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Who leads, who lags? Inter-urban inequities in European climate adaptation funding and financing

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Abstract

Despite increased attention to climate finance in urban adaptation, empirical data on the socio-political processes shaping funding accessibility, allocation, and their implications for inter-urban adaptation progress remains limited. In a first-of-its-kind survey, we analyse results from 148 urban administrations across 17 EU countries. Our results reveal widespread funding shortages (>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. Towns lag behind cities, and Southern Europe lags behind Northern Europe in funding adaptation measures. Notably, higher climate risk levels are not associated with easier access to funding sources or increased funding availability. With reliance on public funding over loans, we nuance the role of financialisation in urban climate governance and propose cohesive adaptation as a finance strategy towards more equitable policy and practice.

1. Introduction

The urgency of the climate crisis has awakened a renewed attention to municipal finance to facilitate effective climate action on the ground (Colenbrander and 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 and Hill 2021). Consequently, urban climate governance is increasingly enmeshed in financial logics, e.g. becoming more financialised (Long *et al* 2020, Bracking and Leffel 2021). Often conflated or used interchangeably, funding and financing refer to distinct processes that have their own challenges and dynamics (Keenan *et al* 2019). Funding typically refers to non-repayable financial support, such as grants, while financing involves borrowed capital, like loans, often requiring repayment with interest (Bertoldi *et al* 2021, Carbon Disclosure Project North America 2023). Nevertheless, mechanisms like concessionary loans, which offer below-market interest rates, and blended finance models that combine public and private sector resources, create hybrid forms of support with varying levels of repayment obligations. As public funds are limited, private finance is currently promoted as a possible solution for the climate crisis by a variety of financial actors at national and international levels (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

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important questions as to how funding and financing climate action impacts vulnerable groups across scales (Bigger and Millington 2019, Johnson 2021, Ponder 2021, García-Lamarca and Ullström 2022, Knuth *et al* 2023, Diezmartínez and Short Gianotti 2024, Hofmann *et al* 2024, Wójcik *et al* 2024).

Although positive strides are being made, research is still inconclusive about how financial processes may create uneven adaptation outcomes and progress within and between cities. Amid fierce competition between cities for funds and the short-term nature of many funding sources, including EU funding programmes, there is a risk of unevenly distributed, short-term projects that could exacerbate spatial inequities both within and between cities, undermining long-term, systemic urban climate adaptation efforts (Venner *et al* in press). 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 data can help assess how financial dynamics shape adaptation outcomes, identify trends in inter-urban adaptation progress and contribute to conceptualising these processes more broadly.

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 and Ullström 2022), Mexico City (Hilbrandt and Grafe 2023, Herrera 2024), Cape Town and New York (Bigger and Millington 2019). Large-scale studies on urban climate adaptation finance have primarily centred on the United States (Moser *et al* 2019, Cousins and Hill 2021), 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, Bourgeois *et al* 2022, Ulpiani *et al* 2023, Economidou *et al* 2024), there remains a notable scarcity of empirical data and understanding regarding financing EU local climate adaptation, particularly beyond large-sized municipalities (Fünfgeld *et al* 2023, Ricciardi *et al* 2023, Fila *et al* 2024).

Given the European Union's ambition to achieve climate neutrality and resilience by 2050, particularly through initiatives like the Sustainable European Investment Plan under the European Green Deal (Abdullah 2021, European Commission 2021, European Parliament & Council of the European Union 2021, Castán Broto 2022, European Commission 2024), local governments are anticipated to play a pivotal role. It is thus crucial to analyse how local governments access funding and financing sources and allocate adaptation funds, understanding these processes within broader political and economic dynamics. In this paper, we, therefore, address three significant gaps in adaptation finance scholarship: the lack of empirical data on the use of finance and funding arrangements for EU urban climate adaptation, limited research on adaptation in small and medium-sized municipalities, and insufficient exploration of the links between socio-political processes around the accessibility and allocation of funding and financing adaptation, and inter-urban inequity in adaptation progress between urban governments. To this end, we ask: what sources of funding and finance do EU urban municipalities draw on for climate adaptation, and how do barriers and socio-political factors influence access to and allocation of these resources? The 148 survey responses from urban administrations of varying sizes across 17 EU countries enable us to identify patterns of inter-urban progress in climate adaptation finance and propose productive conceptualisations of these dynamics moving forward, including cohesive adaptation as a financing strategy grounded in territorial cohesion.

