal necessity.	Adaptation is viewed as a public service and public good, making it primarily the responsibility of the state rather than the market or individuals. As such, adaptation planning is supported by structural programmatic funding and fiscal equalization efforts to balance local revenue and expenditure of local and regional governments.
Private finance	Central to this framework is a reliance on private finance, promoted as the "silver bullet" solution to the climate crisis.	Private finance assumes a supportive rather than a central role; it can facilitate the advancement of public objectives (e.g. adaptation) but is not the primary mechanism for delivering adaptation interventions.
Return on investments	This approach prioritises economic and financial interests over broader social and public values, focusing on monetary return on investments while emphasising cost-efficiency, excellence, and effectiveness in adaptation strategies. In this context, climate vulnerability indicators are frequently disregarded.	Return on investments is not assessed in monetary terms alone; it encompasses considerations of the public good, including enhancements in mental and physical health. Climate finance decisions are made with a strong emphasis on climate vulnerability indicators, rather than solely on economic metrics.
Multi-level governance	Cities are increasingly competing across scales to attract investment, often leveraging city branding with buzzwords like "smart city." The focus on competitiveness and competition poses significant challenges to multi-level governance.	Cities are increasingly collaborating across various levels to invest in adaptation, addressing climate risks at the level of natural boundaries rather than being constrained by jurisdictional limits and inter-urban competition.
Spatial justice	Efficiency and competitiveness are more important values than broader welfare-oriented goals like territorial cohesion and social justice. As such, competitive adaptation perpetuates historic injustices and exacerbates climate apartheid and splintering urbanism.	Instead of “ingesting” entrepreneurial or financial logics, cohesive adaptation "ingests" the spatial heterogeneity in climate vulnerability. Although rooted in a spatial equity framework, cohesive adaptation furthermore recognizes historic and systemic processes of oppression and advocates for a reparative approach to financing that supports marginalized communities and rectifies past and present harm.
Territorial cohesion	Major urban areas, along with strategically located neighbourhoods, are prioritised for investment in adaptation, resulting in uneven territorial progress in adaptation efforts. Additionally, principles like cost-efficiency, reliance on quantitative metrics, and a focus on short-term planning can lead to the neglect of unique local contextual considerations, resulting in place-blind planning.	Priority is given to balanced territorial cohesion, with a strong emphasis on spatial equity. Small and medium cities are key to balanced regional development and resilience, bridging gaps between rural areas and major cities. Furthermore, place-based strategies to enhance belonging and community identity are advocated.
Project management	Competitive tenders lead to projectification, characterised by short implementation horizons and policy silos.	Adaptation is a transversal policy issue and therefore integrated with other policy areas.
Role of knowledge	The technocratic nature of application processes often prioritises and rewards “expert” knowledge.	Data-driven adaptation planning is combined with the democratisation of climate finance decision-making and engagement with subaltern knowledge at various levels, ensuring diverse voices are part and parcel of planning. Such an approach includes increased transparency and accountability.

[10] This table is constructed based on my interpretation of the findings and relevant literature.

As Table 6.3 shows, *competitive adaptation* is shaped by neoliberal principles, following decades of New Public Management (NPM) reforms, and transitions to entrepreneurial and financial urbanism, emphasising market-driven solutions and efficiency, as discussed in the introduction. With **competitive adaptation,** I build on McClure and Baker (2013) and refer to the *competitive spatial logic that underlies the dominant approach to adaptation which prioritises economic principles like competitiveness as a development objective over spatial equity principles and balanced territorial development.* This model relies heavily on competitive tenders, technocratic expertise and private finance, with short-term policy implementation cycles (projectification), which can exacerbate well-documented phenomena in the literature such as splintering urbanism and "climate apartheid" in so far as the competitive spatial logic intersects with various axes of inequality and builds on historic modes of oppression. Through the prioritization of monetary return on investments and performance criteria, high insurance premiums, debt traps, and uneven access to funding mechanisms and financial products may disproportionately impact climate-vulnerable households and regions. Under the competitive adaptation approach, incremental adaptation is widespread and as such fails to address the root causes of vulnerability, highlighting the limitations of this approach.

In contrast, *cohesive adaptation* is grounded in New Public Service (NPS) and democratic governance. In contradistinction to New Public Management and New Public Governance reforms discussed in the introduction, the more radical New Public Service has been proposed to challenge dominant business-oriented approaches in public administration for compromising equity, representativeness, and fairness. NPS advocates blending values of efficiency and expertise with those of citizenship, democracy, and social justice (Denhardt, J. V., & Denhardt, R. B., 2015; Denhardt, R. B., & Denhardt, J. V., 2000). It signifies a return to spatial Keynesianism in so far as it prioritizes even territorial development above economic values like competitiveness. I define **cohesive adaptation** as a *spatially sensitive, place-based funding and financing approach that encourages democratic state intervention and regulated market involvement, utilising multi-level governance principles to ensure equitable access to and benefits from public investments and financial resources for successful climate change adaptation*. This conceptualization views adaptation and its financing as socio-political processes and proactively addresses multi-scalar inequities, including the often-overlooked issue of inter-municipal disparities. The concept emphasizes fiscal equalization, structural state support, equitable access to funding programmes and financial markets across scales, and aligns with the New Collective Quantified Goal (NCQG) by prioritising concessional and grant-based funding. It aims to improve legitimacy and effectiveness by democratising climate finance decision-making at local, regional, and international levels,

addressing local needs directly through place-based adaptation (Murtagh & Lane, 2022). Project management in cohesive adaptation emphasizes collaboration through local consortiums around shared climate risks, fostering local inter-municipal cooperation along natural borders (e.g. riverbed), and integrating adaptation as a transversal policy issue.

Building on the principles of territorial cohesion and drawing from Medeiros & Rauhut's (2020) concept of Territorial Cohesion Cities, small and medium-sized cities in less developed EU regions play a crucial role in a cohesive adaptation strategy. They serve as vital links and development hubs between rural areas and larger urban centres. By directing Cohesion Policy funds towards these 'territorial cohesion cities,' we can catalyse development in their surrounding hinterlands, fostering the territorial development of areas that typically lag behind major cities and agglomerations. (Medeiros & Rauhut, 2020). This aligns with what Demeterova et al. (2020, p. 19) paradoxically refer to as the recognition of the *'right not to catch up*,' allowing regions, especially smaller urban areas, to pursue development paths tailored to their unique needs and contexts instead of adhering to a singular, growth-driven model that may not align with the strengths and priorities of peripheral towns and cities.

I offer the concept of Cohesive Adaptation as an integral part of transformative adaptation and as a crucial step alongside efforts for more intersectional, decolonial, and justice-oriented approaches. In Table 6.4, I build on the multi-scalar inequities identified in Chapter Three to provide a list of policy recommendations on what cohesive adaptation might look like in practice across governance scales. To create a full picture, I draw on my own findings and that of others.

Table 6.4: Policy recommendations for cohesive adaptation across scales and finance gap dimensions

Dimension of finance gap	Urban recommendations against intra-urban inequities	National/EU recommendations against inter-municipal inequities	Global recommendations against inter-state inequities
Variations in Climate Vulnerability	Prioritize the role of climate vulnerability assessments in guiding local allocation of funding (Chapter Four). This approach could be accompanied by place-based adaptation to align with ongoing activities, needs, and priorities and strengthen community identity and sense of belonging (Murtagh & Lane, 2022). What is more, bold anti-displacement tools (Chapter Two), including rent and development controls, increased social housing, and inclusionary zoning, can help combat elite capture in urban adaptation investments by reducing the risk of displacement and gentrification (Oscilowicz et al., 2021; Klein et al., 2020). Any increase in land value can be redirected to social programmes using land value capture instruments.	National and Supranational "Green Deals" should better incorporate considerations of spatial inequities and territorial cohesion (Chapter One). Moreover, funding programmes and tenders should incorporate climate vulnerability indicators in allocation logic, this can, inter alia, include: i) Higher co-financing rates for the most vulnerable administrations. ii) Targeted tenders for the most vulnerable iii) Increased administrative support for vulnerable small and medium-sized municipalities (Chapter Five)	The most climate-vulnerable countries are often those impacted by conflict, and to improve financing efforts for these countries researchers recommend promoting collaboration across the humanitarian, climate, disaster risk reduction, development, and peace-building sectors, along with recognising fragile and conflict-affected states (FCS) as a distinct group within the climate finance framework (Quevedo & Cao, 2022)
Variations in Income, Expenditure, and Debt Obligations	Some adaptation measures are undertaken privately by households, such as purchasing air conditioning units; however, variations in household income and expenditure, along with broader wealth inequalities, may lead to disparities in adaptation efforts at the local level (Tan-Soo et al., 2023). Local governments can implement targeted financial assistance, such as subsidies for air conditioning, along with improved building codes (ventilation, insulation, etc. in social housing) and awareness campaigns to support low-income households in climate adaptation strategies (e.g., climate shelters).	National governments set the fiscal transfers and allowable taxes for sub-national governments (IPCC, 2023). National governments could adopt state reforms and expand fiscal equalization efforts to balance local revenue and expenditures. For local governments burdened by debt, additional state support is provided to address climate adaptation needs. If the state holds the debt, debt relief strategies are implemented without imposing austerity measures.	For heavily indebted countries and local governments with small economies, including small island states (SIDS), it is crucial to increase the share of grants and concessional loans over traditional loans in both multilateral and bilateral support. This shift aims to reduce debt obligations and enhance their capacity to adapt.
Unequal Access to Funding Programmes and Subsidies	Ensure that local government subsidies, whether direct or through tax incentives, are accessible to vulnerable populations, including those without property (Wagner et al., 2024). The legitimacy and practical use of local adaptation funds and subsidies can also be strengthened through participatory budgeting (PB), which reduces the dominance of green growth in adaptation investments and fosters community ownership (Chapter Two). Additionally, incorporating subaltern knowledge can further enhance the legitimacy and effectiveness of local adaptation (Olazabal et al., 2021)	Revise consortium requirements for climate adaptation funding under Horizon Europe's Adaptation Mission to prioritize local collaboration over international partnerships and local competition. Focus on consortiums addressing shared climate risks aligned with natural boundaries. Set a limit on the number of Horizon/LIFE projects each local administration can participate in per programming period. Additionally, promote Territorial Cohesion Cities as regional hubs to attract investment beyond major urban centres (Medeiros & Rauhut, 2020).	Define clear criteria for climate finance, along with enhanced support and streamlined procedures for navigating the diverse range of multilateral funds (Chapter Three). Strengthen the representation and decision-making influence of developing countries within key intermediary institutions of major climate funds (MDBs and UN agencies). This could include revising governance structures, ensuring fair voting rights, and increasing the share of developing countries representatives.
Disparities in Access to Financial Products	To reduce disparities in access to financial products and services at the local level caused by bluelining, researchers recommend enhancing awareness of bluelining among urban policymakers, improving transparency in climate-related practices of financial institutions, and involving these institutions in adaptation planning, while also increasing accountability and enforcing existing laws to prevent and address discriminatory bluelining practices (Montgomery & Palmeira, 2023)	Acknowledge differences in financial autonomy and implement necessary reforms. Provide state support where financial autonomy is lacking and enhance local capacity and administrative support to access markets. Always assess financial products for equity and provide funding where they fail to reduce vulnerabilities (Chapter Four). Offer financing on favourable terms (e.g., via the EIB) and facilitate access for smaller governments through local inter-municipal consortiums (Chapter Five).	Enhance capacity building by providing technical assistance and training to local and regional officials in climate-vulnerable countries on navigating financial markets, project development, and climate adaptation planning. Conduct thorough evaluations of financial products to ensure that adaptation projects consider both financial interests and equity and vulnerability factors (Chapter Four)

Risk Transfer and Compensation Mechanisms	Create strategies to address local disparities in insurance coverage, focusing specifically in both policy and practice on areas with high insurance premiums due to bluelining. Additionally, consider implementing planned, state-supported retreat strategies for areas facing extreme risk (uninsurable). Ensure that all relocation efforts respect human rights and actively engage affected communities in the process, providing them with significant decision-making authority over where and how to relocate, and adequately compensating them for their material and non-material losses.	To address national/EU gaps in insurance coverage against climate risks, develop comprehensive state-supported insurance programmes that specifically target areas lacking adequate local coverage, subsidise premiums for vulnerable areas, and implement public awareness campaigns about available insurance options. These awareness campaigns should target not only residents but also city officials, ensuring they are informed about the options available for local administrations to help reduce these disparities.	As the talks on the New Collective Quantified Goal (NCQG) come to a close around COP29, it's important to officially recognize Loss and Damage as a third key area of climate finance, alongside mitigation and adaptation, while ensuring that commitments to Loss and Damage do not compromise the essential resources required to achieve the Global Goal on Adaptation (GGA) (Schalatek & Richards, 2024)

The provided recommendations in Table 6.4 are neither exhaustive nor exclusive, but I hope they offer insights into what cohesive adaptation may entail across different governance scales. While I recognize the potential of the proposed model and accompanying policy recommendations, it is important to acknowledge that they are still in the early stages of development. Further refinement will be necessary to ensure their relevance and applicability in specific contexts.

Naturally, the decision between providing state support via funding or utilising market-based instruments through finance is influenced by underlying economic worldviews (Keenan, Chu, and Peterson, 2019). The concept of cohesive adaptation does not reject finance; rather, it advocates for a balanced approach that emphasizes enhanced state support alongside financial mechanisms. I assert that, in addition to regulating markets to align with climate objectives (Newell, 2024), it is equally important to reform public funding mechanisms that have adopted the competitive logic of finance, thereby incorporating a more spatially equitable, or 'cohesive,' approach.

In light of ongoing climate apartheid practices and unprecedented weather events, I aimed to clarify what a more spatially equitable climate finance arena could look like. Achieving this vision requires a re-evaluation of finance's role in climate adaptation and a renewed commitment from public institutions and the state to develop effective strategies for mitigating climate impacts. This dissertation contributes to this vital conversation by proposing an initial framework for cohesive adaptation within the EU, with the hope that it will inspire further progress and drive transformative change.

6.4. Future Research Directions

As in all research, several limitations are present in my dissertation, some of which have already been discussed in the individual chapters. In this section, I use these limitations to identify areas and topics that require further investigation.

First and foremost, our focus was on the urban, while there is indeed a gap in understanding the adaptation needs of rural communities and the role of funding and finance in this regard. Additional research and empirical data are crucial for effectively addressing these needs, particularly as the theory suggests that this type of sub-national inequity may be significant (Chapter Three).

The adaptation finance gaps outlined in Table 6.2 are not exhaustive. While we focus on five key dimensions, additional sub-gaps warrant further research, including informal, decentralized, and community-based financial practices, as highlighted by Robin (2022).

What is more, some of the dimensions of the finance gap we identify remain relatively unaddressed. For instance, further research is needed in areas such as fiscal health, which our empirical work did not delve into deeply. For example, to date, fiscal equalization has received limited attention in the context of climate adaptation. Emerging evidence has examined how fiscal equalization can promote greening by rewarding green cities and penalising grey cities (López-Laborda et al., 2023). More research is needed to understand how these competitive dynamics contrast with the cohesive strategy of fiscal equalization proposed by the competitive-cohesive model presented here to yield the desired cohesive outcomes.

As a socio-political process, it is unsurprising that research shows adaptation finance is further constrained by corruption, a topic still underexplored in climate finance literature (IPCC, 2023). While we did not account for corruption, its variation across geographies and scales can significantly affect the success of adaptation efforts. More comprehensive research is needed to understand how corruption intersects with climate adaptation finance at different levels.

Future spatial analyses of adaptation finance must incorporate social inequities, including gender, race, socio-economic status, disability, and migratory status. The 2023 Adaptation Gap Report highlights that “gender is only weakly included in adaptation finance” and notes that “other aspects of social inclusion (e.g., Indigeneity, ethnicity, disability, age, or migration status) receive little attention” (United Nations Environment Programme, 2023, p.30). While this thesis does not focus primarily on these issues, it acknowledges the role of intersecting inequities. However, mere recognition is insufficient. I concur with Kotsila et al. (2023) on the need for further exploration of exclusionary processes and persistent patterns of domination in urban (green) adaptation through radical scholarly practices, such as ethnographic and activist research, to fully uncover the intersectional and relational dimensions of justice in climate finance. Additionally, it is essential to consider how to integrate these insights into the proposed competitive-cohesive adaptation model.

Research could also examine how the proposed model could inform and feed into the UNFCCC New Collective Quantitative Goal (NCQG), which aims to set a shared target for developed countries to

provide measurable climate finance to help developing nations with mitigation and adaptation efforts. This could involve identifying alignment with other recommendations, such as advocating for a more complex definition of the NCQG that includes both qualitative and quantitative elements (Zagema et al., 2023), exploring proposals like adding qualitative sub-goals (Watson, 2023), e.g. on the proportion of grants vs loans (Pauw et al., 2022)

While this thesis primarily focuses on the EU, with empirical data derived from EU cities and towns, the insights gained may be relevant to other regions worldwide. However, it is crucial to acknowledge cohesive adaptation requires a participatory and inclusive approach, deeply rooted in democratic governance traditions. Consequently, its applicability may be limited in more autocratic settings, where democratic practices are less prevalent. Future research could explore how to effectively integrate cohesive adaptation, as an ideal-type framework, into real-world scenarios, acknowledging that, given current political and economic conditions, achieving full or even substantial cohesion is unlikely. However, my hope is that some of the recommendations may help address and mitigate the shortcomings of the competitive adaptation approach prevalent in climate urbanism.

Finally, given the significant role of public funding for cohesive adaptation, a critical question arises: how will we finance these initiatives? Modern Monetary Theory (MMT) has emerged as an important topic in the context of post-pandemic recovery (Nersisyan, 2022), and is being considered as a way to address the financing of ambitious social-ecological policies and public provisioning systems within a degrowth framework (Olk et al., 2023). MMT argues that governments with sovereign currencies can finance their expenditures through the creation of money, as long as they have available resources such as labour and materials, which alleviates concerns related to budgetary constraints (Nersisyan, 2022; Olk et al, 2023). Nersisyan (2022) draws parallels to the successful mobilization of economic resources by the U.S. government during World War II (including the Marshall Plan), a remarkable achievement accomplished with minimal inflation. This historical precedent, along with the substantial state investments made during the post-pandemic recovery phase, underscores the feasibility of extensive resource mobilization through effective financial planning and public policy.