2. Data and methods

We followed a cross-sectional survey method (Connelly 2016) to examine how European urban policymakers from different-sized cities and EU regions perceive access and allocate funding for climate adaptation. Following the approach of Berrang-Ford *et al* (2019), our analysis excludes the examination of private sector-led climate adaptation initiatives and focuses solely on government-led climate adaptation efforts. Survey design was informed by climate urbanism literature and prior surveys. The survey covered topics such as funding sources, barriers, equity considerations and socio-political dynamics shaping adaptation funding and financing. It included 26 questions (main and sub-questions) in various formats (open-ended, binary, ordinal and categorical) (see survey example in SI). Two pilot tests ensured clarity and relevance, with minor adjustments made based on feedback.

There is ample evidence of adaptation being managed by a diversity of municipal departments (Woodruff and Stults 2016, Reckien *et al* 2020) and little evidence regarding how financial departments are involved. To increase the credibility of collected responses and guarantee that our survey was fitted to local officers from different departments (and not only financial), we designed the survey to avoid highly technical terminology or concepts. For example, we categorised financial instruments into relatively broad categories and linked them back

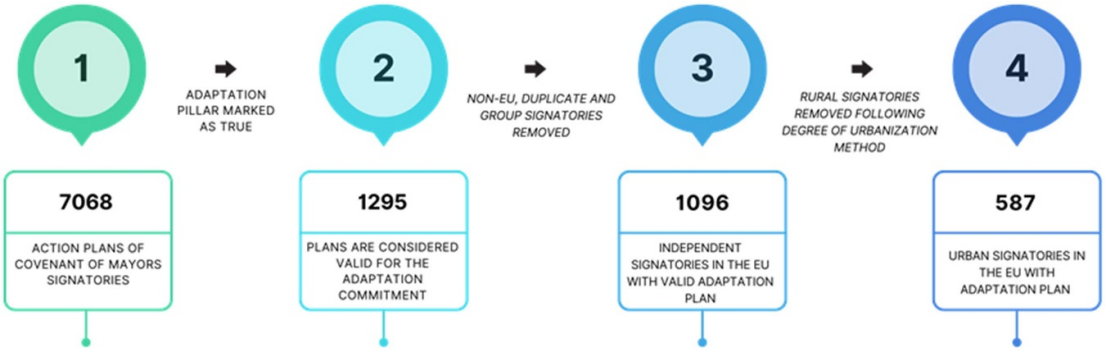


Figure 1. Survey sampling method building on the Joint Research Centre (JRC) dataset (Treville *et al* 2022).

to established frameworks. Additionally, many questions focused on perceptions of challenges and political priorities that would not depend on highly technical financial knowledge.

To identify local governments in the European Union that are likely to have experience with funding and financing climate adaptation, the sample was drawn from the only European database with credible and traceable information regarding this aspect: the Joint Research Centre/Covenant of Mayors (CoM) dataset. We targeted local governments that submitted adaptation plans via the My Covenant platform.

We followed the degree of urbanisation methodology[7]. Rural areas were intentionally excluded from the analysis to concentrate on urban municipalities, where the stakes and opportunities for impactful climate action are highest (UN-HABITAT 2024, Rosenzweig *et al* 2025). This focus is further supported by prior research showing that rural communities with populations under 5000 often face significant constraints in financial resources and institutional capacity, limiting their ability to effectively engage in climate initiatives (Bausch and Koziol 2020). As a result, the final sample consisted of 587 urban LAUs, including cities and towns/suburbs (see figure 1). The survey was distributed in English, Spanish, Italian and French (the latter three being the most widely spoken languages among the 587 urban LAUs in the survey pool) with accredited translators ensuring accurate translation from the original English version. We acknowledge, however, that this language selection may have influenced regional variation in response rates.

[7] DEGURBA is the European Commission's officially accepted standard for classifying urban and rural areas at the local (LAU) level (Eurostat 2018). The methodology uses 1 km² grid cells to classify Local Administrative Units (LAUs) into three categories: cities, where at least 50% of the population lives in urban centres (>50 000); towns and suburbs, where less than 50% live in urban centres but at least 50% live in urban clusters (>5 000); and rural areas, where more than 50% of the population lives in rural grid cells.