To further put things in perspective, when one considers that the proposed (fictional) 1 trillion euros for the EGD is substantially less than the 4.2 trillion euros allocated for EU bank rescues (Varoufakis, 2023; Varoufakis & Adler, 2020), it becomes apparent that the challenge we face may not be a matter of scarcity, but rather one of distribution—specifically, how we govern financial resources and prioritize their allocation. Ultimately, the real question we should be asking is not whether we can afford to finance cohesive adaptation, but rather: can we afford *not* to implement cohesive adaptation?

6.5. Closing Thoughts

Although collaboration is inherent to human nature, 50 years of neoliberalism have entrenched the belief that competition is the primary driver of innovation and progress. However, financial systems and funding programmes rooted in competitive logic often stand in tension with the broader public interest. My thesis demonstrates that both financial processes and public funding programmes—intertwined to some degree—frequently deepen spatial inequities, a situation worsened by uneven climate vulnerability. Much like the cover of this dissertation—with its depiction of murmuration as a cooperative and collective strategy against threats—I believe our path forward requires embracing multi-scalar collaboration and challenging the entrenched competitive logic within climate finance.

In this day and age, divisions are evident not only in climate vulnerability but also in levels of trust and political opinion. Hackworth (2019) observes that after decades of debt crises and austerity many of the "urban outcasts" no longer view the state as a protector but as a predatory extension of the one percent. I believe such erosion of state legitimacy is starkly evident in the widening political geographic divide between urban centres, suburban areas, towns and rural regions, where radical right movements are gaining traction especially in "left-behind" places. Based on my findings, and those of others, I fear that the lack of a territorial dimension in climate adaptation strategies, given the underlying competitive spatial logic of funding and financing, may further exacerbate this political divide, and further erode trust in state institutions. Recognising these growing tensions, this dissertation proposes a model for more spatially equitable climate adaptation finance, aiming to inspire a shift towards realigning financial and funding mechanisms with the principles of balanced territorial development.

For those closely following IPCC reports, it is clear that minor adjustments to the status quo are no longer adequate (if they ever were), as existing financial and economic logics have brought us to the brink of climate catastrophe. Bold, radical proposals are now needed—ideas that may seem politically infeasible or even idealistic. Acknowledging that finance serves as both a political project and a product of political processes—a perspective long embraced by political ecologists—opens the door for much needed activism. Amid the collapse of life support systems and growing climate apartheid, where elites increasingly secure 'climate safety' across various scales and geographies, I believe it is crucial to politicize and challenge the role of finance—too often presented as a silver bullet solution to the climate crisis yet frequently falling short of protecting the most vulnerable—while also recognizing the full responsibility of public institutions and the state in crafting a spatially sensitive strategy for funding and financing climate adaptation. I hope that by reimagining the state's role as a custodian of equity and territorial cohesion, we can foster solidarity across communities—a solidarity rooted in our shared vulnerabilities and interconnected futures.

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Appendix A: Supplementary Information of Chapter 4

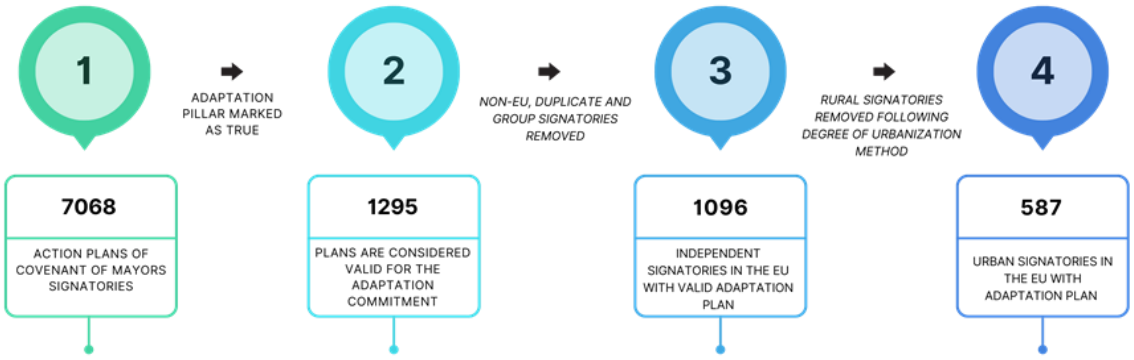
A.1 Methods

A.1.1 The Sample

To identify local governments in the European Union that are likely to have experience with funding and financing climate adaptation a non-probability sampling method was followed, drafting inclusion and exclusion criteria (Berndt, 2020). We thus depart from the assumption that cities that have committed to adaptation and adopted a plan will be further along their climate adaptation policy cycle and have more information available on funding and financing climate adaptation. As the principal alliance for local governments committed to combating and adapting to climate change in the EU, we assume that local governments with climate adaptation plans will be signatory to the Covenant of Mayors (CoM) (Basso & Tonin, 2022). The survey sample therefore draws from the CoM network, with submission of an adaptation plan on the My Covenant Platform being the main inclusion criteria. Notably, following the approach of Berrang-Ford et al. (2019), our analysis excludes the examination of private sector-led climate adaptation initiatives and focuses squarely on government-led climate adaptation efforts.

The *GCoM - MyCovenant, 2021, Second release* dataset, and specifically data frame 2, served as the starting point of the survey sampling procedure (Treville et al., 2022). This dataset identifies 7069 action plans, 1296 of which in compliance with the Adaptation Action Plan Pillar. We performed a curation of this data by removing signatories outside the EU (158), group profiles (21) and duplicate entries (21), resulting in 1096 signatories. The latter number (1096) comprises local administrations of all sizes and typologies. As our research focuses on urban areas, we excluded predominantly rural communities. We did so by applying the degree of urbanisation method. Formally endorsed by the United Nations Statistical Committee in 2020, the Degree of Urbanisation method is used by Eurostat within the European Union context for statistical comparisons (Dijkstra et al., 2021). This method builds on statistical data of Local Administrative Units (LAUs) - municipalities or communes - and distinguishes three urbanisation levels: cities, towns and suburbs, and rural areas (Eurostat, 2024b). Within this framework, urban areas are those that are either cities (level 1) or towns and suburbs (level 2). Only those with level 1 (cities) and level 2 (towns and suburbs) were included in the survey, resulting in a total of 587 LAUs (See Figure A.1).

Figure A.1: Survey Sampling Method Building on JRC dataset (Treville et al., 2022).



Contact details of the environmental, urban planning and financial department of all 587 LAUs were collected following a documenting protocol encompassing three main steps, including a search on 1) the Covenant of Mayors website, 2) the municipal website (and more specifically the environmental/financial/urban planning department webpage and the general contact page/directorate), and lastly 3), policy documents. This resulted in a pre-selection of 938 email addresses, with some LAUs being represented by two departments in the contact list.

The survey was launched at the end of November 2022 on the Covenant of Mayors website and disseminated through the Covenant of Mayors Channels (e.g. Twitter, LinkedIn etc.). Survey invitations were subsequently sent in December and January to the collected 938 email addresses in English, Spanish, French, Italian and Dutch. A maximum of two follow-up reminders were sent on a rolling basis, with a period of time in between each reminder until the end of January 2023. Out of 155 total submissions received (25% response rate), six duplicates and one submission from outside the EU were removed, leaving 148 submissions. In the case of duplicate responses, the most recent or the most complete response was retained.

Responses were received from 17 countries, with varying degrees of regional coverage (see Figure 4.1). Survey responses were highest in Spain, Italy, and Belgium, coinciding with the higher number of Covenant of Mayors Signatories in these countries (Melica et al., 2022). Some regions within these countries, such as Flanders in Belgium, Galicia in Spain, and Emilia-Romagna in Italy, are overrepresented due to a concentration of signatories in said regions. The vast majority of respondents were affiliated with the environmental department (64%), followed by "other" (20%), with a relatively smaller number of contributions from urban planning (12%) and finance (3%) departments. Respondents under "other" included representatives from offices dedicated to sustainability, environment, energy, public works, and European Projects. Out of the 148 local government responses, 63 were categorised as cities based on the degree of urbanisation method, while 85 were classified as towns (See Figure 4.1). Using population adhesion data, these 148 local

governments represent roughly 26 million people, which includes approximately 6 % of the total European Union population.

A.1.2 The Survey Design

Inspired by the climate urbanism literature, and previous surveys conducted in the USA, our survey focused on identifying funding and financing practices, sources of funding/finance, barriers to accessing funding and finance, climate vulnerability and equity considerations, and socio-political factors influencing the allocation and accessibility of funding and finance.

We followed a cross-sectional survey method (Connelly, 2016), and included 16 main and 10 sub-questions, totalling 26 questions. Due to skip logic, the number of questions each respondent answered was generally lower and varied based on their responses. Survey questions were open-ended, binary, ordinal and categorical in nature (See SI A.4). To assess perceptions of barriers and funding priorities, respondents were presented with statements and asked to indicate their level of agreement using a 3-point Likert scale, complemented by a "Don't know" option. A 3-point Likert scale with an additional "don't know" option was chosen for its simplicity and ease of use, reducing cognitive burden, making it particularly useful in exploratory research settings with technical and factual questions where nuanced degrees of sentiment are less critical (Jacoby & Matell, 1971; Preston & Colman, 2000; Revilla et al., 2014). Throughout the survey, respondents were prompted to provide detailed information or clarifications where necessary.

Financial instruments were largely based on the ICLEI Climate Finance Decision-Making Tree. However, to simplify the survey, we opted not to incorporate all instruments individually, instead grouping various instruments and excluding others. For a full list of key financial instruments featured in the survey, please see Figure A.2.

Figure A.2: Overview of surveyed financial instruments with definitions

Instrument Category	Debt Based	Market Based	Definition
Local Government's Own Funds	✗	Varies	Local governments can finance smaller climate adaptation projects or overcome debt limitations by utilizing their own funds, which may include government transfers, savings (through municipal taxes) or revenue generated from the sale or lease of municipal land (LVC instruments).
Grants and Subsidies	✗	✗	Funds derived from external public sectors provided without the requirement for repayment. Grouped in the survey under regional, national, and EU/international grants and subsidies.
Public Loans	✓	✗	Money borrowed from governments, involving repayment. Not strictly market-based; money is provided by national or international public banks (e.g. the EIB). In general, public loans will be provided under more favourable terms (soft loans) than commercial loans.
Public-Private Partnerships (PPPs)	Varies	✓	A public-private partnership (PPP) is a contract between public and private entities. PPPs leverage private resources and expertise to achieve public goals, such as the construction or maintenance of adaptive infrastructures. PPP structures vary; some may involve debt or equity.
Private Loans	✓	✓	Private sector loans entail commercial loans from private sources and financial institutions. These types of loans require repayment, typically under market conditions.
Municipal (Green) Bonds	✓	✓	Debt securities issued by local governments. Bonds differ from loans in that they can attract multiple investors and may be traded on secondary markets. Moreover, they typically have fixed interest rates and maturity dates.
Risk Mitigation Instruments	Varies	✓	Market-based instruments, such as guarantees and insurance, mitigate financial risks. Guarantees ensure loan repayment through a guarantor, while insurance provides compensation for climate-related damage based on insurance premiums. Instruments vary; not inherently debt-based.

Note: partly derived from the ICLEI Climate Finance Decision-Making Tree (Mogyorósy & Deng-Beck, 2020). To avoid complexity in the survey's categorization, instruments such as equity (involving shares) and blended finance (a combination of public and private financial instruments), along with other financial instruments, were not assigned separate categories. Nonetheless, a designated category labelled "other" was introduced specifically for these instances. Under the "other" category in the survey, local governments reported a limited number of additional financial instruments, including: Crowdfunding (3x), Finance from other public entities, such as water agencies (2x), Blended finance (1x), Contribution from Private foundation (1x), Financial gifts from local companies (1x), Green Energy Revolving Fund (1x), Participative Budgeting (1x), Paris Fonds verts (Venture capital) (1x), and Energy Service Company (1x).

Surveyed adaptation barriers were based on adaptation scholarship, and included financial constraints, lack of political support or leadership, and limited staff capacity (Moser et al., 2019; Aguiar et al., 2018; Boehnke et al., 2023; Mendizabal et al., 2021). Additionally, research shows low levels of participation in the design of adaptation plans can serve as a significant barrier to equitable adaptation (Shi et al., 2016; Olazabal & De Gopegui, 2021). In terms of factors that influence the allocation of funds for adaptation, we were inspired by the urban political ecology, critical geography and climate urbanism literature. These studies suggest that urban climate projects are shaped by competitive dynamics driven by vested financial and political interests (Long et al., 2020; Shokry et al., 2020; Castán Broto & Robin, 2021; Rice et al., 2020).

In terms of funded adaptation actions and processes (Figure 4.5), our approach was inspired by the approach of Moser et al. (2018). We acknowledge that some of these actions, such as implementation of adaptation actions and risk and vulnerability assessments, may overlap particularly when the RVA is integrated into the planning process. However, to gain deeper insights, particularly in areas where literature indicates a disconnect—such as risk and vulnerability assessments, monitoring and evaluation (Olazabal et al., 2019) —we chose to separate these categories.

The survey was available in English, Spanish, French, and Italian, providing clear definitions of funding and financing instruments to ensure uniform understanding of queries using the ICLEI Climate Financing Tree. Accredited translators were employed to perform the translation from English to Spanish, Italian, and French. These languages were chosen as they are the languages of the urban LAUs most represented in the survey pool of 587 cities.

The survey was subject to two pilot tests. The first pilot test ran from July to October 2022 and included feedback on a draft document from 10 colleagues and practitioners based in Europe. The first 10 responses to the survey served as a second pilot test. Following this pilot test, a few minor text adjustments were made to the survey. Detailed information on the survey questions is to be found in the supplementary information (SI).

A.1.3 Methods of Analysis

The survey responses were analysed using a combination of Excel, Tableau, RStudio and MAXQDA. Multiple variables were considered in our analysis; apart from Eurostat's degree of urbanisation (a classification measured by population density, size and contiguity to distinguish between towns and cities indicated in the paper by "urban typology"), we looked at GDP per capita at NUTS 3 level, taking the pre-COVID pandemic and validated year of 2019 for comparison (Eurostat, 2024a). As a proxy for local climate risk, aggregated relative climate risk scores at NUTS 3 level were obtained from the ESPON Project using the high emission scenario of RCP8.5 (European Observation Network for Territorial Development and Cohesion, 2022). The indicator represents aggregated climate change risk in the very high emissions scenario (2070-2100) with relative exposure. It combines various risk scenarios, including heat stress, coastal floods, river floods, flash floods, wildfires, and droughts. Values range from 1 to 2, with 2 indicating the highest risk and 1 the lowest. Three municipalities of Gran Canaria were excluded from this analysis as no ESPON data is available for said region. Population size at the time of adhesion to the COM initiative is derived from the Covenant of Mayors dataset (Treville et al., 2022). European regions are also considered and categorised according to the EuroVoc classification (Publications Office of the European Union, 2024). To ensure sufficient data for analysis, Northern and Western European countries are amalgamated into Northwestern Europe.

- Northwestern Europe (Finland, Sweden, Estonia, Latvia, Germany, France, Belgium, Ireland)
    - 46 local governments of which 23 cities and 23 towns
- Southern Europe (Spain, Portugal, Italy, Greece)
    - 84 local governments of which 29 cities and 55 towns
- Central and Eastern Europe (Romania, Czech Republic, Slovakia, Croatia, Hungary)
    - 18 local governments of which 11 cities and seven towns

Patterns are identified and results are discussed using descriptive statistics, tables and figures. Calculations were made using a combination of Excel and Tableau and visualised in tables, graphs and pie charts To explore potential relationships between our data and variables such as GDP per capita, population size, and climate risk, we applied the Kruskal-Wallis Test and the Mann-Whitney U test, as detailed in the Supplementary Information. These analyses were conducted using R, a statistical programming language, and RStudio, an integrated development environment for R. The analysis employed R packages such as dplyr, ggplot2, readxl, and stats, using functions like shapiro.test, kruskal.test, wilcox.test, mean, and sd. ChatGPT, an AI language model developed by OpenAI, assisted in generating and refining the R codes. We verified that the R codes executed in RStudio produced results consistent with those obtained from the Tableau analysis, including, for example, overlapping mean values.

In the results section, we present values for GDP per capita, climate risk, and population size based on the raw data, prior to any outlier removal. Although we evaluated the normality of distributions with the Shapiro-Wilk Test and identified outliers using the Interquartile Range (IQR) method, we recognize that these outliers reflect real cities with unique characteristics. Given the inherent variability in urban data, we thus consider it essential to retain these outliers to capture the full spectrum of data. However, for clarity and transparency, tables showing the relationships with and without outliers are included in the supplementary information. In the limitations section, we subsequently highlight two instances where significance was lost after outlier removal, suggesting areas for further investigation. Finally, quantitative insights are complemented by qualitative insights from the open questions and comment sections of the survey. These open survey questions were analysed on MAXQDA using a coding scheme developed in relation to the research questions.

A.1.4. Limitations

Our survey's territorial coverage reveals participation gaps, with a higher number of responses from Southern and Northwestern Europe and limited participation from Eastern Europe. The low response rate in Eastern Europe, potentially due to language issues, underscores the need for caution in interpreting findings and highlights the necessity for additional research. Moreover, the aggregation of data into three European regions—Northwestern, Southern, and Central & Eastern—may oversimplify complexities inherent in adaptation planning, which is ultimately linked to national policy frameworks. Our sample, composed solely of frontrunner urban municipalities with established climate adaptation plans and Covenant of Mayors membership, does not fully represent all local governments in the EU. Some of our findings may therefore be optimistically skewed towards the higher end, e.g. data related to funded actions and political support. Although these

limitations must be considered, the data still reveals significant patterns and disparities in the funding of adaptation actions.

Lastly, regarding statistical analyses, the Kruskal-Wallis test, like the Mann-Whitney U test, does not account for confounding variables such as political climate, institutional capacity, and other socio-economic factors that may influence access to funding sources and the implementation of adaptation actions. Further research is needed to investigate how these and other variables impact funding and adaptation efforts by cities. Finally, while the IQR method was employed to manage outliers, this approach may exclude significant data points and affect the results. To address this, we present the raw data before outlier removal in the results section. While most relationships remained significantly consistent both before and after outlier removal, we observed two instances where significance was lost after outlier removal: the association between GDP per capita and funding for climate change risk/vulnerability assessments (p-value: 0.087 after outlier removal) and the relationship between climate risk levels and access to financial intermediaries (p-value: 0.051 after outlier removal). These findings suggest that these potential associations may warrant further exploration or analysis with additional data.