In a subsequent phase of the study, 938 contact emails from the environmental and financial departments of these urban administrations were gathered through a systematic search of municipal websites, the CoM platform as well as relevant policy documents. Between November 2022 and January 2023, a survey was conducted. The ICLEI Climate Financing Tree provides clear definitions of funding and financing instruments to ensure consistent understanding across respondents. The survey achieved a 25% response rate, resulting in 148 valid responses from urban administrations of varying sizes across 17 EU countries (figure 2). The sample is geographically distributed across three major European regions: Southern Europe (84 local governments); Northwestern Europe (46 local governments) and Central and Eastern Europe (18 local governments). Although the sample from Central and Eastern Europe is relatively modest and requires caution, the findings offer valuable insights and a meaningful foundation for further exploration, particularly in underrepresented regions. Most responses came from environmental departments (64%), with a low participation rate from finance departments (3%).

Quantitative and qualitative analyses were conducted using Excel, Tableau, RStudio, and MAXQDA. The analysis also included variables such as urban typology, gross domestic product (GDP) per capita at the NUTS 3 level for the year 2019 (Eurostat 2023), population size and relative climate risk (ESPON Project, RCP8.5 scenario). The data were categorised according to the EuroVoc classification into three European regions—Northwestern, Southern and Central/Eastern Europe—to explore regional patterns. Responses were mostly analysed using descriptive statistics, visualised in graphs and charts, while specific relationships between variables were statistically tested using the Kruskal–Wallis and Mann–Whitney U tests. Qualitative insights from open-ended responses were analysed thematically using MAXQDA.

Detailed information on data collection methods—such as survey design, sampling criteria

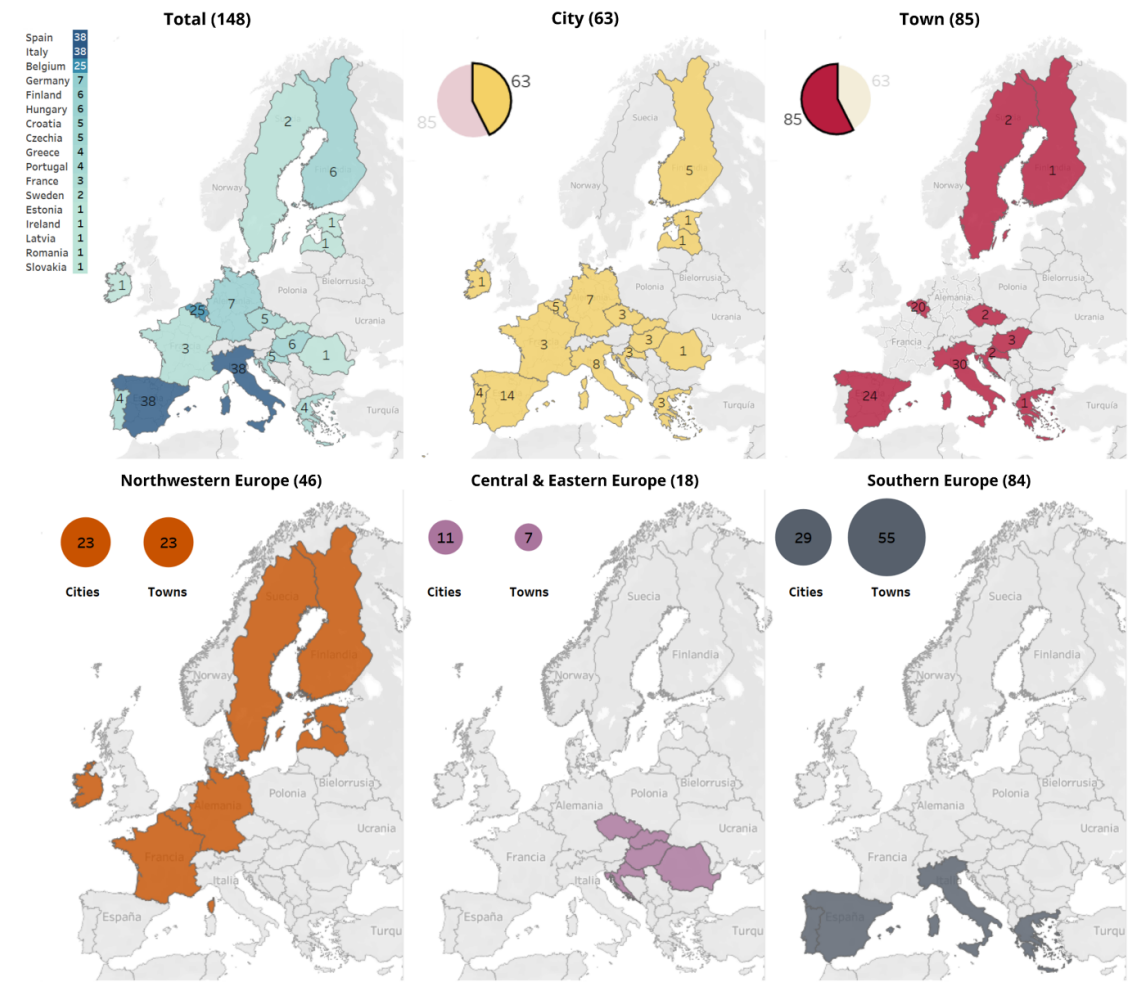


Figure 2. Mapping survey respondents by Eurostat's degree of urbanisation (a classification using population density, size and contiguity to denominate towns or cities) and European region. Total number of cities and/or towns (*n*-values) indicated between brackets. See SI Methods for further details.

and case study selection—as well as data analysis methods and supplementary result tables is provided in the supplementary information (SI).

3. Results

The results are divided into the following three thematic sections: (1) the use of financial instruments for urban climate adaptation measures, (2) barriers to funding adaptation measures, and (3) the factors influencing the allocation of climate adaptation funds.

3.1. The use of financial instruments for urban climate adaptation measures

The most reported instruments are local government funds (79%), regional grants/subsidies (63%), national grants/subsidies (55%), and EU grants/subsidies (50%) (figure 3(a)). In comparison, the use of finance for climate adaptation, particularly debt-based and market-based options like private sector loans and municipal (green) bonds, is relatively low (figure 3(a)). 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 financialisation on the ground. Among the cities expressing interest in using financial instruments, public loans are preferred over private-sector loans. 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.

Overall, cities (60%) report greater use of EU/International grants than towns (39%) (figure 3(a)), with cities primarily utilising Horizon 2020/Europe, the LIFE Programme and the European Regional Development Fund (ERDF), while towns mainly rely on the ERDF and NextGeneration EU (figure 3(b)). Notably, we find a high 'do not know' response rate regarding specific EU funding

a)

Type of Instrument	City / Town	Use of Instrument: Used	Use of Instrument: Planning to use	Use of Instrument: Not planning to use	Don't Know Response Rate
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%**	



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	Don't Know Response Rate
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%**	

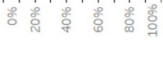


Figure 3. (a) Financial instrument usage by City/Town, ranked by the used column from highest to lowest ($N = 148$). (b) Use of EU funding programmes by City/Town, similarly ranked ($N = 112$), restricted to those who reported using or planning to use EU/international grants in panel (a). Percentages in the use of instrument column in panels (a) and (b) exclude 'do not know' responses. The bar graphs on the right show 'do not know' responses as a proportion of the respective sample, with darker shades indicating more 'do not know' responses. Note: URBACT III/IV and the European Urban Initiative/Urban Innovative Actions are part of the European Regional Development Fund but are listed separately due to their focus on urban areas.

programmes. This suggests that local government officers may have limited awareness of these funds, highlighting a need for capacity building and better information exchange.