A.2. Kruskal-Wallis Test: Results and Interpretations

Relationship between availability of funds and climate risk, GDP per capita, and population size

Note: For climate risk, three responses from local governments in Gran Canaria were excluded from the analysis due to the lack of ESPON climate risk data for the Canary Islands. We used the Interquartile Range (IQR) method to identify and remove outliers. It calculates Q1 (25th percentile), Q3 (75th percentile), and IQR. Observations outside 1.5 times the IQR from Q1 and Q3 are considered outliers and removed.

Table A.1: Relationship between availability of funds and climate risk, GDP per capita, and population size before removing outliers

City Characteristics	Mean (SD) - Sufficient Funds	Mean (SD) - Insufficient Funds	Mean (SD) – Extremely Insufficient Funds	Chi-Squared (Kruskal-Wallis)	P-Value (Kruskal-Wallis)
Climate Risk (ESPON)	1.52 (0.13)	1.54 (0.13)	1.63 (0.17)	7.15	**0.028**
GDP per Capita	34,824 (17,802)	34,104 (18,283)	23,062 (8,201)	13.5	**0.001**
Population Size	165,605 (286,459)	153,915 (409,134)	120,847 (343,530)	4.45	0.108

Table A.2: relationship between availability of funds and climate risk, GDP per capita, and population size after removing outliers

City Characteristics	Mean (SD) - Sufficient Funds	Mean (SD) - Insufficient Funds	Mean (SD) - Extremely Insufficient Funds	Chi-Squared (Kruskal-Wallis)	P-Value (Kruskal-Wallis)
Climate Risk (ESPON)	1.52 (0.13)	1.54 (0.12)	1.62 (0.16)	6.24	**0.044**
GDP per Capita	32,120 (13,114)	31,253 (11,512)	23,062 (8,201)	12.03	**0.002**
Population Size	67,255 (62,092)	54,238 (59,627)	39,663 (39,292)	3.29	0.193

Conclusions

- There is a significant relationship between levels of climate risk and funding availability; local governments with higher climate risk scores report less sufficient funds for their adaptation plans.
- Population size is not associated with the availability of funds, as there is no statistically significant difference in population size across the various categories of funding availability (p-value > 0.05).
- GDP per capita is associated with the availability of funds for adaptation; local governments with higher GDP per capita report more available funds for adaptation.

Relationship between climate risk levels and accessibility of funding

Note: Three responses from local governments in Gran Canaria were excluded from the analysis due to the absence of climate risk levels (no ESPON data). To conduct a Kruskal-Wallis test, a minimum of 5 observations per category is required (University of Virginia Library, 2024)

Table A.3: Observations by funding source and category (excluding three responses from Gran Canaria)

Funding Source	Easy	Neutral	Difficult	Total
Regional Government	46 (34.85%)	61 (46.21%)	25 (18.94%)	132
National Government	23 (17.69%)	69 (53.08%)	38 (29.23%)	130
EU Institutions and Programmes	11 (8.59%)	36 (28.13%)	81 (63.28%)	128
Financial Intermediaries (banks)	9 (13.24%)	16 (23.53%)	43 (63.24%)	68
Philanthropic Institutions	2 (3.28%)	23 (37.70%)	36 (59.02%)	61
Private Investors	4 (5.19%)	20 (25.97%)	53 (68.83%)	77

Philanthropic Institutions and Private Investors were excluded from the Kruskal-Wallis test analysis due to insufficient observations in the 'Easy' category. The remaining funding sources meet the minimum requirement of 5 observations per category and are therefore included in the analysis.

Table A.4: Relationship between climate risk levels and the accessibility of funding before removing outliers

Meeting requirements	Climate Risk Mean (SD) - Easy	Climate Risk Mean (SD) - Neutral	Climate Risk Mean (SD) - Difficult	Chi-Squared (Kruskal-Wallis)	P-Value (Kruskal-Wallis)
Regional government funds	1.54 (0.14)	1.56 (0.14)	1.59 (0.15)	1.54	0.463
National government funds	1.49 (0.16)	1.55 (0.14)	1.60 (0.14)	9.75	**0.008**
EU institutions and programmes	1.53 (0.18)	1.54 (0.14)	1.56 (0.15)	1.15	0.561
Financial intermediaries (banks)	1.50 (0.15)	1.52 (0.12)	1.61 (0.14)	7.12	**0.028**

Note: Following a Shapiro-Wilk Test (p-value ≤ 0.05), we concluded that climate risk is not normally distributed (P= 0.01866). We then used the Interquartile Range (IQR) method to identify and remove outliers. It calculates Q1 (25th percentile), Q3 (75th percentile), and IQR. Observations outside 1.5 times the IQR from Q1 and Q3 are considered outliers and removed.

Table A.5: Relationship between climate risk levels and the accessibility of funding after removing outliers

Meeting Requirements	Climate Risk Mean (SD) - Easy	Climate Risk Mean (SD) - Neutral	Climate Risk Mean (SD) - Difficult	Chi-Squared (Kruskal-Wallis)	P-Value (Kruskal-Wallis)
Regional Government Funds	1.53 (0.13)	1.56 (0.14)	1.57 (0.13)	1.4482	0.485
National Government Funds	1.49 (0.16)	1.55 (0.13)	1.59 (0.13)	9.0915	**0.011**
EU Institutions and Programmes	1.53 (0.18)	1.54 (0.14)	1.55 (0.13)	0.7408	0.690
Financial Intermediaries (Banks)	1.50 (0.15)	1.52 (0.12)	1.59 (0.12)	5.9702	**0.051**

Conclusions

- A significant association exists between climate risk levels and access to national funding sources; local governments with higher climate risk levels report less ease in meeting the requirements of national funding source. This relationship remains significant both before and after removing outliers.
- The relationship between climate risk levels and access to financial intermediaries (banks) shows variability based on the presence of outliers; after outlier removal, there is a near-significant relationship instead of a significant relationship.
- There is no significant relationship between variations in climate risk levels and the ease of meeting requirements for other funding sources.

Relationship between population size and accessibility of funding

Note: Prior to conducting the Kruskal-Wallis test, categories were converted to numerical values in Excel: Easy (3), Neutral (2), Difficult (1). To conduct a Kruskal-Wallis test, a minimum of 5 observations per category is required (University of Virginia Library, 2024).

Table A.6: Observations by funding source and category (including Gran Canaria)

Funding Source	Easy	Neutral	Difficult	Total
Regional Government	46 (34.07%)	64 (47.41%)	25 (18.52%)	135
National Government	23 (17.29%)	70 (52.63%)	40 (30.08%)	133
EU Institutions and Programmes	11 (8.40%)	37 (28.24%)	83 (63.36%)	131
Financial Intermediaries (banks)	9 (12.68%)	17 (23.94%)	45 (63.38%)	71
Philanthropic Institutions	2 (3.12%)	24 (37.50%)	38 (59.38%)	64
Private Investors	4 (5.00%)	21 (26.25%)	55 (68.75%)	80

Philanthropic Institutions and Private Investors were excluded from the Kruskal-Wallis test analysis due to insufficient observations in the 'Easy' category. The remaining funding sources meet the minimum requirement of 5 observations per category and are therefore included in the analysis.

Table A.7: Relationship between population size and the accessibility of funding sources before removing outliers

Meeting Requirements	Population Size Mean (SD) - Easy	Population Size Mean (SD) - Neutral	Population Size Mean (SD) - Difficult	Chi-Squared (Kruskal-Wallis)	P-Value (Kruskal-Wallis)
Regional Government Funds	66,203 (80,499)	174,580 (435,130)	218,287 (468,739)	2.55	0.280
National Government Funds	208,862 (465,136)	155,657 (397,526)	145,823 (351,801)	2.81	0.245
EU Institutions and Programmes	317,945 (495,863)	276,064 (607,001)	102,383 (210,905)	12.06	**0.002**
Financial Intermediaries (Banks)	332,419 (736,612)	65,748 (62,859)	173,009 (492,707)	0.46	0.793

Note: Following a Shapiro-Wilk Test (p-value ≤ 0.05), we concluded that population size is not normally distributed. We then used the Interquartile Range (IQR) method to identify and remove outliers. It calculates Q1 (25th percentile), Q3 (75th percentile), and IQR. Observations outside 1.5 times the IQR from Q1 and Q3 are considered outliers and removed.

Table A.8: Relationship between population size and the accessibility of funding sources after removing outliers

Requirements	Population Size Mean (SD) - Easy	Population Size Mean (SD) - Neutral	Population Size Mean (SD) - Difficult	Chi-Squared (Kruskal-Wallis)	P-Value (Kruskal-Wallis)
Regional Government Funds	60,798 (72,478)	58,625 (55,163)	60,822 (80,320)	1.56	0.458
National Government Funds	87,431 (88,828)	55,813 (53,885)	53,283 (66,639)	2.36	0.307
EU Institutions and Programmes	119,734 (97,688)	81,803 (62,345)	52,923 (60,394)	9.84	**0.007**

Financial Intermediaries (Banks)	44,594 (51,584)	65,748 (62,859)	53,041 (63,704)	2.09	0.351

Conclusions

- The Kruskal-Wallis test indicated a statistically significant difference in ease of meeting EU institutions and programme requirements based on population size; local governments with larger populations more frequently report ease in meeting EU funding programme conditions than local governments with smaller populations.
- Population size does not significantly relate to access to other funding sources.