Irrespective of the European region, more cities (92%) than towns (73%) have allocated funds to the implementation of adaptation actions (figure 4). 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, tables S11 and S12). Notably, local governments with elevated climate risk levels less frequently report funding for climate change risk/vulnerability assessments and monitoring and evaluation of implemented actions (See SI, tables S13 and S14). 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 (See SI, tables S15 and S16). Relatedly, cities in Northwestern Europe are particularly notable for their advanced stage in the

	Implementation of adaptation actions	Adaptation planning and coordination of adaptation plan	Climate risk/vulnerability assessment	Participatory processes	Monitoring and evaluation
City					
Northwestern EU	100%	90%	90%	86%	81%
Central & Eastern EU	82%	73%	82%	45%	45%
Southern EU	90%	76%	69%	62%	62%
EU City Average	**92%**	**80%**	**79%**	**67%**	**66%**
Town					
Northwestern EU	74%	74%	61%	48%	39%
Central & Eastern EU	71%	71%	29%	57%	43%
Southern EU	73%	54%	52%	46%	46%
EU Town Average	**73%**	**62%**	**53%**	**47%**	**44%**
Weighted Total	**81%**	**70%**	**64%**	**56%**	**53%**

Figure 4. Types of funded actions or processes by city, town and European region ($N = 139$). Nine urban governments did not answer this question ('do not know' response rate of 6%), and are excluded from the table. 'EU town and city averages' represents the weighted sum of all regions. 'Weighted total' denotes the weighted total of towns and cities. Note: the EU town and city averages are skewed towards Southern Europe and the weighted total percentages are skewed towards the towns and Southern Europe due to a higher number of Southern European respondents and a larger representation of towns in the sample, respectively.

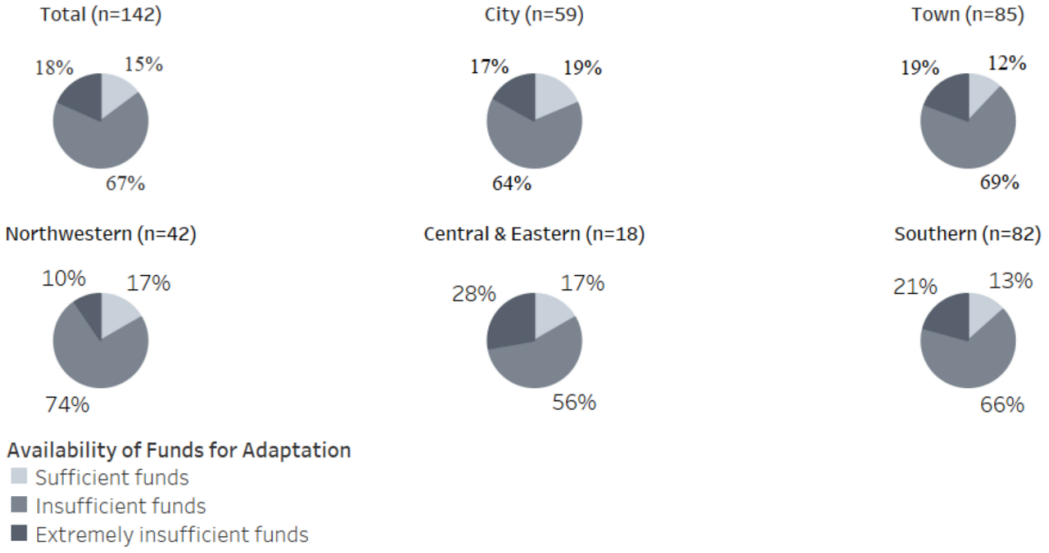
adaptation planning cycle. For example, they are already using funds for the implementation of adaptation actions (100% of Northwestern European cities), climate change risk/vulnerability assessments (90%), participatory processes (86%) and monitoring and evaluation of implemented actions (81%). In contrast, 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.

3.2. Barriers to funding adaptation measures

Most local administrations (85%) report insufficient available funds for the implementation of adaptation measures, with both towns and cities experiencing substantial financial constraints (see figure 5(a)). 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 (12 0847) than those with insufficient (15 3915) and sufficient funds (16 5605), no statistically significant relationship exists (See SI, tables S1 and S2).

Only 43% of local governments indicate adequate political support for adaptation measures, with towns notably lagging behind cities (figure 5(b)). 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 S17). 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 S18).

a) Availability of Funds for Climate Adaptation Measures



b) Statements on Adaptation Barriers

Statement	City / Town	Agree	Neutral	Disagree
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%**

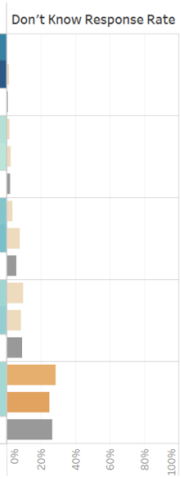


Figure 5. Barriers to funding adaptation measures. (a) illustrates the availability of funds for climate adaptation measures across total, town, city, and European regions (*n* value varies). (b) displays statements on adaptation barriers along with corresponding agree/neutral/disagree responses. Do not know responses excluded are illustrated by the bar graphs on the right; the darker the shade of orange, the higher the number of 'do not know' responses. The total do not know response rate is represented by grey bars in 5b.

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 'do not 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 for urban adaptation measures in Southern Europe (See SI, tables S19 and S20).

In terms of challenges to equitable adaptation, only 26% of urban administrations (19% of towns, 43% of cities) report they involve vulnerable groups (or their representatives) in climate adaptation planning, with considerable regional variations: 20% in Southern Europe, 24% in Central and Eastern Europe, and 35% in Northwestern Europe (See SI, tables S21 and S22).

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

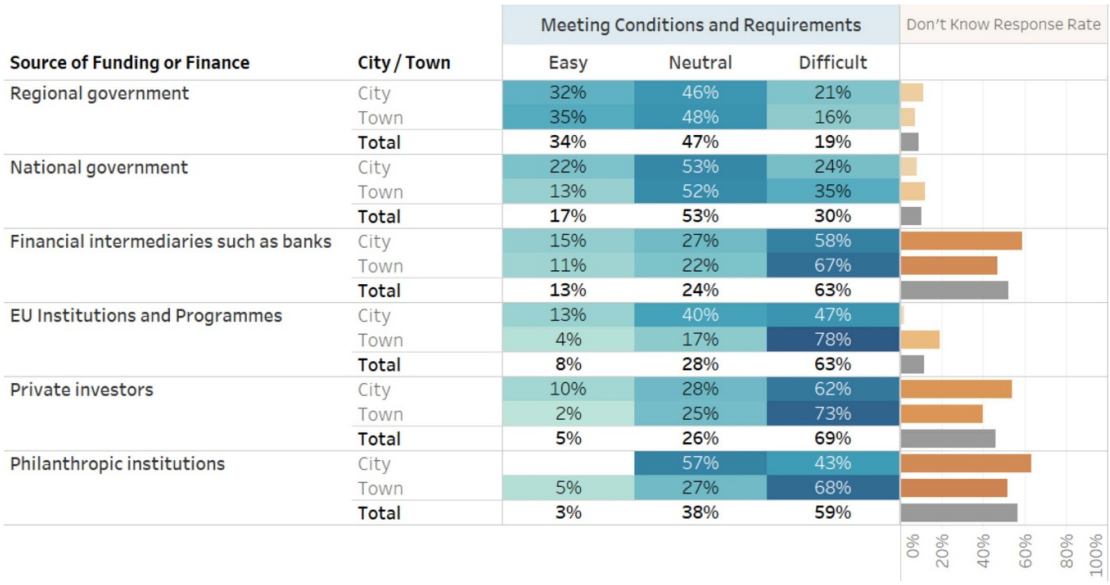


Figure 6. Funding or finance accessibility by source as indicated by Towns and Cities, ordered by ease in fulfilling conditions and requirements ($N = 148$). The percentages in the *Meeting Conditions and Requirements* column exclude 'do not know' responses. The bar graphs on the right represent the 'do not know' response rate; the darker the shade of orange, the higher the number of 'do not know' responses.

of funding (figure 6). 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 'do not 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 (31 7945) compared to those reporting difficulty (10 2383). 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, tables S4–S10).

3.3. 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 7 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 may suggest a greater diversity of interest groups and political pressures.

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%).