Relationship between GDP per capita and accessibility of funding

Note: To conduct a Kruskal-Wallis test, a minimum of 5 observations per category is required[1]. Observations are the same as Table A.4 (see Table A.4). Philanthropic Institutions and Private Investors were excluded from the Kruskal-Wallis test analysis due to insufficient observations in the 'Easy' category. The remaining funding sources meet the minimum requirement of 5 observations per category and are therefore included in the analysis.

Table A.9: Relationship between GDP per capita and the accessibility of funding before removing outliers

Meeting Requirements	GDP per Capita Mean (SD) - Easy	GDP per Capita Mean (SD) - Neutral	GDP per Capita Mean (SD) - Difficult	Chi-Squared (Kruskal-Wallis)	P-Value (Kruskal-Wallis)
Regional Government Funds	34,193 (13,093)	31,367 (18,728)	33,648 (20,042)	3.28	0.194
National Government Funds	36,200 (22,070)	31,644 (18,471)	27,260 (9,237)	3.03	0.220
EU Institutions and Programmes	28,664 (12,281)	36,286 (25,516)	30,434 (13,099)	1.23	0.541
Financial Intermediaries (Banks)	39,089 (31,383)	25,612 (13,930)	28,369 (10,548)	1.69	0.429

Note: Following a Shapiro-Wilk Test (p-value ≤ 0.05), we concluded that GDP per capita is not normally distributed. We then used the Interquartile Range (IQR) method to identify and remove outliers. It calculates Q1 (25th percentile), Q3 (75th percentile), and IQR. Observations outside 1.5 times the IQR from Q1 and Q3 are considered outliers and removed.

Table A.10: Relationship between GDP per capita and the accessibility of funding after removing outliers

Meeting Requirements	GDP per Capita Mean (SD) - Easy	GDP per Capita Mean (SD) - Neutral	GDP per Capita Mean (SD) - Difficult	Chi-Squared (Kruskal-Wallis)	P-Value (Kruskal-Wallis)
Regional Government Funds	33,360 (11,943)	28,005 (10,273)	30,304 (11,290)	4.66	0.097
National Government Funds	32,668 (14,482)	28,596 (10,980)	27,260 (9,237)	2.24	0.326
EU Institutions and Programmes	28,664 (12,281)	29,815 (12,500)	29,260 (10,820)	0.41	0.814
Financial Intermediaries (Banks)	29,738 (15,037)	25,612 (13,930)	28,369 (10,548)	1.23	0.540

Conclusions

- GDP per capita is not associated with reported ease in access to sources of funding. The Kruskall-Wallis test did not find significant differences between GDP per capita and ease in access to funding sources.

A.3. The Mann-Whitney U test: Results and Interpretations

Relationship between population size and reported adaptation actions funded

Note: The Mann-Whitney U test was conducted instead of the Kruskal-Wallis test because the analysis aimed to compare population size between two categorical groups ("Funded" and "Not Funded") within each action. The Interquartile Range (IQR) method was used to identify and remove outliers.

Table A.11: Relationship between population size and reported adaptation actions funded before removing outliers

Action	Mean (SD) - Funded	Mean (SD) - Not Funded	U Statistic (Mann-Whitney U Test)	p-value (Mann-Whitney U Test)
Adaptation Planning and Coordination of Climate Adaptation Plan	196,292 (487,487)	140,435 (462,233)	3,197	**0.004**
Implementation of Adaptation Actions	194,836 (478,338)	119,601 (479,687)	2,773	**p<0.001**
Climate Change Risk or Vulnerability Assessment	235,164 (531,837)	89,372 (370,369)	3,611	**p<0.001**
Participatory Processes in Adaptation Planning or Implementation	228,541 (549,339)	119,662 (379,303)	3,549	**0.002**
Monitoring and Evaluation of Implemented Actions	232,962 (546,556)	121,126 (393,987)	3,662	**p<0.001**

Table A.12: Relationship between population size and reported adaptation actions funded after removing outliers

Action	Mean (SD) - Funded	Mean (SD) - Not Funded	U Statistic (Mann-Whitney U Test)	p-value (Mann-Whitney U Test)
Adaptation Planning and Coordination of Climate Adaptation Plan	68,502 (68,044)	43,471 (54,307)	2,562	**p<0.001**
Implementation of Adaptation Actions	66,477 (66,604)	39,001 (52,996)	2,217	**p<0.001**
Climate Change Risk or Vulnerability Assessment	73,349 (70,420)	41,602 (50,827)	2,907	**p<0.001**
Participatory Processes in Adaptation Planning or Implementation	72,112 (70,384)	46,687 (55,289)	2,737	**p<0.001**
Monitoring and Evaluation of Implemented Actions	76,823 (74,697)	43,968 (49,077)	2,808	**0.004**

Conclusions

- Even after removing outliers—excluding the 16 largest cities ranging from 259,579 to 3,750,000—by applying the Interquartile Range (IQR) method, significant differences in funding for adaptation actions persist between local governments with high and low populations. Local governments with high populations more frequently report funding actions/processes such as Adaptation Planning, Implementation of Adaptation Actions, Climate Change Risk or Vulnerability Assessment, Participatory Processes, and Monitoring

and Evaluation. Although the strength of these relationships has diminished post-outlier removal, they remain statistically significant, indicating that local governments with higher populations more frequently allocate resources towards these adaptation efforts.

Relationship between climate risk levels and reported adaptation actions funded

Note: The Mann-Whitney U test was conducted instead of the Kruskal-Wallis test because the analysis aimed to compare climate risk values between two categorical groups ("Funded" and "Not Funded") within each action. The Interquartile Range (IQR) method was used to identify and remove outliers.

Table A.13: Relationship between climate risk levels and reported adaptation actions funded before removing outliers

Action	Climate Risk Mean (SD) - Funded	Climate Risk Mean (SD) - Not Funded	U statistic (Mann -Whitney U Test)	p-value (Mann-Whitney U Test)
Adaptation planning and coordination of climate adaptation plan	1.53 (0.13)	1.58 (0.16)	1,990	0.131
Implementation of adaptation actions	1.54 (0.13)	1.58 (0.16)	1,620	0.213
Climate change risk or vulnerability assessment	1.52 (0.12)	1.59 (0.17)	1,853	**0.008**
Participatory processes in adaptation planning or implementation	1.54 (0.13)	1.57 (0.16)	2,342	0.275
Monitoring and evaluation of imple mented actions	1.52 (0.12)	1.58 (0.16)	2,035	**0.019**

Table A.14: Relationship between climate risk levels and reported adaptation actions funded after removing outliers

Action	Mean (SD) - Funded	Mean (SD) - Not Funded	U Statistic (Mann-Whitney U Test)	p-value (Mann-Whitney U Test)
Adaptation Planning and Coordination of Climate Adaptation Plan	1.53 (0.13)	1.57 (0.11)	1,767	0.206
Implementation of Adaptation Actions	1.54 (0.12)	1.58 (0.16)	1,522	0.175
Climate Change Risk or Vulnerability Assessment	1.53 (0.11)	1.59 (0.16)	1,853	**0.016**
Participatory Processes in Adaptation Planning or Implementation	1.54 (0.11)	1.56 (0.15)	2,275	0.401
Monitoring and Evaluation of Implemented Actions	1.52 (0.12)	1.57 (0.14)	2,034	**0.036**

Conclusions

- Climate risks levels are associated with reported funding for climate change risk or vulnerability assessment and monitoring and evaluation of implemented actions; local governments with lower climate risk levels more frequently report funding these actions and processes.
- Climate risks levels are not significantly associated with other funded actions/processes.

The relationship between GDP per capita and reported adaptation actions funded

Note: The Mann-Whitney U test was conducted instead of the Kruskal-Wallis test because the anal ysis aimed to compare GDP per capita between two categorical groups ("Funded" and "Not Funded ") within each action. The Interquartile Range (IQR) method was used to identify and remove outliers.

Table A.15: Relationship between GDP per capita and reported adaptation actions funded before removing outliers

Action	Mean (SD) - Funded	Mean (SD) - Not Funded	U Statistic	p-value
Adaptation Planning and Coordination of Climate Adaptation Plan	33,692 (19,046)	29,755 (11,848)	2,711	0.339
Implementation of Adaptation Actions	33,716 (18,319)	27,877 (10,662)	2,343	0.100
Climate Change Risk or Vulnerability Assessment	35,029 (19,529)	28,271 (11,124)	3,191	**0.027**
Participatory Processes in Adaptation Planning or Implementation	36,187 (20,310)	28,043 (10,868)	3,437	**0.007**
Monitoring and Evaluation of Implemented Actions	35,932 (20,674)	28,738 (11,253)	3,352	**0.019**

Table A.16: Relationship between GDP per capita and reported adaptation actions funded before removing outliers

Action	Mean (SD) - Funded	Mean (SD) - Not Funded	U Statistic	p-value
Adaptation Planning and Coordination of Climate Adaptation Plan	30,699 (12,077)	28,916 (10,325)	2,507	0.442
Implementation of Adaptation Actions	30,788 (11,704)	27,877 (10,662)	2,168	0.193
Climate Change Risk or Vulnerability Assessment	31,343 (11,638)	28,271 (11,124)	2,896	0.087
Participatory Processes in Adaptation Planning or Implementation	32,025 (11,803)	28,043 (10,868)	3,087	**0.032**
Monitoring and Evaluation of Implemented Actions	32,084 (12,522)	28,149 (10,119)	3,056	**0.043**

Conclusions

- Analysis of the relationship between GDP per capita and reported funding for various adapt ation actions reveals that higher GDP per capita is consistently associated with increased fu nding for participatory processes and monitoring and evaluation of implemented actions. T his relationship remains significant both before and after removing outliers.
- The relationship with climate change risk or vulnerability assessment shows variability bas ed on the presence of outliers, suggesting that further investigation may be required to clari fy its association with GDP per capita.
- Reported funding for adaptation planning and implementation of adaptation actions shows e ither non-significant or marginally significant relationships with GDP per capita.