Regarding formal climate risk and vulnerability assessments (RVAs), only 33% of local governments —43% of cities compared to 24% of towns—recognise their important role in the allocation of climate adaptation funds (See SI, table S23). Concernedly, most administrations either reported neutrality or, less frequently, disagreement about the importance of RVA for fund allocation. It is surprising, for example, that while Northern European cities indicate they frequently fund climate RVA (90%, figure 4), only 42% acknowledge its importance in the allocation of adaptation funds (See SI, table S23). 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 and Rice 2019) or affluent areas (Kim *et al* 2021), at the expense of more vulnerable areas. Studies

	Political interests	Project's visibility	Local climate vulnerability	Fiscal sustainability	Return on investment	Private sector interests	Historical budget allocation
City							
Northwestern EU	90%	86%	67%	67%	48%	38%	29%
Central & Eastern EU	70%	70%	80%	80%	30%	10%	10%
Southern EU	66%	62%	79%	76%	62%	10%	10%
EU City Average	**75%**	**72%**	**75%**	**73%**	**52%**	**20%**	**17%**
Town							
Northwestern EU	95%	76%	67%	43%	57%	19%	19%
Central & Eastern EU	57%	71%	43%	86%	71%	43%	14%
Southern EU	60%	60%	62%	56%	63%	17%	15%
EU Town Average	**69%**	**65%**	**61%**	**55%**	**63%**	**20%**	**16%**
Weighted Total	**71%**	**68%**	**67%**	**63%**	**58%**	**20%**	**16%**

Figure 7. The factors influencing the allocation of adaptation funds by city, town and European region ($N = 140$). Eight urban governments ('do not know' response rate of 5%) did not answer this question and are excluded from the table'Weighted Total' denotes the combined total of cities and towns. Note: the EU Town and City averages are skewed towards Southern Europe and the weighted total percentages are skewed towards both towns and southern Europe due to a higher number of Southern European respondents and larger representation of towns in the sample, respectively.

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, tables S24 and S25). 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, tables S26 and S27).

Lastly, while participatory budgeting processes are considered a tool for advancing more just and equitable climate adaptation outcomes (Cabannes 2021), most 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 S28).

4. Discussion

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

Our EU-wide data confirms that the vast majority of local governments lack funds to implement adaptation plans (Aguiar *et al* 2018, Olazabal and Ruiz De Gopegui 2021, Boehnke *et al* 2023), questioning the credibility of plans to reduce vulnerabilities and increase resilience (Olazabal *et al* 2019). In contrast to a USA bias in finance research (Wójcik *et al* 2024), and the tendency in the literature to overemphasize the influence of (private) finance (August *et al* 2022), our data reveals limited use of financial instruments in EU municipal adaptation planning. This finding aligns with mitigation-related research showing minimal involvement of EU cities with financial products (Ulpiani *et al* 2023, Economidou *et al* 2024). The high number of 'do not know' responses regarding market and debt-based instruments reflects a significant gap in financial expertise among local government officers overseeing adaptation, as highlighted by the European Climate Adaptation Mission (European Commission 2023). Unsurprisingly, we find smaller

urban areas, particularly towns, seldom use financial instruments, likely due to legal constraints, limited tax revenues, and higher borrowing costs (Bourgeois *et al* 2022, Fünfgeld *et al* 2023, Fila *et al* 2024). Despite this, financial logic, such as return on investment and fiscal health, continue to dominate adaptation planning, even in projects that are publicly funded (Diezmartínez and Short Gianotti 2024). This underscores the need for a context-specific understanding of climate urbanism (Robin and Castán Broto 2021), one that recognises the role of public funding dynamics and challenges the simplistic view of climate urbanism as *business-as-usual capitalism* (Shi 2020).

At the municipal level, vulnerability is often overlooked in the allocation of adaptation funds, with political interests and a focus on returns on investment taking precedence, a pattern that is consistent with prior case study-based research (Eriksen *et al* 2015, Rice *et al* 2020, Shokry *et al* 2020, Castán Broto and Robin 2021). Likely due to their position in the adaptation cycle (having more experience with implementation), this dynamic is particularly perceived in Northwestern Europe, where political and private sector interests in fund allocation are reported more dominant compared to 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. To ensure resources reach the neighbourhoods most in need and effectively combine scientific and local knowledge, a more strategic and equitable allocation of resources is required, informed by inclusive participatory processes and scientific assessments—such as CoM SECAPs and local or regional RVAs.

At the national and EU level, there is a mismatch between risk and adaptation funding and finance: 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. While this pattern may align with ESPON's framing of risk—which combines hazard, exposure, and vulnerability—the finding remains deeply concerning. Given that vulnerability often reflects underlying institutional and administrative limitations, it is precisely these systemic weaknesses that may be hindering access to much-needed resources. This adaptation funding-risk mismatch is particularly pronounced in parts of Southern Europe and raises important concerns about spatial equity.