A.4. Supplementary Tables: Tableau (A.17 until A.28)

Table A.17: Political support by European region and city/town (n=132)

Statement	Regions of Europe	City / Town	Agree	Neutral	Disagree
There is sufficient political support to implement the adaptation measures of our climate plan (N= 132)	Northwestern	City (n=21)	33%	38%	29%
		Town (n=17)	41%	47%	12%
		Total	**37%**	**42%**	**21%**
	Central and Eastern	City (n=11)	36%	36%	27%
		Town (n=7)	57%	14%	29%
		Total	**44%**	**28%**	**28%**
	Southern	City (n=26)	69%	15%	15%
		Town (n=50)	34%	36%	30%
		Total	**46%**	**29%**	**25%**
	Total		**43%**	**33%**	**24%**

Table A.18: Staff capacity by European region and city /town (n=147)

Statement	Regions of Europe	City / Town	Agree	Neutral	Disagree
Our local authority has enough staff capacity to look for funding opportunities and write competitive grant applications (N= 147)	Northwestern	City (n=23)		17%	83%
		Town (n=22)	18%	9%	73%
		Total	**9%**	**13%**	**78%**
	Central and Eastern	City (n=11)	27%	36%	36%
		Town (n=7)	14%	14%	71%
		Total	**22%**	**28%**	**50%**
	Southern	City (n=29)	17%	31%	52%
		Town (n=55)	5%	7%	87%
		Total	**10%**	**15%**	**75%**
	Total		**11%**	**16%**	**73%**

Table A.19: Don't Know response rate NRRP

Statement	Regions of Europe
Our country's National Recovery and Resilience Plan (NRRP) provides opportunities for our local authority to secure funding for climate adaptation measures	Northwestern Central and Eastern Southern

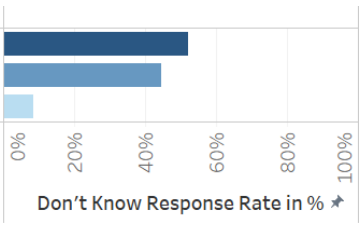


Table A.20: Use of EU recovery and resilience facility (RRF) (n=119)

		Use of EU Fund or Programme		
Type of EU Fund or Programme	**Regions of Europe**	Used	Planning to use	Not planning to use
EU's Recovery and Resilience Facility / NextGenerationEU	Northwestern		44%	56%
	Eastern	11%	78%	11%
	Southern	42%	58%	
	Total	**34%**	**59%**	**8%**

Table A.21: Participation of vulnerable groups or their representatives in drafting the climate adaptation plan by city/town (N=104)

City / Town	Participation of vulnerable groups	No participation of vulnerable groups
City (n=46)	43%	57%
Town (n=58)	19%	81%
Total	**26%**	**74%**

Note: Significant don't know response rate of roughly 30% suggests that the number of local governments including participatory processes may be even lower.

Table A.22: Participation of vulnerable groups or their representatives in drafting climate adaptation plan by EU region (N=104)

Regions of Europe	Participation of vulnerable groups	No participation of vulnerable groups
Northwestern (n=38)	35%	65%
Central & Eastern (n=13)	24%	76%
Southern (n=53)	20%	80%
Total	**26%**	**74%**

Note: Significant don't know response rate of roughly 30% suggests that the number of local governments including participatory processes may be even lower.

Table A.23: Importance of RVA in Climate Adaptation Fund allocation by city/town and EU region (n=126)

		The climate change risk and vulnerability assessment has played an important role in the allocation of climate adaptation funds		
City / Town	Regions of Europe	Agree	Neutral	Disagree
City (n=56)	Northwestern	42%	42%	16%
	Central & Eastern	27%	73%	
	Southern	50%	42%	8%
	Total	**43%**	**48%**	**9%**
Town (n=70)	Northwestern	24%	48%	29%
	Central & Eastern	14%	71%	14%
	Southern	26%	57%	17%
	Total	**24%**	**56%**	**20%**
Total		**33%**	**52%**	**15%**

Table A.24: Ease of Financing Climate Adaptation in Centre Vs. Outskirts (N=137)

	Climate adaptation measures in the center of our city or town are easier to finance than those on its outskirts		
City / Town	Agree	Neutral	Disagree
City (n=61)	25%	34%	41%
Town (n=76)	22%	45%	33%
Total	**23%**	**40%**	**36%**

Table A.25: Ease of demonstrating a return on investment for Climate Adaptation Investments in Affluent Vs. Deprived Neighbourhoods (N=115)

	It is easier to demonstrate a return on investment for climate adaptation projects in affluent neighborhoods than it is for deprived neighborhoods		
City / Town	Agree	Neutral	Disagree
City (n=53)	17%	30%	53%
Town (n=62)	19%	47%	34%
Total	**18%**	**39%**	**43%**

Table A.26: The effects of Climate Adaptation Investments on property values and land markets (N=111)

	The effects climate adaptation investments may have on property values and land markets is taken into account when allocating climate adaptation funds		
City / Town	Agree	Neutral	Disagree
City (n=52)	19%	44%	37%
Town (n=59)	24%	34%	42%
Total	**22%**	**39%**	**40%**

Table A.27: Seeking an increase in property and land values (N=117)

	When making climate adaptation investments, my local authority actively seeks to increase property and land values		
City / Town	Agree	Neutral	Disagree
City (n=53)	8%	51%	42%
Town (n=64)	19%	31%	50%
Total	**14%**	**40%**	**46%**

Table A.28: Participatory budgeting (N= 123)

	Did the climate (adaptation) plan include a participatory budgeting process?	
City / Town	Yes	No
City (n=53)	23%	77%
Town (n=70)	16%	84%
Total	**19%**	**81%**

A.5. Survey Example

Welcome to the BC3 & BCNUEJ Climate Adaptation Finance Survey,

You have received an invitation to participate in this survey because we believe you may be able to provide very valuable information for our NAVIS research project funded by Spain's La Caixa Foundation. Our project aims to better understand how local authorities fund climate adaptation in light of their climate vulnerability needs, as well as to analyse the extent to which urban adaptation planning is influenced by financial processes. This survey will take approximately **10 minutes** to complete.

Your participation in this research project is entirely voluntary, and you may opt out at any time with no negative consequences. This survey has been reviewed in accordance with the ethical procedures of the Basque Centre for Climate

Change (BC3) for research involving human subjects. Your responses will be completely anonymous and confidential; please see the data protection and privacy policy below for more information.

The survey is being conducted by La Caixa INPhINIT Fellow Kayin Venner of the Basque Centre for Climate Change (BC3) and Barcelona Lab for Urban Environmental Justice and Sustainability (BCNUEJ) at the Autonomous University of Barcelona, Spain, in collaboration with the Covenant of Mayors EU Office and researchers of the Joint Research Centre (JRC). Among other things, we aim to produce a Policy Brief to inform EU policy makers about climate adaptation funding experiences and needs from the perspective of local authorities.

If you participate in the survey, we will share a summary of the results of the survey as well as our research outcomes. For any questions, concerns or suggestions, you can contact us at any time by sending an email to: **navis@bc3research.org**.

Thank you for your participation!

Informed Consent

The information that BC3 and BCNUEJ collect in this questionnaire is anonymous and absolutely confidential. That is to say, results will be presented in such a way that your local authority's name will not be linked to the answers you provide. Furthermore, the survey does not contain information that will personally identify you. All data is stored in a password protected electronic format and only the

researchers have access to the data.

The results of this study will be used for scholarly purposes and policy suggestions only and may be shared with the Joint Research Centre, the European Commission's science and knowledge service, and Covenant of Mayors EU Office. Your decision to participate is completely free and voluntary and you can opt out at any time without any negative consequences. You will not receive financial compensation for your participation.

If you would LIKE to participate in the survey, please select the option "I CONSENT to participate in the questionnaire":

◯ I CONSENT to participate in the questionnaire.

◯ I do not consent to participate in the questionnaire

DATA PROTECTION

BC3 and BCNUEJ as Data controllers, collects this data through KoBoToolbox, owned by Kobo, Inc, to carry out a study on local authorities' experiences with funding and financing climate adaptation efforts. This information will be stored on KoboToolbox's servers. You can see their privacy policy here. KoBoToolbox, developed by the Harvard Humanitarian Initiative, is an open-source platform for data collection and analysis and is funded entirely through grants and donations.