Lastly, 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 RVAs. They subsequently fund fewer climate adaptation actions and processes and lag behind cities in their climate adaptation planning cycle. Our findings reinforce prior research on the structural adaptation barriers faced by small and medium-sized municipalities (Rivas *et al* 2022, Fünfgeld *et al* 2023, Fila *et al* 2024), while empirically grounding the need for a differentiated, spatially-aware approach to adaptation finance.

In light of our findings and to address the observed inequities across urban areas, we propose *cohesive adaptation* as a policy and financing strategy that incorporates territorial cohesion principles into adaptation funding and financing mechanisms. While the principle of territorial cohesion is acknowledged in the Lisbon Treaty and the EU Territorial Agenda (Medeiros and Rauhut 2020), research has shown it has often been overshadowed by other priorities, such as regional competitiveness (Madanipour *et al* 2022, Weck *et al* 2022). The cohesive adaptation approach advocates for more equitable access to EU and national adaptation funding, alongside fiscal equalisation, where resources are redistributed more evenly across municipalities, not only to support those with lower financial capacity but also to prioritise areas facing higher climate risks (Venner 2024). Building on Medeiros (2016), territorial cohesion principles emphasize a polycentric urban structure, where smaller and medium-sized cities are vital for linking rural areas to larger urban centres. In the context of cohesive adaptation, we hypothesise that supporting these cities (especially in less developed EU regions) through targeted funding and policies can enhance their capacity to adapt to climate risks, fostering more balanced regional development.

While our survey data confirms that Horizon Europe and LIFE play a pivotal role in financing urban climate adaptation, it also reveals that small and medium-sized cities often struggle to access these programmes. This aligns with recent findings that the competitive nature of such programmes tends to concentrate resources in already high-performing cities, inadvertently disadvantaging those with more limited institutional capacity (Venner *et al* in press). A concrete application of the cohesive adaptation approach could therefore involve revising consortium requirements under the EU Adaptation Mission to level the playing field for smaller and medium sized cities (Venner *et al* in press). While Horizon Europe and LIFE emphasise innovation and excellence, we hypothesise that a closer alignment with territorial cohesion goals could broaden participation and, in turn, catalyse—rather than hinder—innovative urban adaptation pathways.

More broadly, a cohesive adaptation approach would require leveraging major instruments—such as Cohesion Policy Funds, European Investment Bank loans, and national budgets—to support adaptation at scale. Given that global temperatures have already reached 1.5 °C with no clear sign that greenhouse gas emissions will peak and decline rapidly (World Meteorological Organization 2025), the need for adaptation spending is urgent, and failing to act now will only exacerbate future costs and risks.

Certainly, the focus on CoM signatories and the high participation of administrations from Southern Europe in CoM, affect the generalisation of our findings. Future large-scale studies on urban adaptation funding and finance can include a more diverse sample, incorporating non-signatories, rural administrations and more municipalities from Central and Eastern Europe. Moreover, we invite further reflection on how a cohesive adaptation approach could be implemented in practice. While we have presented several examples of such an approach, grounded in strong evidence of the need to address inter-urban inequities, there are undoubtedly additional avenues to explore. Nevertheless, we believe that by aligning the EU's climate adaptation objectives with its long-standing commitment to territorial equity, cohesive adaptation could provide a strategic framework that not only fosters policy coherence but also lays the foundation for a more resilient and equitable future.

Data availability statement

The data cannot be made publicly available upon publication due to legal restrictions preventing unrestricted public distribution. The data that support the findings of this study are available upon reasonable request from the authors.

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Conflict of interest

The authors have no relevant financial or non-financial interests to disclose.

Ethics statement

This study, including the survey, was reviewed and approved by the Scientific Committee of BC3 following ethical guidelines for research involving human participants. As such, the research was conducted in accordance with the Declaration of Helsinki and all relevant local regulations.

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Authors' contributions

K V, M O, and M G L were involved in conceptualisation, methodology and formal analysis. K V led the investigation, and performed the data collection and curation. A T and L C A advised in the development of the methodology and the survey design. K V wrote the original draft. K V, M O, A T, L C A and P B reviewed and edited the final manuscript. K V, M O, and M G L obtained funding. M O and M G L supervised.

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