Basic information on Data Protection	
Data controller	BC3 Basque Centre for Climate Change - Klima Aldaketa Ikergai (BC3) and Barcelona Lab for Urban Environmental Justice and Sustainability (BCNUEJ)
Purpose	Data collection to carry out a study on local authority's experience with funding and financing climate adaptation efforts
Legitimation	Consent of the interested party
Addressee	Data processor: Kobo, Inc (KoBoToolbox)
Rights	Access, rectify, oppose the use, limit the use and delete your data, as well as other rights, specified in our privacy policy. You can also contact us at: ARCrights@BC3research.org and/or proteccio.dades@uab.cat
Additional information	You can consult the additional and detailed information on Data Protection on our website: https://www.bc3research.org/options/options/privacy_policy_3.html
Term	Your data will be kept for 5 years from the date of publication of the study or until you revoke your consent or request its deletion at an earlier time, as well as the additional time that, where appropriate, it is necessary to comply with the legal obligations that BC3 must observe.

If you would LIKE to participate in the survey, please select the option "I CONSENT to the described data processing"

◯ I CONSENT to the described data processing.

◯ I do not consent to the described data processing.

Basic Information

1. What is the name of the local authority you represent? _____

2. What department or office do you work for?
   - Finance
   - Environment
   - Civil Protection
   - Urban Planning
   - Other

2.A You have selected the option "Other". Please specify which department or office you work for here: _____

Financial Instruments

3. We would like to know whether your local authority has sufficient funds available to implement the adaptation measures of its climate plan. Please indicate which of the following options applies to your local authority:
   - ○ More than sufficient funds
   - ○ Sufficient funds
   - ○ Insufficient funds
   - ○ Extremely insufficient funds
   - ○ Don´t know

4. Which financial tools has your local authority used or plans to use to implement the adaptation measures in the climate plan? *For reference, please check the ICLEI Climate Finance Decision Making Tree*

Financial Tool	Used	Planning to use	Not planning to use	Don't know
Local government's own funds	○	○	○	○
Regional grants and/or subsidies	○	○	○	○
National grants and/or subsidies	○	○	○	○
EU/International grants and/or subsidies	○	○	○	○
Public loan (e.g. government or European Investment Bank loan)	○	○	○	○
Private sector loan (e.g. commercial banks)	○	○	○	○
Municipal (green) bonds	○	○	○	○
Public-private partnership	○	○	○	○
Risk mitigation (e.g. guarantees and insurance)	○	○	○	○

4.A If your local authority is planning to or has used any financial tools that do not appear in the previous question, please specify.

Examples include privatization, equity, blended finance, and/or crowdfunding. For instance: “We plan to use crowdfunding” or “We have used crowdfunding”.

_____

4.B Has your local authority been in touch with its corresponding managing authority for EU funds to fund climate adaptation measures?

Most EU funds are managed directly at the regional or national level by managing authorities. Your country´s managing authority can be found here.

- ○ Yes
- ○ No
- ○ Don´t know

4.C Has your local authority used any of the following Land Value Capture (LVC) instruments to generate revenue to implement the adaptation measures in the climate plan?

Land value capture is a financing tool whereby a public entity obtains benefits or revenue derived from land value or increases in land value that can then be reinvested into community.

- ○ Sale of local government owned land/asset
- ○ Lease of local government owned land/asset
- ○ Sale of development rights
- ○ Land values taxes
- ○ None
- ○ Other
- ○ Don´t know

4.D Which international (EU) funds and funding programmes has your local authority used or plans to use to implement the adaptation measures in the climate plan?

EU funding programmes	Used	Planning to use	Not planning to use	Don't know
EU´s Recovery and Resilience Facility (NextGenerationEU)	○	○	○	○
European Regional Development Fund (including INTERREG)	○	○	○	○
European Social Fund (ESF)	○	○	○	○
Cohesion Fund (CF)	○	○	○	○
The Just Transition Fund (JTF)	○	○	○	○
The LIFE Programme (EU) URBACT	○	○	○	○
(III & IV)	○	○	○	○
European Urban Initiative (EUI) or Urban Innovative Actions (UIA)	○	○	○	○
Horizon 2020/Europe	○	○	○	○

4.E Please specify if your local government is planning to or has used any other international grant or subsidy that does not appear in the previous question.

_____

Implementation

5. Following the approval of your local authority's climate (adaptation) plan, please list the type of actions and processes your local authority has funded.

- o Climate change risk or vulnerability assessment
- o Adaptation planning and coordination of climate adaptation plan
- o Implementation of adaptation actions
- o Participatory processes in adaptation planning or implementation
- o Monitoring and evaluation of implemented actions
- o Other
- o Don't know

5.A You have marked the "other" option. Please specify which type of action/processes your local authority has spent money on.

_____

Barriers to Adaptation

6. The following statements relate to barriers in the implementation of the adaptation measures in the climate plan. For each statement, please indicate the extent to which you agree or disagree with the statement.

Statements	**Disagree**	**Neutral**	**Agree**	**Don't Know**
Budget constraints are hindering the implementation of the adaptation measures of our climate plan	○	○	○	○
Our local authority has enough staff capacity to look for funding opportunities and write competitive grant applications	○	○	○	○
The COVID-19 pandemic added further financial strain to our local authority, making it more difficult to implement the adaptation measures of our climate plan	○	○	○	○
Our country's National Recovery and Resilience Plan (NRRP) provides opportunities for our local authority to secure funding for climate adaptation measures	○	○	○	○
There is sufficient political support to implement the adaptation measures of our climate plan	○	○	○	○

7. For the following external sources of funding, how easy is it for your local authority to meet the conditions/requirements to obtain funds for climate adaptation projects?

External sources of funding	**Difficult**	**Neutral**	**Easy**	**Don't Know**
Regional government	○	○	○	○
National government	○	○	○	○
EU Institutions and Programmes	○	○	○	○
Private investors	○	○	○	○
Financial intermediaries (banks)	○	○	○	○
Philanthropic institutions	○	○	○	○

Priorities in the Allocation of Funds

8. Which of the following play a role in the allocation of funds to climate adaptation measures? Please mark all those that you believe are relevant.

- ○ Fiscal sustainability of local government
- ○ Return on investment of action/project
- ○ Political interests
- ○ Private sector interests
- ○ Local climate vulnerability
- ○ Visibility of action/project
- ○ Historic budget allocation (path-dependency)
- ○ Other
- ○ Don't know

8.A You have selected the option "other". Please specify which factors you are referring to.

_____

9. The following statements relate to priorities in the allocation of funds to climate adaptation measures. For each statement, please indicate the extent to which you agree or disagree with the statement.

Statements	**Disagree**	**Neutral**	**Agree**	**Don't Know**
Pressure to show return on investments play an important role in determining which adaptation projects and measures get funded and which do not	○	○	○	○
Climate adaptation measures in the centre of our city or town are easier to finance than those on its outskirts.	○	○	○	○
It is easier to demonstrate a return on investment for climate adaptation projects in affluent neighbourhoods than it is for deprived neighbourhoods	○	○	○	○
The effects climate adaptation investments may have on property values and land markets are taken into account when allocating climate adaptation funds	○	○	○	○
When making climate adaptation investments, my local authority actively seeks to increase property and land values	○	○	○	○
The climate change risk and vulnerability assessment has played an important role in the allocation of climate adaptation funds	○	○	○	○

9.A Please explain how the risk and vulnerability assessment has played an important role in allocating climate adaptation funds.

_____

Climate Adaptation Plan & Budget

10. What is the name of your local authority's current climate (adaptation) plan?

NOTE: When we refer to your local authority's climate (adaptation) plan, we mean your **local authority's climate adaptation plan/strategy/policy** or **climate plan/strategy/policy with adaptation actions**.

_____

11. If possible, please provide a link (URL) to the current climate (adaptation) plan.

If there is no link, please feel free to share the plan with us by emailing it to navis@bc3research.org

_____

12. Does your local authority have a budget for its climate (adaptation) plan?

- Yes, it is publicly available
- Yes, but it is not publicly available
- No, there is no separate budget for the climate adaptation plan, but its actions are included in other budgets (i.e. sewage improvement)
- No, there are no budgets for the actions in the climate adaptation plan

Participation

13. Have vulnerable groups (or their representatives) participated in drafting the climate adaptation) plan?

Vulnerable groups may include children, elderly, women and girls, low-income households, migrants and displaced people, LGBTQI+ people, persons living in sub-standard housing, persons with chronic diseases, persons with disabilities, unemployed persons etc.

- Yes
- No
- Don't know

13.A You have selected the option "yes". Please specify how vulnerable groups (or their representatives) have participated in drafting the climate (adaptation) plan?

_____

14. Did the climate (adaptation) plan include a participatory budgeting process?

Participatory budgeting is a type of citizen participation in which citizens participate in deciding how public money is spent.

- Yes
- No
- Don't know

End of Survey

15. Is there anything relating to the topic of climate adaptation funding and finance that you would like to share, but that does not appear elsewhere in the survey?

_____

16. Please provide your email address if you would like to receive the survey and research project's findings.

_____

Thank you for taking the time to complete the survey. Please click on "submit" to finalize your participation.

We truly value the information you have provided. The responses to this survey are anonymous and will help us understand what support local authorities may need to ensure equitable investments in urban climate adaptation.

Once available, we will share with you a summary of the results of the survey as well as any outcome of our research. If you have any comments on the survey or the project, please contact us by mail: navis@bc3research.org

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